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Biomechanical Running Indicators and Neurodynamic Functions of an Elite Athlete with Visual Impairment in a Track and Field Sprint

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Abstract

Introduction: Study of the problem of compensatory development is of great importance for all categories of the population suffering from impaired operation of the visual analyzer. This problem is of particular importance for Paralympians with visual impairment, since in this case the development of compensatory mechanisms serves not only to maintain the quality of life, but also to achieve high athletic performance. Objective: to identify potential compensatory mechanisms of visual impairment in an elite athlete in the Paralympic sprint based on an analysis of the biomechanical characteristics of running and indicators of neurodynamic functions. **Methods:** A highly qualified athlete participated in the study, specializing in short-distance running and long jump among athletes with visual impairment (category T12). The individual characteristics of the neurodynamic funktions and the results in running for 60, 80,100, 120, 200 m were analyzed and the biomechanical characteristics of the run for 100 m were determined. In total, 36 series of measurements of each indicator were carried out for 5 months. **Results:** It is shown that the athlete being examined is an atypical sprinter from the point of view of the properties of the nervous system, development and maintenance of speed at a distance, some biomechanical characteristics of running. The subject athlete is a representative of a mobile and strong type of nervous system, which allows her to maintain a higher speed at a distance compared to other athletes for a longer time, which can be considered as a potential reserve. The presence of a small irregularity in the change in the speed and acceleration of the movement of the ankle and knee joints, observed in some steps when lowering the limb after hip removal, was revealed. Conclusion: Revealed a high reliable relationship between the neurodynamic and biomechanical characteristics of the examined female athlete. Improving the biomechanics of running by focusing on the work of a kinestatic analyzer can give an increase in speed at a distance while maintaining it almost to the finish.

Keywords: sprint, paralympic, vision, adaptation, neurodynamics biomechanics

1. Introduction

Currently, visual impairment is one of the main problems of human health. There are many different methods of improving vision (special exercises, lifestyle), as well as methods for correcting the visual analyzer (lenses, glasses). However, in some cases, vision is difficult to correct. And in this case, the development of compensatory mechanisms of visual dysfunction is of particular importance [1]. These

mechanisms often consist in activating other analyzers (auditory, kinesthetic), and may also consist in the work of the nervous system as a whole. Such compensation is typical for people with congenital anomalies of vision, since there is a rather long period of adaptation. For people whose visual analyzer malfunctions have developed in adulthood, compensatory mechanisms are much less developed, although in the absence of opportunities to restore visual function, compensatory mechanisms are the only means of ensuring a quality of life. Therefore, the study of the problem of compensatory development is of great importance for all categories of the population suffering from impaired operation of the visual analyzer. This problem is of particular importance for Paralympians with visual impairment, since in this case the development of compensatory mechanisms serves not only to maintain the quality of life, but also to achieve high athletic performance [2].

2. Literature Review

One of the factors to ensure high sports results are the neurodynamic functions or properties of the nervous system (Properties of the nervous system) [3; 4; 5]. According to modern definitions of this concept, these are stable dynamic features of the nervous system, to a greater degree genetically determined, which determine individual differences in behavior when reacting to the effects of the physical and social environment. Currently, the properties of the nervous system are presented in the form of a hierarchy of levels: 1) elementary (properties of individual neurons), most often used in determining the characteristics of the work of motor and other neurons; 2) complex (properties of various brain structures), most often used in determining the work of individual analyzers; 3) cerebral (systemic) properties (i.e. properties of the whole brain), most often used as indicators of individual typological characteristics. Neurodynamic functions are also referred to psycho-physiological functions, which combine a wide range of indicators that reflect the work of the nervous system at the physiological level. In many studies, "neurodynamic" and "psychophysiological" functions are intersecting concepts [6; 7].

The main properties of the nervous system are the strength, mobility and balance of the nervous processes [6; 7; 8]: force - the ability of nerve cells to maintain normal performance with a significant voltage of excitatory and inhibitory processes. It is believed that individuals with a stronger nervous system are stronger and more stress-resistant. The mobility of the nervous system is expressed in the ability to quickly move from one process to another. Persons with a more mobile nervous system are distinguished by flexibility of behavior, adapting to new conditions more quickly. Balance means the same intensity of the processes of excitation and inhibition. People with a more balanced nervous system are characterized by more balanced behavior.

Later, in connection with the new methods of studying the properties of the nervous system, both the structure of the basic properties of the nervous system and their neurophysiological content were substantially refined [9; 10; 11]. In these studies, it was shown that the so-called weak nervous system is not a disadvantage, but a sign of higher susceptibility to the surrounding world. Moreover, in the studies of Ilyin [10; 11] it was shown that among athletes of various specializations there are representatives of a strong or weak nervous system. So, for example, sprinters, as a rule, are distinguished by a weak nervous system, i.e. their nervous system quickly turns to work with small stimuli, but they cannot sustain neuropsychic tension for a long time. Representatives of the strong nervous system prevail among the stayers. For representatives of sports games, martial arts, the mobility of the nervous system is of great importance.

Ilyin [10; 11] also proposed a method for determining the strength of the nervous system by tapping test: the subject performs this test in five series, the frequency of movements in each series is determined. The more dramatically the frequency of movements decreases from the first series of tests to the subsequent ones, the higher the nervous system fatigue (less power) and the higher the sensitivity.

In studies Lizogub et al. [6] proposed a computerized method for determining the strength and mobility of the nervous system. In this method, to determine the properties of the nervous system, the definition of the reaction rate in different test modes and the number of errors during the tests are used. This method is based on the same principles as the method of Ilyin [10; 11], but instead of the tapping test, the speed of a complex reaction is used. The authors suggested several testing modes. In the test with feedback mode, the next signal is given the faster, the faster the subject responds to the previous signal. The faster the subject goes to his maximum reaction rate, the faster the reaction rate and the shorter the overall test time, the higher the mobility of the nervous system. The fewer errors the subject makes, the higher the strength of the nervous system. In the imposed rhythm mode, the subject is given several series of stimuli, and in each series the rate of appearance of signals increases. The longer the subject can manage to stay without a sharp

drop in the accuracy of the answers, the higher the strength of the nervous system.

Since the properties of the nervous system are innate characteristics and relatively poorly amenable to development, according to these indicators it is recommended to predict a person's tendency to a certain type of activity, and an athlete to choose sports specialization or to determine the features of an individual approach to training athletes within specialization [12; 13].

Adaptive changes to physical stress on the part of the nervous system occur both at the level of individual neurons, analyzers, and at the level of the central nervous system as a whole. In case of insufficiency of the visual analyzer, compensatory mechanisms may be manifested in the activation of the auditory, kinesthetic analyzers, as well as at the level of the entire nervous system [14]. At the level of the nervous system as a whole, compensatory mechanisms may manifest themselves in enhancing the properties of the nervous system. As a rule, compensatory mechanisms arise in the work of functions that are most individually expressed for a person. For example, if a person with a visual impairment has more developed hearing or tactile sensitivity, then compensatory mechanisms are manifested in a more pronounced development of these functions. If a person with inadequate functioning of an analyzer is characterized by the development of certain properties of the nervous system, then it is logical to assume that compensatory mechanisms may also manifest themselves in a more pronounced development of these properties of the nervous system.

Based on these provisions, a hypothesis was posed: 1) there is a relationship between neurodynamic functions, biomechanical characteristics and speed of run; 2) in an elite sportswoman with visual impairment, compensatory mechanisms can manifest themselves not only at the level of development of individual analyzers, but also at the level of properties of the nervous system.

The study of the compensatory mechanisms of visual dysfunction is of great importance both for Paralympic athletes and for people suffering from such dysfunctions, especially in cases where analyzer disturbances occurred in adulthood and the natural adaptation mechanisms did not have time to get involved in the process of growth and development of the organism.

The aim of the work was to identify potential compensatory mechanisms of visual impairment in an elite athlete in the Paralympic sprint based on an analysis of the biomechanical characteristics of running and indicators of neurodynamic functions.

3. Method

3.1. Participants

The study involved a highly qualified athlete specializing in short-distance running and long jump, European Athletics Champion of 2010; medalist of the World Paralympic Championships and the Paralympic Games among athletes with visual impairments (category T12 [1; 3; 5]) of 2016. Category T12 provides for competitions in the Paralympic race with an accompanying partner who controls the direction of the Paralympic movement. Paralympic athletes are divided into categories immediately before the competition. Belonging to a specific functional category is established by the Paralympic Medical Commission. At the same time, athletes with different diagnoses, but with similar functionality, can fall into one category. So, as a rule, sportsmen who have a severe stage of myopia fall into the T12 category. In the examined female athlete, the middle stage of myopia, but in combination with a complex form of astigmatism and retinal dystrophy, the function of the visual analyzer of this athlete by the Paralympic Medical Commission was classified as corresponding to category T12 [8]. An athlete can see quite well near (at a distance of up to 1-2 m), and therefore can undergo computer testing. But already at a distance of 1-2 m the ability to see well, and, accordingly, to orient in space, this athlete becomes more complicated. Therefore, we found it possible to use computer testing to determine the latent time of simple and complex reactions to visual objects in various test modes at a distance of 30 cm from the screen.

3.2. Materials

Methods for determining neurodynamic (psycho-physiological) functions

Determining the speed of a simple and complex reaction to light stimuli, strength and mobility of the nervous system

The tests were carried out according to the "Psychodiagnostics" program. The "Psychodiagnostic" program is a computerization of the Diagnost system proposed by Lizogub with co-authors for "Windows-98" [6] and is intended to determine individually-typological properties of higher nervous activity and human sensomotor functions in processing visual information of varying degrees of complexity. We used a

version of this program, developed by us for modern information systems (certificate of authorship No. 29956) [1; 3; 5].

The program allows you to determine the psycho-physiological capabilities - the speed of a simple and complex reaction with different testing modes, as well as the properties of the nervous system. This program has three main modes. The main modes are divided into optimal, feedback and imposed rhythm.

In turn, each of these modes consists of sub-modes - a simple visual-motor reaction, the reaction of choosing one signal from three; reaction of choosing two signals from three. In the mode of feedback and imposed rhythm, you can determine the level of functional mobility and strength of nervous processes. In the feedback mode, each next exposure is given the faster, the faster the subject responds to the previous exposure [8].

The definition of a simple reaction and a complex reaction to the light indices was carried out in an optimal test mode (each signal is given at regular intervals of time, 900 ms) and in a closed-loop mode (the faster the subject reacts, the faster the next signal is given). When determining the latent time of a simple visual-motor reaction, the subject was given the task to press the left mouse button as quickly as possible when any object appeared on the screen. The subject was given 30 attempts. The following indicators were recorded: the average value of the latent reaction time (ms), standard deviation, the number of errors.

When determining the latent time of a complex reaction, 2 test passing options were used: selecting 1 object with 3 and selecting 2 objects from 3. When selecting 1 object with 3, the subject was given the task to react by pressing the left mouse button only on the appearance of geometric shapes, to skip all other objects. When selecting 2 objects with 3, the subject was given the task of pressing the left mouse button when geometric shapes appeared, and pressing the right mouse button when images of natural subjects appeared (animals, birds, fish). All other objects should be passed. Testing was conducted in the optimal mode (the next signal appears after a certain period of time, 900 ms). In these tests, the following parameters were recorded: average latent reaction time (ms), standard deviation, number of errors.

The determination of the mobility and strength of the nervous system was carried out in feedback modes, that is, each next signal appeared the faster, the faster the subject responds to the previous one. In these tests, it is necessary to select 2 objects out of 3 similar to the test for determining the latent time of a complex reaction in the optimal mode, but the signals are fed in feedback mode. The subject underwent 2 tests: with the number of signals 30 and with the number of signals 120. The following indicators were recorded: the average latent reaction time, standard deviation, the number of errors, the time to reach the minimum signal exposure (that is, how long after the test started its maximum response speed) (s), the minimum signal exposure time (ms), the total test time (s).

In determining the strength and mobility of the nervous system, the following provisions were adhered to: the smaller the number of errors when performing a test for a complex visual-motor reaction with feedback, the higher the strength of the nervous system; the shorter the latent period of the reaction to the stimulus, the time of the minimum signal exposure, the time of reaching the minimum signal exposure and the total time for performing the test for a complex visual-motor reaction with feedback, the higher the mobility of the nervous system [5; 8].

The results of the execution of all tests are automatically recorded by the program in an Excel document.

Determining the speed of response to sound

Determination of the latent response time to sound was carried out according to the “Complex” program [8]. The subject is given the task to click on the "space" as soon as he hears the special sound produced by the computer. It was given 30 attempts. The latent reaction time, the standard deviation, the number of errors were recorded. A mistake was pressing the "space" button before the sound occurred. Indicators were recorded by a computer program automatically.

The definition of mental health according to the method of "Schulte table" [3].

This technique is used to determine the level of mental (mental) performance. The subject is alternately offered five tables on which numbers from 1 to 25 are arranged in a random order. The subject searches and marks the numbers by pressing the left mouse button in the order of their increase. The sample is repeated with five different tables.

The main indicator of the test - time to complete. According to the results of the implementation of each table, an exhaustion (fatigue) curve can be constructed, which reflects the stability of attention and performance in dynamics. Using this test, you can also calculate such indicators as work efficiency, degree of work (the ratio of work time on the second table to work time on the first table is determined), mental

stability (the ratio of work time on the fourth table to work time on the first table is determined.

After completion of the test results are automatically entered into the program database.

Diagnostics of the psychophysiological state of a person according to the program "Measuring the response time of a point selection in space:"Choice of a button"" [5; 8]

The registration of the psycho-physiological state of a person was carried out by measuring the reaction time of a point selection in space. The reaction time of a point selection in space was measured, which included conducting one series or several test series, according to the algorithm consists of a sequence of actions: an image of an object is displayed on the computer screen, the object is displayed every time in a new place, the time interval between appearances of the object is not permanent; Responding to the appearance of an object on the screen is carried out by touching the image of the object. Summarize the number of appearances of the object in each series, the number of correct touches in each series, the number of series.

Method for determining the biomechanical indicators of elite runner-run athlete with visual impairment

The biomechanical indicators of running an elite female athlete with visual impairment were determined by analyzing the video tracks of the run using the Kinovea program, version 0.8.15. [13]. Kinovea program allows you to perform video analysis of movements. It is intended for athletes, coaches, health workers, for research in the field of sports. Also, the software can be useful to experts in the field of ergonomics or animation. The main function of Kinovea is to watch and analyze sports videos. The main tools that users use: "Line", "Chronometer", "Tracking". The "Line" and "Chronometer" functions allow you to measure distance and time, and with the help of the "Semi-automatic tracking" tool, you can track both the trajectory and time. When working with Kinovea, you can use video from external sources: video cameras, smartphones, etc. It is enough to save the video files on your computer, and then load it into the program and conduct a video analysis. - the program recognizes them independently.

For the analysis of biomechanical parameters, 2 running steps of the athlete were selected at the moment of reaching the maximum running speed per 100 m (17 frames) (Fig. 1). Calibration distance was carried out along the length of the athletics barrier (92,3 cm). The travel time was determined by the stopwatch indicators in the program. The determination of the speed of movement of the ankle joint (V, m·s^{-1}) (Fig. 2), the speed of movement of the knee joint (V, m·s^{-1}), and the angle at the knee joint (degrees) (Fig. 3) were carried out. The acceleration of the movement of these points was automatically determined (m·s^{-2}). The force (F) developed by the extremity (kgm·s^{-2}) was also determined by the formula (1):

$$F = ma \quad (1)$$

where:

F - the force developed by the limb;

a - acceleration of the movement of the knee joint;

m - the mass of a limb (approximately 13 kg)



Fig. 1. An example of a videogram of running on 100 m of an elite sportswoman with visual impairment



Fig. 2. An example of automatic determination of the speed of a point in space (ankle) along a curved path using the Kinovea program



Fig. 3. An example of automatic determination of the angle in the knee joint using the program "Kinovea"

In total, 36 videos of 100 meters running were analyzed, in each video, 17 frames (2 running steps) were selected for analysis when the athlete reached the maximum running speed.

In addition, points were determined by time and distance to reach a maximum speed at a distance of 100 m. 36 videos were also analyzed. The obtained data regarding the moment of reaching the maximum speed at a distance and the beginning of its decrease were compared with the literature data.

3.3. Procedure

The study was conducted from mid-August to the end of December 2015, during the preparation for the 2016 Paralympics. The athlete tested neurodynamic functions twice on Sunday (Monday and Thursday). The athlete underwent testing of neurodynamic functions at a distance of 30 cm from the screen with standard lighting (300-500 lux) and standard angle of view and upper edge of the computer (150) in accordance with hygienic requirements. Testing was carried out at 10 am after a light breakfast. The next day, after passing the tests (Tuesday, Friday), the athlete in training (1100-1300) ran 60, 80, 100, 120, 150, 200 m stretches. The running time of the distances was recorded. Each race was filmed for later analysis. In just 5 months, 36 measurements of the running time of each distance were taken, 36 measurements of the passing of each test in neurodynamics.

3.4. Statistical analysis

The digital material obtained during the research was processed using traditional methods of mathematical statistics. For each indicator, the arithmetic mean value $\bar{x}$, the standard deviation S (standard deviation), and the standard error m were determined. According to the results in the run at 200 m, 60 m, 80 m, 100 m, 120 m, 150 m, 400 m, the biomechanical indicators and neurodynamic (psychophysiological) indicators were carried out a correlation analysis of Pearson. Differences and reliability of correlation coefficients were considered reliable at a significance level of $p<0.05$.

4. Results

The results showed that the athlete being examined is an atypical sprinter in terms of the properties of the nervous system, the development and maintenance of speed at a distance, some biomechanical characteristics of running. "Atypicality" of an athlete is manifested primarily in the fact that she achieves a maximum speed at a distance of 100 m approximately after reaching 60 m (Table 1, Fig. 4), while most

sprinters reach their maximum speed to 40-50 m of 100 m distance (Fig. 4). However, the speed achieved by an athlete is slightly higher compared to other athletes of similar qualifications. In addition, the athlete being surveyed retains the maximum speed achieved much longer, practically without reducing it to the finish line (Table 1, Fig. 4). This type of development and maintenance of speed at a distance is more typical for middle distance runners, therefore it can be concluded that the athlete being examined is an intermediate type runner between sprinters and middle distance runners. However, the maximum speed developed by an athlete is higher compared to other sprinters of similar qualifications and compared to middle distance runners. Perhaps this feature of the athlete is associated with a greater mass, which makes it difficult to quickly disperse the body, and a higher creatine phosphate and glycolytic endurance athlete, which allows you to develop a higher speed at a distance and keep it almost to the finish.

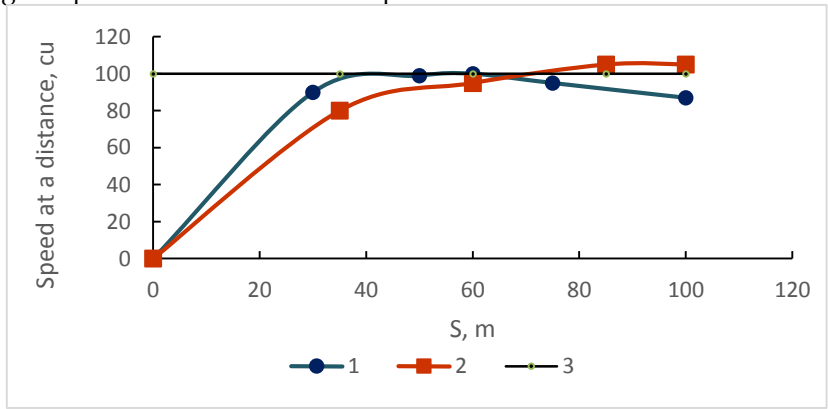


Fig. 4. Speed when running elite athletes of a distance of 100 m:
Speed at a distance, cu - speed at a distance, cu;
1 - the average data of athletes running 100 m in 11-12 s;
2 - data of the examined sportswoman with visual impairment;
3 - the maximum speed at a distance (the average data of athletes running 100 m in 11-12 s)

Table 1. *Results of sprint distances running by an elite athlete with visual impairment (n = 36)*

Indicators	$\bar{x}$	S	m
Running 60 m (s)	7.16	0.22	0.04
Running 80 m (s)	9.64	0.35	0.06
Running 100 m (s)	12.20	0.47	0.08
Running 120 m (s)	14.49	0.38	0.06
Running 150 m (s)	19.25	1.23	0.20
Running 200 m (s)	26.20	1.84	0.31
The moment of reaching the maximum speed at a distance of 100 m (m)	62.3	4.45	0.74
The moment of the beginning of reduction of speed at a distance of 100 m (m)	99.2	1.24	0.21

Sprinters, as a rule, are representatives of the "sensitive" (weak) type of the nervous system [6; 7]. They quickly react to stimuli, they are able to distinguish stimulus of small strength, but they have less ability to withstand strong or long-lasting incentives. However, an analysis of the development and maintenance of the athlete's speed at a distance suggests that the athlete being tested is distinguished by a stronger nervous system compared to other sprinter of the same qualifications, since its ability to tolerate strong stimulus involves maintaining a high speed in running for a relatively long time. This assumption should confirm the data analysis of neurodynamic parameters.

Neurodynamic indicators show that, according to the results of the latent time of a simple and complex reaction, the athlete examined corresponds to the average statistical data (Table 2). The only test in which an athlete shows a higher result compared to the average data is the number of correct responses to an object that changes its position in space in the Ermakov test (tab. 2). This indicates a high mobility of the nervous system, which, in general, is characteristic of the sprinter. The latent period of the response to the

sound of the examined female athlete also does not exceed the average statistical data (Table 2). Therefore, we can conclude that compensation for insufficiency of the visual analyzer from the side of a more developed auditory analyzer does not occur in this athlete. This is an unfavorable factor for the sprinter, because the sprint requires a high response rate to the sound.

Table 2. *Neurodynamic indicators of elite athletes with visual impairment (time of simple and complex reaction, switching attention) (n = 36)*

Indicators	$\bar{x}$	S	m
Simple visual-motor reaction time (ms)	238.08	11.42	1.90
Test for a simple visual-motor reaction (number of errors)	0.44	0.50	0.08
Simple visual-motor reaction time, standard deviation (ms)	2.73	0.03	0.01
The reaction time for selecting one element out of three (ms)	445.94	22.45	3.74
Test the reaction of selecting 1 item with 3 (number of errors)	1.42	1.08	0.18
The standard deviation in the test for the reaction time of selecting one element out of three (ms)	4.11	0.43	0.07
Reaction time for selecting two elements from three (ms)	435.81	9.70	1.62
Test for the reaction time of the choice of two elements out of three (number of errors)	2.14	0.76	0.13
The standard deviation in the test for the reaction time of the choice of two elements of the three (ms)	3.98	0.45	0.08
Sound response time (ms)	317.64	1.97	0.33
" Ermakov test " (number of correct answers in 15 s)	35.25	1.86	0.31

Analysis of neurodynamics in tests for the speed of a complex reaction in the feedback mode confirms that the athlete being examined is a representative of the rolling type of the nervous system, as evidenced by the indicators of the minimum signal exposure time, the time required for the minimum signal exposure, the total test time. The data showed above average data. The number of errors, on the contrary, is lower than the average data, which makes it possible to regard the type of the nervous system of the female athlete as strong. Identifying that the sportswoman has a mobile nervous system is natural for a sprinter. However, the discovery of the fact that the nervous system of the female athlete is strong is somewhat contrary to the research of Ilyin [10; 11], Lizogub [6], Korobeynikov [7] that the sprinters dominate the weak (sensitive) nervous system. Comparing the data obtained regarding the neurodynamic characteristics of an athlete with the peculiarities of development and maintaining speed at a distance, it can be concluded that a strong type of nervous system of a female athlete allows her to maintain a higher speed at a distance compared to other athletes for a longer time.

Table 3. *Neurodynamic indicators of an elite athlete with visual impairment (time of a complex reaction in various testing modes, strength and mobility of the nervous system) (n = 36)*

Indicators	$\bar{x}$	S	m
The reaction time of the choice of two elements out of three in the test with feedback at 30 signals (ms)	442.39	13.81	2.30
The number of errors in the test with feedback at 30 signals (number)	20.89	2.05	0.34
The standard deviation of the reaction time of the choice of two elements out of three in the test with feedback at 30 signals (ms)	4.01	0.45	0.08
Minimum signal exposure time in a test with feedback at 30 signals (s)	434.22	8.71	1.45
The total time of the test with feedback at 30 signals (s)	104.14	10.19	1.70
The time to reach the minimum signal exposure in the test with feedback at 30 signals (s)	66.17	3.50	0.58
The reaction time of the choice of two elements out of three in the test with feedback at 120 signals (ms)	432.03	12.65	2.11
The number of errors in the test with feedback at 120 signals (number)	29.72	21.07	3.51

Standard deviation in the test with feedback at 120 signals (ms)	4.08	0.45	0.08
The minimum signal exposure time in the test with feedback at 120 signals (ms)	383.31	15.21	2.53
The total time of the test with feedback at 120 signals (s)	279.56	16.27	2.71
The time to reach the minimum exposure in the test with feedback at 120 signals (s)	75.83	2.44	0.41

Analysis of psycho-physiological indicators, such as mental (mental) performance, confirmed the assumption of a strong nervous system of the athlete. Hours on the tables Schulte is almost the same from the first to the fifth table (Table 4).

Table 4. *Neurodynamic indicators of an elite athlete with visual impairment (mental (mental) performance, workability, concentration, attentional shift) (n = 36)*

Indicators	$\bar{x}$	S	m
Opening hours on the 1st table of Schulte (s)	49	1.02	0.23
Opening hours on the 2nd table of Schulte (s)	50	8.01	0. 12
Opening hours on the 3rd table Schulte (s)	52	1.04	0. 25
Opening hours on the 4th table of Schulte (s)	49	1.03	0. 22
Opening hours on the 5th table of Schulte (s)	49	1.05	0. 21
The total time of the Schulte test (s)	185	11.26	0.22
Work efficiency in the Schulte test (cu)	50.75	10.14	1.69
The rate of inclusion in the Schulte test (cu)	1.12	0.11	0.02
The performance of the nervous system Schulte test (cu)	1.13	0.15	0.03
Time in Bourdon test (s)	184.2	1.38	0.02
Errors in the Bourdon test (number)	0.58	0.69	0.12
Concentration in the Bourdon test (cu)	1091.67	8.76	1.46
The pace of work in the Bourdon test (cu)	5.03	0.7	0.12
Switching attention in the Bourdon test (cu)	0.5	0.51	0.08

This indicates a high performance of the nervous system, which is atypical for a sprinter, and also indicates a strong type of nervous system. Indicators of the rate of inclusion in the work and the health of the nervous system above 1, which confirms the fact of a strong nervous system in the examined athletes. These indicators are combined with a relatively low number of errors in the Bourdon test, a high concentration of attention (Table 4). The presence of a strong nervous system can be considered as a potential reserve for athletes, which can serve as the basis for the development of compensatory mechanisms of visual impairment.

The obtained data on the neurodynamics of the athletes were compared with the biomechanical characteristics of running. Analysis of the curves of change in the speed and acceleration of the movement of the ankle and knee joints shows the presence of a small uneven movement of the limb, observed in some steps when the limb is lowered after the hip has been removed (Fig. 7, 8; Table 5, Fig. 3, frames 7-9). This may be due to visual impairment and an increase in attentiveness when running at the moment of setting the foot, because with a lack of visual analyzer the nervous system does not allow to develop high running speed, working as a "fuse" of distortion of the direction of running. Outwardly, it may look like some kind of tightness while running. It should be noted that the athlete herself assessed in such cases her run as enslaved.

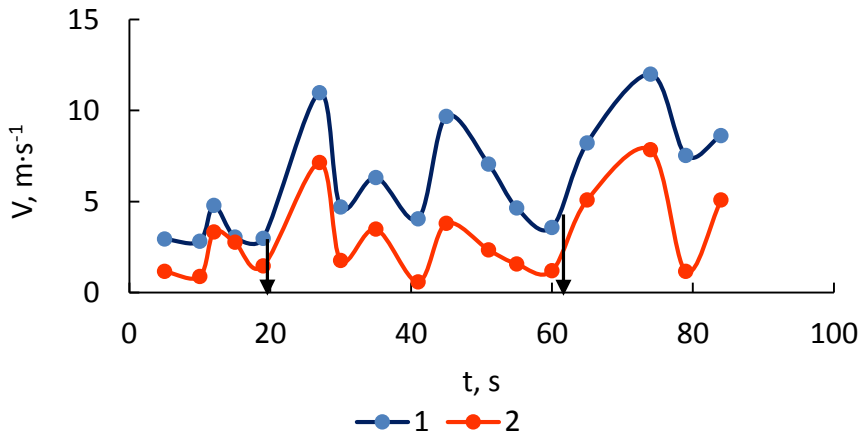


Fig. 5. The speed of movement of various points of the lower limb when an elite athlete with a visual impairment runs over a distance of 100 m:

V, m·s^{-1} – point speed (m·s^{-1});
1 – point on the ankle joint;
2 – point on the knee joint;
→ - the moment of contact with the ground, t = 0.11-0.12 s, the velocity at these times was not fixed due to the short duration of time intervals, tends to zero, since there is no movement

A slight irregularity is also observed when the angle in the knee joint changes when the hip is removed (Fig. 1, Table 5, frames 9-11, Fig. 7). Based on the data obtained, it can be assumed that, due to the ability to develop high speed at a distance and maintain a maximum speed at a distance of almost to the finish line, correcting the identified biomechanical distortions while running will give an additional reserve for improving the athletic result of the athlete being examined.

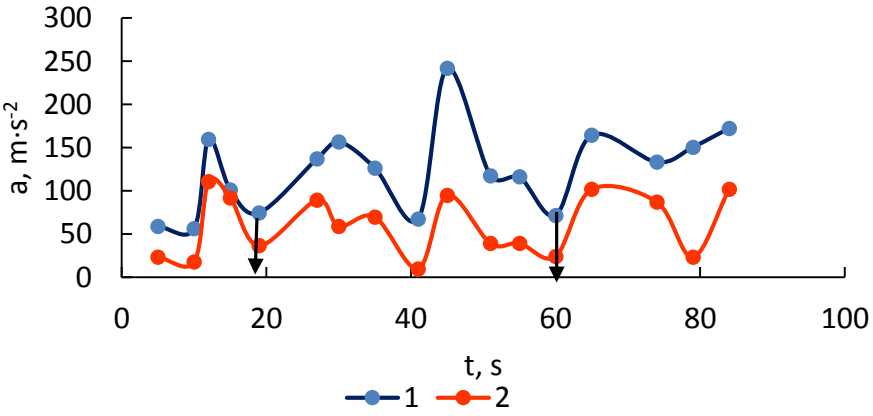


Fig. 6. Acceleration of movement of various points of the lower limb when running by an elite athlete with visual impairment of a distance of 100 m:

a, m·s^{-2} – point acceleration (m·s^{-2});
1 – point on the ankle joint;
2 – point on the knee joint;
→ – the moment of contact with the ground, t = 0.11-0.12 s, the velocity at these times was not fixed due to the short duration of time intervals, tends to zero, since there is no movement

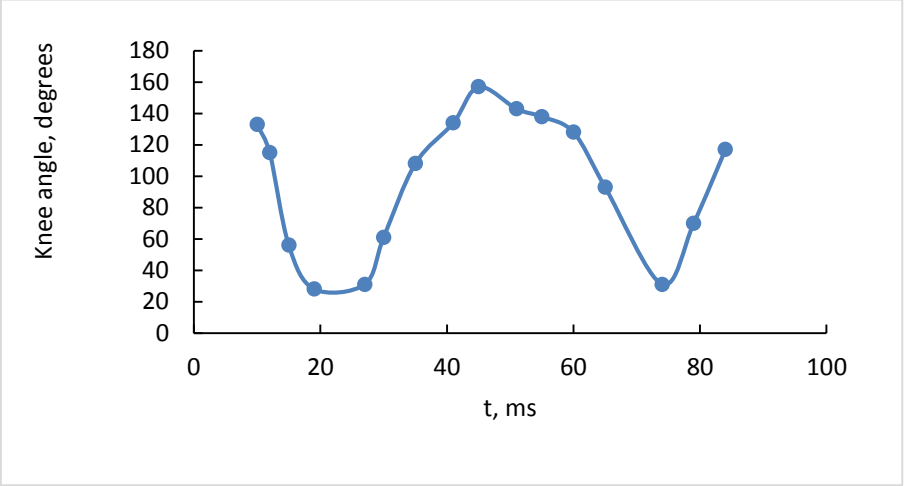


Fig. 7. Changes in the angle in the knee joint when an elite athlete with visual impairment runs a distance of 100 m

Correlation analysis of neurodynamic and biomechanical characteristics indicates the presence of a medium and high reliable relationship between the performance of the nervous system and running biomechanics (Table 6). The suggestion was confirmed that the strong type of the athlete's nervous system (according to Schulte's test, tests for a complex reaction rate in the feedback mode) is one of the factors for the athlete's ability to maintain the maximum speed at a distance for a fairly long time without reducing it at the finish.

Table 5. *Biomechanical characteristics of running on 100 meters of an elite sportswoman with visual impairment (n = 36)*

Frame, fig. 4	t	Knee angle (left leg)		V, m·s^{-1} ankle joint (right)		a, m·s^{-2}, ankle joint (right)		V, m·s^{-1} knee angle (left)		a, m·s^{-2} knee angle (left)		F, kgm·s^{-2}	
		$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S
1	5.00	143	4.32	2.94	0.23	58.80	3.71	1.16	0.11	23.20	1.62	301.6	7.13
2	10.00	133	3.22	2.81	0.15	56.20	3.83	0.88	0.06	17.60	1.23	228.8	21.11
3	12.00	115	2.12	4.79	0.89	159.67	9.65	3.32	0.45	110.67	7.75	1438.71	16.02
4	15.00	56	1.23	3.04	0.78	101.33	7.36	2.76	0.36	92.00	6.44	1196	100.71
5	19.00	28	1.01	2.98	0.56	74.50	5.64	1.46	0.12	36.50	2.56	474.5	83.72
6	27.00	31	1.34	10.97	1.34	137.13	9.13	7.14	0.28	89.25	6.25	1160.25	33.22
7	30.00	61	1.89	4.70	0.67	156.67	11.3	1.77	0.11	59.00	4.13	767	81.22
8	35.00	108	2.21	6.32	0.69	126.40	8.63	3.49	0.43	69.80	4.89	907.4	53.69
9	41.00	134	3.23	4.05	0.34	67.50	6.43	0.58	0.08	9.67	0.68	125.71	63.52
10	45.00	157	4.55	9.68	0.78	242.00	19.3	3.80	0.34	95.00	6.65	1235	8.80
11	51.00	143	3.21	7.05	0.65	117.50	10.5	2.35	0.12	39.17	2.74	509.21	86.45
12	55.00	138	2.89	4.65	0.38	116.25	10.1	1.57	0.07	39.25	2.75	510.25	35.64
13	60.00	128	2.45	3.58	0.21	71.60	6.32	1.20	0.06	24.00	1.68	312	35.72
14	65.00	93	1.98	8.22	0.28	164.40	14.4	5.09	0.17	101.80	7.13	1323.4	21.84
15	74.00	31	0.54	11.99	1.14	133.22	8.65	7.84	0.48	87.11	6.10	1132.43	92.64
16	79.00	70	1.07	7.53	0.57	150.60	8.67	1.16	0.15	23.20	1.62	301.6	79.27
17	84.00	117	2.45	8.62	0.62	172.40	11.5	5.09	0.47	101.80	7.13	1323.4	21.11

Notes: V, m·s^{-1} – the speed of a point in space (m·s^{-1}); a, m·s^{-2} - acceleration of motion of a point in space (m·s^{-2}); F, kgm·s^{-2} - force developed by a limb (kgm·s^{-2})

Based on the data obtained, it can be concluded that the search for compensatory mechanisms for impairment of the visual function of the examined female athlete should be sought in her strongest sides, distinguishing her from other sprinters of similar qualifications. One of such reserves can be a strong type of nervous system, which is one of the factors of the ability to maintain a maximum speed for a long time at a distance. Therefore, improving the biomechanics of running by focusing on the work of a kinesthetic analyzer can give an increase in speed at a distance with its preservation almost to the finish. As for the hearing analyzer, it certainly also needs to be improved, although as a compensatory mechanism of visual dysfunction at the time of the examination of the female athlete his role is not detected. Since neurodynamic indicators are innate characteristics and poorly amenable to development, the greatest emphasis should be placed on those functions that exceed the average statistical data, are the strengths of the athlete, and therefore can be a reserve for improving athletic performance.

The athlete was given recommendations on the development of factors affecting her improvement of the technique of running, and which can serve as compensatory mechanisms for visual dysfunction:

1) The development of a kinesthetic analyzer through increased control of the nervous system of the body position in space, the development of the ability to maintain balance. One of the means to achieve this result may be the strengthening of small muscles-stabilizers on the spine, in the joints of the lower extremities; improving the coordination of antagonist muscles. This can be achieved, for example, by exercises on unstable platforms, as well as by autogenic and ideomotor training, given the high ability of the athlete to concentrate attention according to the results of the Bourdon test;

Table 6. *Interrelation of neurodynamic and biomechanical indicators of an elite female athlete with visual impairment (only reliable correlation coefficients are shown) (n = 36)*

Indicators	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)	Simple visual-motor response time (ms) Sound response time (ms)
Running 60 m (s)	0.87***	0.67*	0.87***	0.86***	0.72**	0.82***	0.78**	0.77**
Running 80 m (s)	0.82***	0.72**	0.82***	0.78**	0.84***	0.77**	0.89***	0.87***
Running 100 m (s)	0.77**	0.65*	0.77**	0.82***	0.84***	0.84***	0.85***	0.84***
Running 120 m (s)	0.76**	0.68*	0.76**	0.81***	0.82***	0.83***	0.83***	0.82***
Running 150 m (s)	0.74**	0.62*	0.74**	0.78**	0.81***	0.77**	0.85***	0.84***
Running 200 m (s)	0.71**	0.53*	0.71**	0.79**	0.86***	0.76**	0.87***	0.83***
The moment of reaching the maximum speed at a distance of 100 m (m)	0.54*	0.51*	0.54*	0.78**	0.54*	0.76**	0.57*	0.52*
The moment of the beginning of reduction of speed at a distance of 100 m (m)	0.49*	0.48*	0.49*	0.67*	0.89***	0.68*	0.91***	0.87***
Angle in the knee joint during hip removal (deg.)	0.68*	0.52*	0.68*	0.45*	0.76**	0.48*	0.82**	0.78**
V, ankle (m $\cdot s^{-1}$)	-0.52*	-0.50*	-0.52*	0.56**	0.72**	0.58**	0.79**	0.76**

a, ankle joint (m ·s^{-2})	-0.54*	-0.51*	-0.54*	0.59*	0.73**	0.55*	0.79**	0.78**
V, knee joint (m ·s^{-1})	-0.53*	-0.51*	-0.53*	0.54*	0.74**	0.53*	0.82**	0.77**
a, knee joint (m ·s^{-2})	-0.53*	-0.50*	-0.53*	0.56*	0.75**	0.54*	0.82**	0.81**
F, (kgm ·s^{-2})	-0.51*	-0.49*	-0.51*	0.57*	0.79**	0.55*	0.77**	0.75**

Notes: V - the velocity of a point in space (m ·s^{-1}); a - the acceleration of a point in space (m ·s^{-2}); F - the force developed by the limb (kgm ·s^{-2}); * - correlation coefficient is reliable at $p<0.05$; ** - correlation coefficient is reliable at $p<0.01$; *** - correlation coefficient is reliable at $p<0.001$

2) Further development of speed endurance, because it is a strong point of the athlete, and has a certain reserve for development, given its kinematic and neurodynamic features;

3) The development of explosive power, since this indicator is also associated with the strength of the nervous system and is the strength of the athlete.

4) The emphasis on the above points should level the athlete's weaknesses (relatively low speed of response to sound, a long period of maximum speed at a distance) and serve as a compensatory mechanism for visual impairment.

The development of explosive strength and speed endurance is a common requirement for sprint training, but for other athletes it may be more relevant to focus on a starting spurt in cases where this is their strength. However, in our case, the development of speed at a distance corresponds to the strengths of the athlete, which can provide an opportunity to improve the athletic performance. Regarding the development of explosive power, it can also be noted that this is typical of all sprinters, however, perhaps for other athletes who have such qualities as high reactivity, the emphasis should be placed on the development of speed qualities mainly compared to power. In our case, the speed-strength qualities, in particular, the explosive force should be developed with a primary focus on the power aspect.

It should be noted that during the end of 2015 - the first half of 2016, these recommendations were implemented in the training process of the athletes, and allowed her to improve athletic performance and become the silver medalist of the 2016 Paralympics.

5. Discussion and Conclusion

The results obtained confirmed the hypothesis put forward in this study that elite sprinters have a high correlation between neurodynamic functions, biomechanical characteristics, and running speed. It has also been confirmed that the elite sportswoman with visual impairment may have compensatory mechanisms that manifest themselves not only at the level of development of individual analyzers, but also at the level of the properties of the nervous system. It was shown that in the examined female athlete a strong nervous system acts as a compensatory mechanism. However, contrary to expectations, no compensatory function was identified on the part of the auditory analyzer. Perhaps this is due to the fact that the examined female athlete began to deteriorate her eyes at a rather mature age, and the compensatory mechanism on the part of the auditory analyzer did not have time to develop. At the same time, the analysis of the biomechanics of running showed the availability of opportunities for improving technology by improving the work of the kinesthetic analyzer.

According to the theory of functional systems Anokhin [15; 16; 17], the general scheme of the relationship of running speed and perception of the surrounding space can be represented as follows (Fig. 8). The central nervous system receives signals from muscle proprioceptors about the intensity of muscle contractions. At the same time, signals from the visual analyzer about the environment enter the central nervous system. Thanks to these signals, the direction of the run is regulated, as well as its speed. If environmental conditions are relatively stable, like on a treadmill, for example, the body focuses solely on running speed. If environmental conditions change, such as when running over rough terrain, in different weather conditions, the speed and direction of running varies.

In the case when the information from the visual analyzer is insufficient, which occurs in the case of a lack of visual function, the danger signaling during running is activated in the brain due to the lack of information about the surrounding space [18] (Fig. 8). As a result, the development process of the maximum speed of movement is blocked, which adversely affects the sports result. Athletes with visual impairment are harder than healthy athletes to develop maximum running speed due to the blockage of speed from the central nervous system.

A partial or complete solution to this problem lies in the activation of compensatory mechanisms with a lack of visual function.

Increased perception of signals from the auditory receptors, from proprioceptors of muscles, may act as compensatory mechanisms. To a greater extent than in healthy athletes, such specific feelings as "track sense", "sense of distance", etc. develop. These signals may fully or partially block the danger signals associated with a lack of visual information, and ensure the running speed characteristic of the capabilities of the locomotor system (Fig. 8).

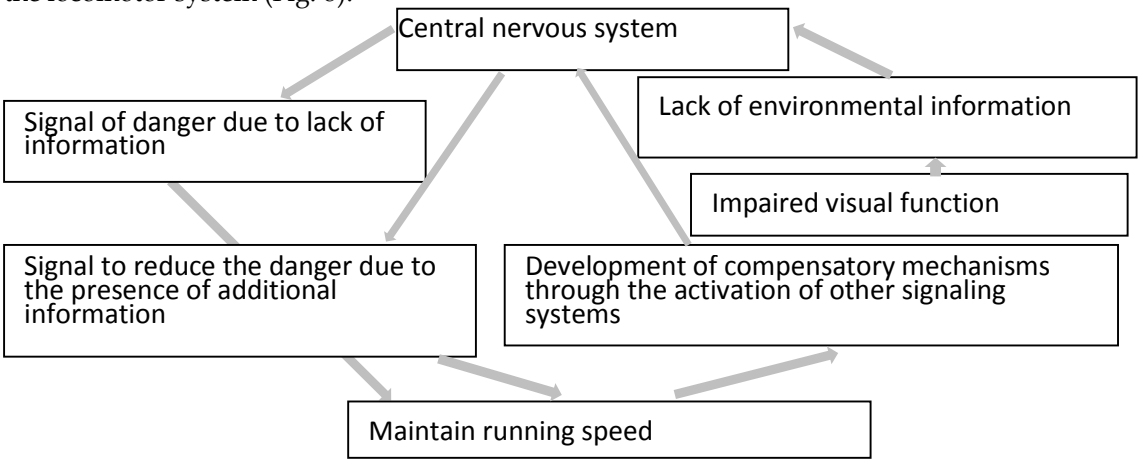


Fig. 8. Scheme of compensation for the insufficiency of the function of the visual analyzer while regulating the speed and direction of the run, depending on the visual perception of the surrounding space

With the development of psycho-physiological functions characteristic of a particular person, compensatory mechanisms will be developed to reduce the lack of a visual analyzer. This requires the identification of psycho-physiological factors associated with the speed of running [18]. This will enable a deeper understanding of the mechanisms regulating the speed of running in people with limited visual function and a more optimal selection of tools and methods when building a training process for sprinters with visual impairment. For example, with a pronounced mobility of the nervous system, with a high reaction rate [19, 20], it is advisable to focus on the development of the starting speed, on the development of the ability to change the degree of tension and muscle relaxation. When the strength of the nervous system is strong, it makes sense to concentrate on maintaining speed at a distance. The development of the athlete's strengths will give additional information to the central nervous system about the movement of the athlete, as a result of which danger alarms will be blocked due to the lack of visual analyzer, and the athlete's running speed will not decrease.

Conclusions

1. It is shown that the athlete being examined is an atypical sprinter in terms of the properties of the nervous system, development and maintaining speed at a distance, some biomechanical characteristics of running. The speed achieved by an athlete is slightly higher compared to other athletes of similar qualification, however, the time to achieve and the time to maintain maximum speed is higher compared to other athletes of similar qualification.
2. It was revealed that the athlete being examined is a representative of a mobile and strong type of nervous system. A strong type of nervous system of an athlete allows her to maintain a higher speed at a distance compared to other athletes for a longer time, which can be considered as a potential reserve. The role of the auditory analyzer at the time of the examination of the female athlete as a compensatory mechanism of visual dysfunction was not identified.
3. The presence of a small uneven change in the speed and acceleration of movement of the ankle and knee joints, observed in some steps when lowering the limb after hip removal.
4. Correlation analysis of neurodynamic and biomechanical characteristics indicates the presence of a medium and high reliable relationship between the performance of the nervous system and running biomechanics.
5. Improving the biomechanics of running by focusing on the work of a kinesthetic analyzer can give an increase in speed at a distance with its preservation almost to the finish.

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Conflict of interests

The authors declare that there is no conflict of interest.

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Characteristics of Healthbreakers in the Conditions of Realization of Health-Safety Technologies in Education Structures

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Abstract

Background: One of the objectives of health conservation activities in the educational environment of the educational institution is to preserve and further develop public healthcare-saving experience accumulated by civilization. This will ensure the formation in educational institutions of such pedagogical conditions that are at least harmful to the health of all participants in the educational process.

In view of this, modern views on healthcare presuppose the study of students of general education institutions at the same time and as objects and subjects of vocational and pedagogical activities. Given that pedagogical systems are complex social entities, the effectiveness of the process of forming, strengthening and maintaining the health of all participants in the educational process depends on the level and quality of the subject-subjective interaction of all its structural elements.

The formulation of the question, in which students are simultaneously perceived both as objects of pedagogical management, and as subjects of health and conservation activities, actualizes the need for analysis of the characteristics of the subjects of health preservation in the realization of healthcare-saving technologies in education structures.

Methods : The basis of scientific research is the observation as a systematic purposeful study of the object; poll as the most common method of obtaining information; comparison-analysis as a method for comparing the features inherent in two or more objects. In addition, the study of healthcare providers as well as analysis of the main trends in the development of scientific views on health, the use of a set of methods: theoretical methods: a comparative analysis of psycho-pedagogical, and health-saving literature for the synthesis of scientific facts regarding the health aspects of preservation in society; retrospective analysis, scientific reflection to form a holistic view of the phenomenon of health conservation; empirical methods:

diagnostic (sociological observations).

Results: It is the study of the health of students of comprehensive educational institutions as well as the analysis of statistical data related to the preservation of health, the development of scientific views and the substantiation of the main stages of the formation of theoretical concepts for the preservation of human health in general, and the child in particular, the society's attitude to the problems of health preservation, which reflected the dynamic manifestation of universal values and needs. Pilot study 2012-2013 during pedagogical practice for 3-4-year students of the Faculty of Natural Sciences of the Poltava V. G. Korolenko National Pedagogical University named after, as well as analysis of the health status of students of general educational institutions of Poltava, based on which practice was conducted.

Conclusions: The state of health of students of comprehensive educational institutions of Poltava city has been studied and analyzed, the main tendencies in the development of public opinion on the preservation of health and health-saving activity are determined, the main problems of health care have been researched and substantiated. This article does not exhaust all aspects of the problem under consideration and updates the need for increased attention in relation to further fundamental research, theoretical developments and practices of historical heritage, the implementation of the most advanced technologies of healthcare in education.

Keywords: Health,health-saving technologies, health-saving activities, stages of healthcare

1. Introduction

Many studies conducted in different regions of Ukraine indicate a significant deterioration in the health status of children and adolescents: an increase in the incidence rate of virtually all classes of diseases, deterioration in physical development, and a decrease in the level of physical students` readiness.

2. Literature Review

Consideration of certain characteristic features of contemporary students as elements of subject-subject interaction in the professional activity of future teachers in the implementation of healthcare-saving technologies allows to distinguish:

– -a set of indicators of physical, mental and social health;

– a set of factors that affect the level of health of participants in the educational process and, accordingly, selection for the use of adequate health protection technologies.

Physical health of students of general educational institutions as subjects of health-saving activity is characterized by such features:

– the absence of any diseases or defects in development;

– resistance to the effects of negative health factors;

– dynamics of indicators of development within the average norm;

– functionality of an organism within the limits of the average norm;

– availability of reserve capacity of the organism.

According to the data of the Ministry of Education and Science of Ukraine, regarding various posture disorders, which have approximately 60% of school-age children, neuroses - 30%, deviations from the norm in the cardiovascular system - 30-40%, convincingly [1, p. 17]. The results of the sample surveys indicate that almost 36% of Ukrainian secondary school students have a low level of physical health, 34% are below average, 23% are average, 6% are above average, and only about 1 % - high [1, p. 18].

From this position, some scholars suggest to consider the organization of health protective work in an educational institution, as a parallel counter process, on the one hand, the transfer of healthcare-saving experience from teachers to students and, on the other hand, the process of active perception of students' knowledge of the subsequent formation of the corresponding health-saving skills and abilities.

In this context, it is possible to consider the health-saving process in the educational environment of an educational institution as an interaction within the aggregate ideal subject of this activity, whose effectiveness is determined by the awareness of the general civilization goal, which is of extreme importance for both of its parties [2]. The obtained data indicate that at present, "the infirmity of students with chronic diseases has reached 90% (the number of completely healthy children does not exceed 10%), more than 50% of them have poor physical fitness." Based on the analysis of official data of the Ministry of Health of Ukraine, we note that "for the period of training from 1 to 9, the number of healthy children decreases by 4 times, and children with visual impairment increases from 3 to 50%, the number of neuro-mental disorders increases from

15 to 40%, and disorders of the musculoskeletal system (scoliosis, osteochondrosis, complex forms of flattening) increases to 65%" [3, p. 7]. Similar trends in the deterioration of the health of students in general education institutions are observed by scientists in the CIS countries.

The Institute of Age Physiology of the RAO provides data that more than 90% of school-age pupils have diverse deviations in physical and mental health, and more than 50% of schoolchildren suffer from neurotic syndromes. Anxiety is caused by data that more than 35% of children entering school only already record

Analysis of the structure of functional disorders in school-age children indicates that in 50% of school-age children there were deviations in the development of the musculoskeletal system, 30% of schoolchildren had violations of the cardiovascular and respiratory systems, and about 70% of students suffered from hypodynamia.

The statistical data presented in the study of T. Orehova emphasize that during the period of studying in an educational institution the number of children with several diagnoses of diseases is constantly increasing. Children aged 7-8 years have on average two diagnoses of diseases, 10-11 years - three diagnoses, 16-17 years - 3-4 diagnoses, and 20% of senior pupils have five or even more functional disorders and chronic diseases [4, p. 92].

The dependence of the speed and quality of learning material on the state of physical health in students of general educational institutions was studied by L. Ponomariov. The conducted pedagogical experiments have shown that the ability to actively perceive and absorb information is significantly reduced in girls aged 11-12 years and in boys 12-13 years old. The author emphasizes that this process is significantly influenced by disorders of the functional state of the hearing (in 1,2% of the examined children) and vision (20,1%). It has been established that if the frequency of hearing disorders does not increase with age, then the number of cases of visual impairment increases significantly. Analysis of statistical data allowed to establish that in girls aged 14-16 there is a correlation between the highest indicators of mental performance and significant deterioration of the organs of vision (up to 32% of the total number of examined girls had deviations from the average norm). Studies have shown that chronic diseases (more than 10% of the surveyed), thyroid gland enlargement (in 37.5% of the examined children) have a negative impact not only on physical development, but also on mental performance, psycho-emotional balance and personal development of students [5 , p. 23].

Within the framework of the pilot study in 2012-2013 during the pedagogical practice, students of the 3-4th year of the Natural History Faculty of the V.P. Korolenko Poltava National Pedagogical University were tasked with analyzing the state of health of schoolchildren of secondary schools of Poltava, based on which practice was conducted. The purpose of this study was to identify the health of students, the dynamics of the development of this indicator and analysis of the main causes of the current tendency to deteriorate schoolchildren's health, which in recent years has become steady.

3. Method

3.1. Participants

According to the data obtained from the analysis of official data sources (Public Council at Poltava Oblast State Administration), the incidence rates for schoolchildren for 2012-2013 are 1164.0 and 1103.7 per 1000 pupils respectively. The structure of morbidity by major nosologies is given in table. 1.

Table 1

Structure of the students` morbidity of general education structures in Poltava (% the children`s diseases total number)

№	Type of diseases	% students
1	Diseases of the respiratory organs	65,2 %
2	Diseases of the digestive system	12,0 %
3	Diseases of the skin and subcutaneous tissue	9,1 %
4	Infectious and parasitic diseases	5,2 %
5	Ophthalmic and otolaryngologic diseases	3,9 %
6	Diseases of the bone and muscular system	2,8 %
7	Other diseases	1,8 %

The data of preventive checkups of schoolchildren in 2012 in Poltava indicate that only 11.6% of

children can be considered relatively healthy. That is, 88.4% of schoolchildren have health problems.

3.2. Materials

According to the data of children's health care institutions of the city, during the period of observation of a child under the age of 18 years, a gradual deterioration of the health status was revealed.

In adolescence:

- the frequency of diseases of the gastrointestinal tract and diseases of the endocrine system increases in 5 times,
- 3 times the frequency of detection of pathology of vision, diseases of ENT of organs and functional abnormalities in the cardiovascular system,
- 2.5 times diseases of the musculoskeletal system,
- 1,5 times the diseases of the central nervous system, which is associated with the impact on the health of the child environmental, social and everyday factors.

Polls of students and teachers of secondary schools of Poltava, conducted during the pilot survey of students and teachers of secondary schools in the city of Poltava, conducted during the pilot study by future biology teachers, highlighted the causes of bad health of schoolchildren, namely:

- violation of the regime and the quality of sleep and nutrition;
- decrease of motor activity and hypodynamia;
- lack of physical culture as a mass phenomenon;
- computer addiction;
- disadvantages of family education and insufficient attention of parents to a healthy lifestyle;
- widespread tobacco use, drinking beer, alcohol and drugs in childhood;
- lack of initiative of the heads of educational institutions in solving the urgent problems of healthcare, including the systematic introduction of health-care institutions in healthcare-saving technologies.

The mental health of the child plays an important role for the general level of health, as the internal state of mental well-being, a set of settings, qualities and functional abilities that allow the individual to adapt as quickly as possible to the environment. Allocate such criteria of mental health:

- awareness of the constancy and identity of their own physical and mental "I";
- conformity (adequacy) of psychic reactions of force and frequency of influence of environment, social circumstances and situations;
- the ability to plan their own livelihoods and implement these plans;
- ability to self-management behavior in accordance with generally accepted social norms, rules, laws;
- critical to oneself, to own mental activity and its results;
- the ability to change the way of behavior depending on changes in life situations and circumstances [6, p. 63].

3.3. Procedure

An analysis of the World Health Organization's statistics reveals that a significant proportion of mental disorders and diseases in children and young people have a so-called didacto-genetic nature, that is, directly caused or triggered by an educational institution. The information obtained as a result of numerous surveys establishes a clear link between the intensification of school education and the increase in the amount of training load on the one hand, and fatigue, the level of neuroticism, increased maladaptation and the deterioration of students' health on the other. In view of this, the ways of solving the so-called "school neuroses", the coordination of educational stresses with the age, physical and mental capabilities of the child, minimizing the adverse psychogenic impact of inadequate training loads becomes the subject of research by many scholars and psychologists.

4. Results

Many psychological problems that occur among students of general education institutions relates to the existing practice of in-depth immersion of students in educational activities, in which the child's personality goes to the background, and knowledge evaluation dominates. The scientist points out that such an organization of the educational process is guaranteed to lead to the formation of a complex of psychological disorders among children, among which the main is the refusal of the process of obtaining knowledge, rejection of the prospects of professional self-determination, undervalued self-esteem, social and psychological pessimism. The researcher stresses that "... the scale of this phenomenon has become so large that it begins to

act as a significant factor in social misery, which is that the enormous number of contingents of young people, having formed during the years of study low self-esteem and despondency to their own strength, it turns out not in a position to effectively build a line of personal and professional life "[7, p. 94].

5. Discussion and Conclusion

An increase in the intensity of risk factors, increased neuropsychological load, information overload, reduced motor activity, an increase in the number of children with the developed harmful habits - this is an incomplete list of negative factors, which in modern conditions have increased the impact on the state of mental health of adolescents [8, p. 39].

Studies conducted by V. Kaloshin found that in many cases the introduction of modern forms and methods of teaching into the educational process, the replacement of traditional educational programs with alternative, without proper pedagogical and medical substantiation, lead to an inadequate increase in the burden on children, their overwork and development pathological states. The obtained data indicate that over 80% of students experience unreasonable stressful situations, which largely prompted the early formation of chronic pathologies and mental disorders [9, p. 26].

The level of interaction between man and society, the adoption of her social norms and values is determined by the level of her social health.

Studies have been carried out to prove the fact that the effectiveness of social adaptation of the child is one of the indicators of its social health, as syndrome of school have adaptation is observed in more than 51% of students, and there is a tendency to further increase their number [10, p. 13]. Its main external features are reducing the level of success and violation of approved school norms of conduct. The results of the study by T. Antipenko, which revealed a stable relationship between the state of health and the adapted activity of schoolchildren, are of interest. Data obtained by the author as a result of surveys of students in grades 1-7 indicate that almost 2 times (from 43% to 80%) the number of pupils increased, which is calculated by the deterioration of their own health for social adaptation. During a sociometric experiment, it was found that no child, in which the first class had expressed neurotic reactions, did not belong to the group of "students" of the teacher, which proves the influence of teacher's pedagogical activity on the occurrence of mental disorders in schoolchildren [11, with. 17].

Systematic exhaustion, nervous overload of children at school is exacerbated by a violation of the regime, unsatisfactory micro-social conditions. The importance of qualitative training of future biology teachers to the implementation of health-saving technologies in further professional activities is conditioned by the fact that the effects of diseases acquired at school age, affect the formation of an adult, future indicators of reproductive and physical health.

Influence of organizational and pedagogical factors on the level of social health of students of general educational institutions is based on factors such as the pedagogical style of the teacher;

- organization of modern classroom teaching technologies;
- the implementation of a pedagogical unit for the formation of a healthy lifestyle, which requires appropriate organization of educational space of the school;
- organization and character of psychological and pedagogical support;
- the organization and nature of health care;
- sanitary and hygienic conditions of education [12, p. 224].

The analysis of scientific and pedagogical literature indicates that several researchers have devoted their scientific research to the distinction between socio-economic and environmental factors, the long-term effect of which affects the health of children, among which the main ones are:

- insufficient readiness of biology teachers to implement health-saving technologies;
- inconsistency of programs, forms, methods, means and technologies of teaching functional and age-specific features of schoolchildren;
- overload of the educational process;
- stressful influence of authoritarian pedagogy;
- non-compliance with elementary sanitary and hygienic requirements for the organization of the educational process;
- Early start of pre-school systematic training [12, p. 56].

The rating of the factors most negatively affecting the level of health of the child determines the inconsistency of methods and technologies of teaching age and functional abilities of the child, which leads to violations of psychophysiological mechanisms, the domination of high-speed indicators of training on

quality, the creation of stressful situations associated with time constraints The second risk factor is authoritarian pedagogy, which prevails in school. The third factor is the irrational organization of the educational process.

The main factors that determine the health status of students in general education institutions, the researcher calls:

- programs, methods, forms and technologies of training;
- volume of educational load;
- personal characteristics of the teacher;
- sanitary and hygienic conditions of training;
- organization of the educational process [12, p. 58].

Allocate negative factors that influence the deterioration of the health of children, among which:

– excessive nervous-emotional stress of children due to inconsistency of requirements of teachers to the intellectual and psychophysiological capabilities of students;

- assessment of the activity of students, built only on the comparison of them with each other by the consequences of the tasks;
- ignoring teachers of the peculiarities of perception of information and thinking of schoolchildren, causing fatigue, neuropsychic deviation of adverse environmental effects;
- bad nutrition of children;
- hypodynamics;
- low level of healing and improving work in school [13, p. 12].

Analyzing the most important reasons for reducing the functional level of students' health, distinguish:

– excessive intensification of the educational process, overload of curricula by factual information, which causes students to overwork and stress; stress-inducing technologies for conducting lessons and assessing students' knowledge;

– the inability of many teachers in the conditions of the modern organization of educational process to implement an individual approach to students, considering their psycho-physiological characteristics and state of health;

– lack of physical activity of students, which leads to hypodynamia and other disorders of schoolchildren's health;

– non-compliance with elementary sanitary-hygienic and physiological requirements for the organization of the educational process;

– incorrect organization of nutrition at school;

– insufficient level of hygienic and psychological knowledge of teachers;

– low level of health culture of pupils and their parents [14 p. 7].

Factors that determine the health of the child, can be divided in proportion to the degree of their impact:

- human factor - 25%;
- ecological factor - 25%;
- socio-pedagogical factor - 40%;
- medical factor - 10% [15, p. 32].

The main reasons for the deterioration of students' health are:

- violation of hygiene requirements for the organization of educational process;
- lack of proper rest;
- insufficiency of motor activity;
- constant stress associated with the overload of training programs;
- an authoritarian style of teacher communication;
- insufficient level of knowledge among teachers about age psychology and physiology;
- insufficient level of educational work with students on the formation of a healthy lifestyle;
- lack of teachers and parents of necessary knowledge on the preservation and strengthening of children's health [16, p. 219].

According to the data obtained during the pedagogical experiment, it can be concluded that, along with other negative factors, the decrease in the health of children (problem ecology, living conditions in the family, blurring of the ethical values of part of society, social tension, medical factors) to the state The health

of children is directly influenced (from 22 to 27%) with factors of the internal school environment. Experimentally, the existence of a connection between health and excessive school load was established: by the end of the school day, 52% of students are deteriorating, as a result of educational overload, more than 60% of schoolchildren fall badly [17, p. 19]. Many cases of emotional disorders in children are associated with the ethical and psychological harm caused to pupils by teachers. The results of the observations make it possible to conclude that in the classes with an uncompromising teacher who meets the rigorous requirements, the current incidence is twice as high; almost three times as many children with so-called microsymptoms, indicating a disorder of neuro-mental health than in a class with a mild, benevolent teacher.

Ensuring a high level of child's education that meets the needs of a modern post-industrial society should be the main result of the educational process in a general educational institution. In view of this, the term "education" can be noted as a personal property of a person, which is formed in the process of education and expresses a certain degree of mastering it as part of social experience, as well as the ability to use the experience in further life.

Studying the problem of balance of education and health that will give the child a high level of knowledge and thus will not hurt her, analyzing the factors that cause overload of students should be noted:

- intensification of the educational process as a result of ignoring the health-saving features of modern educational and methodical kits;
- the orientation of teaching activities of the teacher only on the educational process without considering the psychophysiological and individual characteristics of the child;
- low level of healthcare-saving competence of teachers in designing the educational process in various forms of educational activity [18, p. 14].

Studies conducted in recent years have shown a beneficial effect on the health of the child reducing the density of information flow and strengthening control over hygiene factors. However, many scholars point out that traditional approaches (reducing the academic load, rigid hygienic regulation of conditions of training, increasing the time for physical education lessons) do not fully meet the requirement for the health of children in the learning process.

Analysis of scientific and pedagogical literature allows to identify the basic directions of healthcare of students to which include medical, physical culture, health and valeological directions.

Researchers working within the medical field for solving healthcare problems of schoolchildren are associated with activities that provide:

- improvement of diagnostics of diseases;
- improving the quality of preventive and curative measures;
- provision of sanitary and hygienic conditions for the organization of educational process in educational institutions (compliance with established sanitary norms of food, day regime, lighting, educational equipment and school premises).

Regulation of hygienic conditions of the organization of educational process in general educational institutions reflects in the normative documents the requirements of the medical direction of healthcare. However, in many educational institutions sanitary-and-hygienic standards are not respected, sanitary work is carried out at an inappropriate level, children are often subjected to educational and psycho-emotional overload, mainly on the background of lack of motor activity. Traditional and effective for the health of children, adolescents and young people in the studies of physical culture and health trends are considered the means of physical culture. Physical education and physical culture work in a comprehensive educational institution is an integral part of the formation of a general and health-preserving culture of the individual, which is the basis for maintaining the health of children, the development of functional capabilities of the body, the provision of a healthy lifestyle [19, with. 3, 21].

Physical culture and health direction as an integral part of the system of physical education of students of general educational institutions, ensures the expansion and accumulation of knowledge, skills and abilities of students not only from physical culture and sports, but in the future forms the notion of the aesthetics of movements and physical exercises, influencing the increase of their level health.

The foundation in the studies of valeological direction is valeological education, which directs its attention to the assimilation of social experience in the field of healthcare.

Analyzing the subject of research in this direction, among the main should be highlighted:

- development of projects on the formation of the culture of youth health;

- timely acquisition of knowledge about a healthy lifestyle;
- development of the appropriate style, forms of behavior and level of physical culture.

Investigating the social value of valeological knowledge, it should be noted that the formation of a certain style of life of a young person regarding health - a healthy way of life, is one of the directions of socialization. These two categories are interdependent and affect each other, which manifests itself in the process of social and pedagogical mechanisms: institutional (educational institutions, mass media), traditional (family, parents), stylized (youth subculture) and interpersonal (peers)" [20, p. 17].

Consequently, the analysis of the subjective characteristics of modern students, the formation of which is aimed at health preservation activities of the future teacher of biology, allows us to draw conclusions about the main directions of the implementation of healthcare-saving technologies in educational institutions:

- education for health and the formation of a healthy lifestyle, prevention of violations of physical, mental and social health, maladaptation processes;

- organization of training based on environmental compatibility, considering age and psycho-physiological features of development, sanitary and hygienic requirements and norms.

The student as a subject of the educational process is a separate part of the process of health preservation, the state of his health depends and simultaneously affects the implementation of health-saving technologies in the learning process. It has been established that the level of knowledge and skills of future teachers in preserving health is directly related to the formation and preservation of children's health and, consequently, is an important element of the implementation of health-saving technologies in professional activities.

Conflicts of interest

The authors declare that there is no conflict of interest.

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Model of Professional Training of Future Teachers of Physical Culture in The Process of Self-Working in Sports Games

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Abstract

One of the ways to improve the professional training of physical education teachers is to properly use the opportunities for self-employment in university education. For this purpose, the model of professional training of future teachers of physical culture in the process of independent work on sports games, the key element of which is the humanization of training, was developed and experimentally tested. The participants of this research consisted of 374 students of the faculties of physical education of Ternopil Volodymyr Hnatiuk National Pedagogical University and South Ukrainian National Pedagogical University named after K. D. Ushynskyy. The statistical processing of the obtained data showed that in experimental groups, compared to the control ones, more students had a high and sufficient level of professional readiness (by an average of 18%) and less percentage of those students who were characterized by a low level (by an average of 6%). Model reflects the purpose, tasks, stages, principles, conditions, content of this pedagogical process and its result - professional readiness of students for future pedagogical activity. It involves the planning and implementation of the content of educational activities, both in terms of years of study, and by types of independent work.
Keywords: professional training, independent work of students, sports games, model.

Introduction

The significance of the profession of a teacher of physical culture is determined by the requirements and expectations of civil society, the primary among which is the formation of universal values in the younger generation, the provision of physical and mental health of schoolchildren, the achievement of every person of all-round perfection and harmonization of spiritual and physical forces. In the current conditions of social and economic development of society, its cultural and spiritual status, an alternative to the idea of a teacher of physical culture as a specialist in the formation of motor skills and development of physical qualities should be a new vision, as individuals with developing social and cultural and humane inferences that can ensure the transformation of the physical process education into self-education and self-education.

The reorientation to new conceptual positions in the system of organization of higher education has caused a number of topical issues, which determine the solution of the problem of professional training of teachers. The analysis of literary sources suggests that the study of the problem of professional training is not systematic [1], that the current practice of training physical culture teachers does not meet the requirements of the present and does not provide training of the teacher as an active person [2], that the acquisition of professional knowledge of the future teacher of physical culture most often is carried out in a gap with the ability to apply them [3], that the potential opportunities for independent work of students in higher educational institutions of pedagogical education are not sufficiently used [4], that there is no connection between the system of physical education of schoolchildren and the system of professional training in higher educational institutions [5].

A. Aleksyuk [6], I. Bech [7], S. Honcharenko [8], I. Zyazun [9], O. Pekhota [10], N. Stepanchenko [11], O. Tymoshenko [12] and other scientists attributed further improvement of professional training with the transition from the school of reproduction to the school of understanding and thinking, with the improvement of the interaction of the teacher and the student, in which the emphasis shifts to the cognitive activity of the latter. According to A. Verbytskyy and M. Ilyazova, this path involves the introduction of active forms and methods of education in the educational process with the wide use of elements of problem, scientific research and various types of independent work [13]. It is independence, readiness for constant search, which helps to educate the future teacher about the needs and habits of self-improvement, the formation of their pedagogical skills.

The success of the training of highly skilled pedagogical staff can be achieved by optimizing the educational process based on the independent work of future specialists. However, in practice, independent

work of students is not properly provided by restructuring such forms of organization of educational activities as lectures, seminars, practical classes, which are closely interrelated. The content, forms and methods of independent work of students are not implemented as components of a coherent system. The effectiveness of independent educational activities of students is also reduced due to insufficient provision of educational conditions [14].

One of the ways of solving this problem is connected with the creation of an effective, self-updating system of professional training of future teachers of physical culture in the process of their independent work on sports games, which would ensure the proper formation of the necessary professional and pedagogical competences, would allow a graduate to enter the market works better prepared and reduce the period of their adaptation to work in school. The professional training of physical culture teachers requires a clear focus on a model that should not only meet the needs of the school, but also outperform them. It is necessary to foresee the results of training future specialists as competent, professionally prepared for work not after five or six years after the completion of a higher education institution, and at least 15-20 years ahead, taking into account the development of society and the pedagogical profession.

Sports games are a universal tool of pedagogical influence. In the curricula of higher education institutions, they are represented by a wide variety list and implemented throughout the period of professional training of future teachers of physical culture. The importance of sports games as an important and necessary means for the comprehensive and harmonious development of modern generation is determined by their personality and team essence, accessibility, versatile influence on the human body, the formation of individual physical culture, high emotionality and entertainment. Among the students sports games are one of the most favorite educational disciplines, in the process of studying which creates a real opportunity from the first to the last semester to carry out purposeful training of future teachers, ensure the consistency, durability and continuity of the educational process.

The purpose of the research

is to develop and experimentally test the model of professional training of future teachers of physical culture in the process of their independent work on sports games.

Materials and methods of research

To achieve this goal, a study program was developed that included the use of a set of interrelated methods, namely:

- theoretical: analysis and generalization of scientific information on the problem of research, teaching and methodological and normative documentation; analysis, synthesis, generalization and systematization of theoretical and experimental data; simulation of the professional training of future teachers of physical culture in the process of independent work on sports games; comparison of experimental data obtained;

- empirical: observation of the educational process; conversations with students, teachers, school teachers, trainers; interview with them; student testing; pedagogical experiment; methods of mathematical processing of the obtained results.

The research was conducted on the basis of the faculties of physical education of Ternopil Volodymyr Hnatiuk National Pedagogical University (TNPU) and South Ukrainian National Pedagogical University named after K. D. Ushynskyy (SUNPU). 374 students took part in the pedagogical experiment, 193 of them studied at TNPU, 181 - at SUNPU, as well as 30 teachers of the above-mentioned institutions of higher education, 19 teachers of physical education of comprehensive secondary schools and 28 trainers-educators of children's and youth sports schools from Ternopil and Odessa.

Research results

Discussion. Based on theoretical analysis and materials of experimental research, a model of professional training of future teachers of physical culture in the process of independent work on sports games is developed, which is schematically presented in Fig. 1

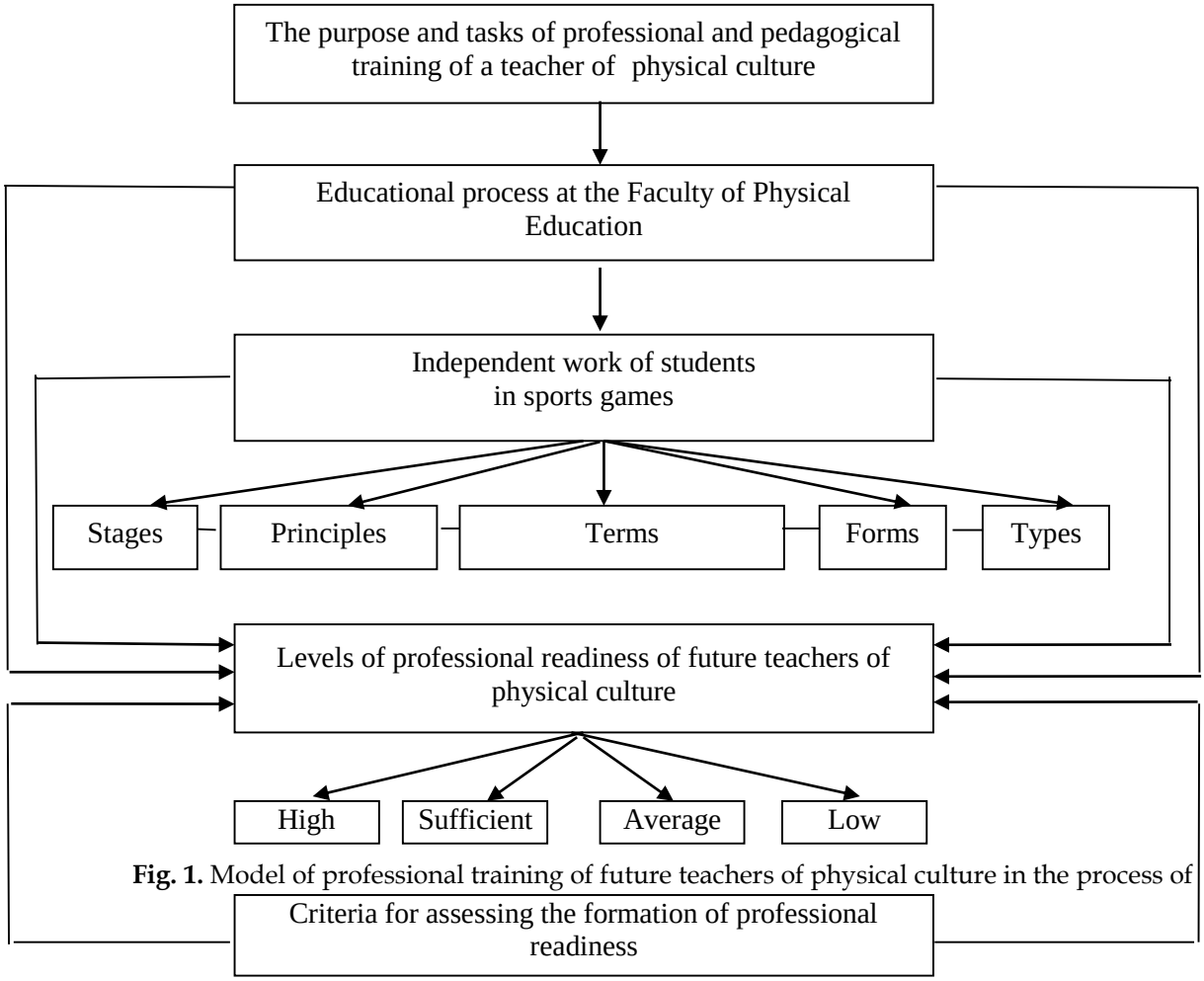


Fig. 1. Model of professional training of future teachers of physical culture in the process of

The main goal of the professional training of future teachers of physical culture is to ensure that the results of students' training in higher education institutions correspond to a social request. The goal is oriented and directly reflects the result of this complex and long-lasting process, readiness of graduates of specialized universities for the activity of the teacher of physical culture. The planned result implies a consistent qualitative transformation of the personality of the future teacher, the gradual achievement of their proper level of vocational and pedagogical competence.

The process of training a specialist is considered as inextricably linked to the content of its activities. On the basis of the analysis of the professional activity of the teacher of physical culture, one can conduct a directed search for the mechanisms of its formation. In this context, the learning process of students, which should be built with the help of a specially directed organization of their own work, should be considered as an analogue of the future professional activity of the teacher.

The basis of the training of specialists is the independent work of subjects of learning from the assimilation of knowledge accumulated by humanity in one or another field of activity. In the didactics of higher education, most researchers consider student autonomy as a prerequisite for the successful formation of a future specialist, as one of the main principles of didactics, and the independent work of students, as the main way of implementing this principle [6, 7, 9, 15]. In our study we proceed from the fact that the core of independent work of a student is the presence of a cognitive task and a method of its solution without direct assistance from the teacher or with minimal intervention. At the same time, the student's independent activity is always aimed at the transition from the way of reproduction to a fundamentally different, the creative problem solving.

The organization of independent work of students in the process of their training is subordinated to certain laws, which are implemented and disclosed in such principles as scientific, consciousness and

activity, systematic, consistency and continuity, accessibility and individualization, strength and progression, connection theory with practice. Being in close relationship, the stated principles of organization of independent work determine the requirements for the content, nature of this activity and act as its regulators. Their knowledge and practical implementation contribute to improving the quality of training of future professionals and reflects the humanization of learning.

The efficiency and effectiveness of students' independent work is significantly improved if it is organized according to the types and is determined by the semantic loadings of each of them, taking into account the projection for future pedagogical activity. Independent work of students in sports games includes classroom activities that are carried out during compulsory training sessions, and non-auditing. Audience types of independent work of students are considered such as: assimilation of techniques, tactical actions and interactions in sports games; conducting lessons of physical education and training sessions (their fragments); the formation and organization of teams, the refereeing of sports games, the conduct of the protocol of the competition. The list of extracurricular types of independent work consists of: improving techniques, tactical actions and interactions in sports games; varieties of pedagogical practice of students in general education and children's and youth sports schools, higher educational establishments; direct participation in competitions in gaming sports and their service as an organizer, judge; individual teaching and research tasks; work in the summer camp for children; scientific research work.

The mentioned types of independent work are systematized taking into account their complexity and variety of organizational forms in accordance with the stages of education, as well as the individual capabilities of students. Organizing the types of independent work, the definition of their semantic loads can purposefully affect each of the components of the structure of professional activities of future specialists, improves the effectiveness of their training in general. The main components of the structure of vocational and pedagogical training of future teachers of physical culture, which are formed during the study of sports games, are: constructive, organizational, communicative, motor, gnostic, and research.

Planning and realization of the content of independent work are carried out in two directions: horizontally (by years of study) and vertically (by types of independent work). The first direction determines the complex of types of independent work of students and their specific weight in terms of the amount of knowledge, skills and abilities during the school year. The second one provides a clear methodological continuity in the implementation of each particular type of independent work in the multi-year cycle of students studying. Both directions are important. Supplementing each other, they ensure the integrity of independent activities.

The development of a model of professional training for future teachers of physical culture in the process of independent work in sports games required the definition and justification of pedagogical conditions that ensure the effectiveness of this process. Pedagogical conditions are considered as the result of joint actions of participants in the educational process for achieving the goals and objectives of professional training and factors that influence its effectiveness. Our studies provide grounds for determining the following pedagogical conditions for improving the professional training of future teachers of physical culture in the process of independent work on sports games, such as: systematic and planned use of types of independent work in accordance with the stages of training and individual capabilities of students; educational and methodological support of independent work of students; coherence of the content of independent work with educational material in sports games; realization in the educational process of three types of internal and intersubject communications: informational, operational, and motivational; orientation of independent work of students as a component of the educational process on the professional pedagogical activity of the teacher of physical culture; improving the quality of control over independent work of students, self-control and student control. Compliance with the above conditions enables active, creative, deep knowledge acquisition, formation of general and professional skills and abilities, development of those qualities of the teacher's personality, which is the key to their professional success.

Important criteria for assessing the professional readiness of students for the activity of the teacher of physical culture are: the quality of knowledge (completeness, systemicity), the volume and level of mastering professionally significant skills and abilities, the degree of mastering the indicative basis of independent activity, the level of formation of independence as a personality trait. The specified set of criteria allows you to evaluate not only the results of students' professional training, but also the ways to achieve them. It makes it possible to determine the level of formation of future professional physical culture teachers (high, sufficient, average, low), which reflects the qualitative and quantitative characteristics and interaction of the indicated criteria, sufficiently stable and typical for pedagogical activity.

The experimental verification of the effectiveness of the proposed model was based on the assessment of those real changes that occurred with the students during its implementation and comparison of the results of the training of future specialists in the control and experimental groups. The diagrams (Figures 2, 3) show the results of the pedagogical experiment, which, through the ratio of students with different levels of formation of professional readiness, prove the effectiveness of the developed model of professional training of future teachers of physical culture in the process of independent work on sports games.

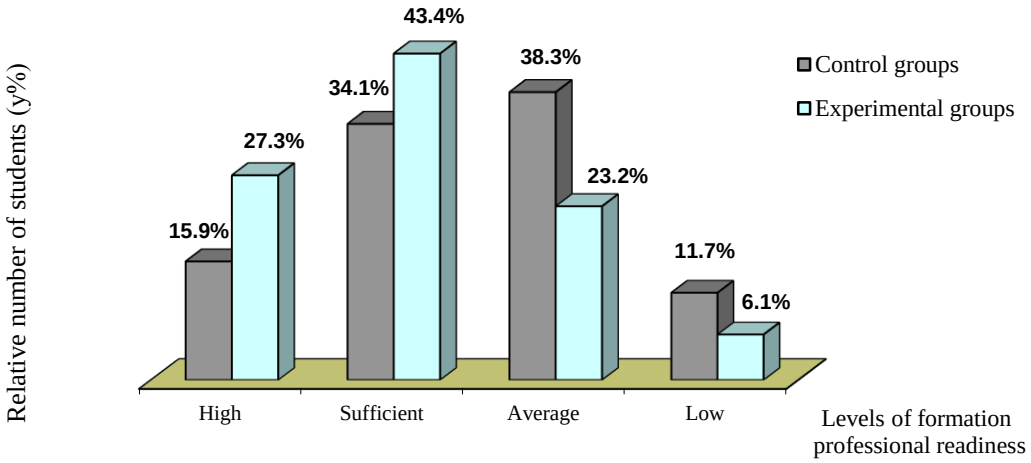


Fig. 2. Levels of formation of the professional readiness of students of control and experimental groups of TNPU

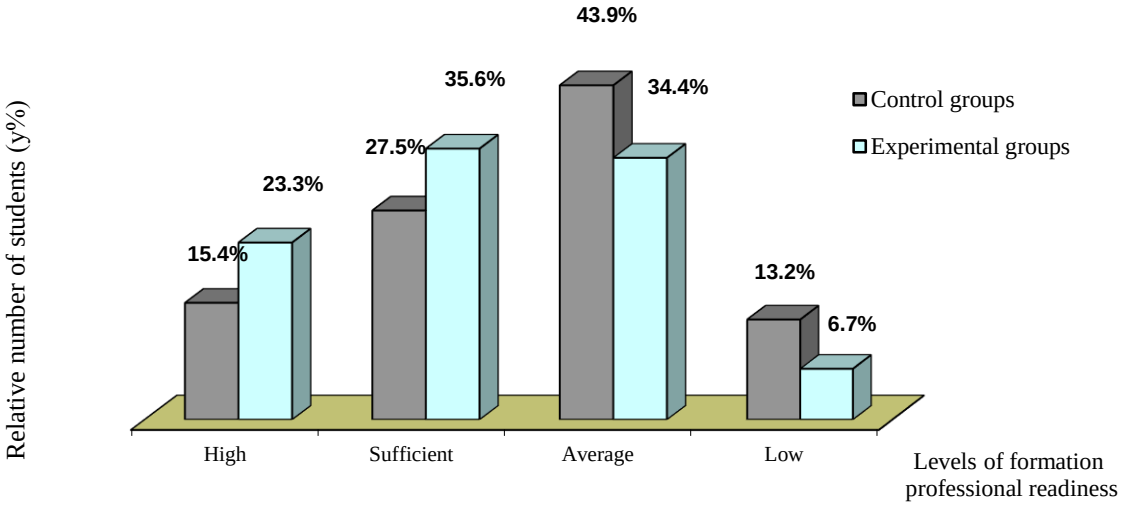


Fig. 3. Levels of formation of the professional readiness of students of control and experimental groups of SUNPU

The statistical processing of the obtained data showed that in experimental groups, compared to the control ones, more students had a high and sufficient level of professional readiness and less percentage of those students who were characterized by a low level. Thus, the total percentage of students of TNPU with high and sufficient levels of formation of professional readiness in the experimental group is 20,7% more compared with the control group. In the SUNPU this advantage is 16%. At the same time, in the control

groups 11.7% of students of TNPU and 13.2% of the SUNPU with a low level of professional readiness were found, and in experimental groups, respectively, 6.1% and 6.7% of students, which is twice less.

An important result of the study is the attitude of students to the quality of personality, as autonomy. Ranking the personal qualities of a teacher of physical culture, the preference for independence in experimental groups was provided by 70.2% of students of TNPU and 63.2% of the SUNPU, whereas in control groups these indicators are lower and make respectively 40.3% and 44.9% respectively.

Conclusions

Independent work on sports games is one of the most effective and perspective forms of improving the training of future teachers of physical culture. It does not oblige students to become professional through the normative construction of their activities, but creates creative conditions, giving them the opportunity to determine the trajectory of occupation itself.

Model of professional training of future teachers of physical culture in the process of independent work on sports games reflects the purpose, tasks, stages, principles, conditions, content of this process and its result - professional readiness of students for future pedagogical activity. It involves the planning and implementation of the content of educational activities, both in terms of years of study, and by types of independent work. On the one hand, the model determines the complex of types of independent work of students and their relative weight in terms of knowledge, skills, and on the other hand - it provides a clear methodological continuity of the implementation of each type of independent work in the multi-year cycle of students.

Theoretical substantiation and practical effectiveness of the model of professional training of future teachers of physical culture in the process of independent work on sports games have been experimentally proved. This is evidenced in particular by the comparison of the percentage of students with control and experimental groups with different levels of formation of professional readiness.

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Evaluation of the Relationship between Self-Esteem and Risk-Taking Behaviors of Students Who Taking Elective Physical Education Course

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Abstract

This research was carried out to examine the self-esteem and risk-taking levels of the university students taking elective physical education and sports courses. For this purpose, the self-esteem and risk-taking levels of the university students who participated in the study were examined according to different socio-demographic characteristics and the results obtained were interpreted. 101 students participated in the study who prefered physical education and sports courses as an elective course in Muğla Sıtkı Koçman University in 2018-2019 fall season. All participants were involved in the study voluntarily. A three-part questionnaire was used as data collection tool in the research. The first part of the research includes the personal information form about the participants, the second part of the research involves "Self-Esteem Scale" and the third part of the research includes the Risk-Taking Scale. Data were analyzed by using SPSS16.0 program. When the results of the research are generally evaluated, there is a significant and negative relationship between self-esteem and risk-taking behavior. It is possible to turn to risk behaviors in order to avoid or deal with negative emotions that arise from low self-esteem, such as feeling worthless and unimportant oneself and not being liked by others.

Keywords: Self- esteem,Risk taking,University student

1. Introduction

The socialization of the young people and the progress of the society formation depend on education and sports today, when technological developments are rapidly progressing and bilateral relations are being replaced by social media interactions.

Up until now, many studies have mentioned the importance of education and sports in the process of the society formation. Sports is an important factor for children and young people in gaining many characteristics such as controlling behavior and excitement, acting within a group and self-confidence, regardless of team or individual sports.

Education is a process that an individual makes a terminal change in her/his behavior through her/his experience or deliberately, i.e. enculturation. Generally speaking, the purpose of education is to enculturate, socialize, individualize and make an individual become prolific (21). Physical education and sports, painting, music, sculpture, folklore, science and technics, etc. can be handled as cultural values transferred through education. Students can take elective courses related to these values during their university education.

The World Health Organization (WHO) defines "youth" in the 15-24 years age group (20). According to the United Nations Population Fund (UNFPA) report, there are 1.8 billion people between 10-24 years of age in the world and these young people constitute one fourth of the world population. The young people between 10-24 years of age consist of one third of the population (25 million) in Turkey (19). This period is also the most active period of education. In particular, university education is an important period in the lives of the young people when they get new experiences, make judgments about themselves, try to make them accepted by the society, turn to some risky behaviors and try to be self-actualized. Maslow states that needs must be met in a hierarchal order in order to achieve a self-actualized and psychologically healthy individual. There is the need for respect, esteem and success in the fourth level of this order.

Feeling worthy oneself, adopting her/his own body and physical characteristics and being satisfied with them, her/his ability to exhibit her/his skills, being admired by the society and her/his ability to accomplish her/his goals are among the factors influencing the development of self-esteem (22). Self-esteem is a prerequisite for being a healthy individual and personal development. If the individual is self-satisfied, where s/he wants to be and feels confident, high self-esteem can be mentioned. However, low self-esteem is in question if s/he is not self-satisfied and is often self-critical.

The danger, fear and need to take a stand against fear for many of human existence have become part of our daily life. Although risk-taking behaviors are interdependent, they usually involve a period from adolescence to adulthood (9).

2. Literature Review

There are a number of studies that examine the risk-taking behaviors of the university students. The risky behaviors of the students were investigated in terms of health in a study conducted and the non-use of safety belt (25.4%), carrying a gun (5.2%), fighting (10%), smoking and alcohol consumption (22.9% - 24.2%) and sexual intercourse (21.6%) were significantly higher in males (8). Another study demonstrated that 10.5% of the participants were physically involved in a fight at least once, 11.1% used emotional, physical or sexual violence against their girlfriend or boyfriend and 12.8% were exposed to emotional, physical or sexual violence by their girlfriend or boyfriend (7). When the related literature is examined, it is seen that one of the personal factors related to risk taking behavior in adolescents is self esteem (15).

This research was carried out to examine the self-esteem and risk-taking levels of the university students taking elective physical education and sports courses. For this purpose, the self-esteem and risk-taking levels of the university students who participated in the study were examined according to different socio-demographic characteristics and the results obtained were interpreted.

3. Method

3.1. Participants

109 students participated in the study who prefered physical education and sports courses as an elective course in Muğla Sıtkı Koçman University in 2018-2019 fall season. All participants were involved in the study voluntarily.

3.2. Materials

A positivist quantitative research approach was selected for the purpose of the study.

A three-part questionnaire was used as data collection tool in the research. The first part of the research includes the personal information form about the participants' age, gender, place of residence, whom they live with, monthly income, their start time of branch of sports in which they are currently interested, and frequency of doing sports.

The second part of the research involves "Self-Esteem Scale" developed by Aricak (1999). The scale consists of 32 items and 5 (self-esteem, self-confidence, depressive affect, self-sufficiency, achievement and productivity) dimensions in the five-point likert type scale (1: I totally disagree, 5: I totally agree). 19 items (1, 3, 4, 6, 7, 9, 11, 13, 15, 16, 18, 19, 21, 23, 25, 27, 29, 31 and 32) with negative expression in the scale were reverse-coded. The obtained higher scores indicate higher self-esteem (2). For this study, the Cronbach Alpha coefficient of the scale was 0.94; the Cronbach Alpha coefficients of the sub-dimensions were determined as 0.83 / 0.84 / 0.70 / 0.71.

The third part of the research includes the Risk-Taking Scale developed by Weber, Blais and Betz (2002), revised by Weber and Blais (2006) and adapted to Turkish by Gursel (2010) following that the reliability-validity studies were conducted. The scale consists of 30 items and 5 (moral domain, social domain, health domain, recreation domain, financial domain) dimensions in the seven-point likert type scale (1: I certainly do not, 7: I certainly do). Higher scores in the scale and sub-dimensions represent high level of risky behaviors in moral, social, health, recreation, financial domains (11). For this study, the Cronbach Alpha coefficient of the scale was 0.90; the Cronbach Alpha coefficients of the sub-dimensions were determined as 0.72 / 0.71 / 0.74 / 0.87 and 0.87.

3.3. Procedure

First of all the participants were informed about the research. They were answered questions by providing a quiet classroom environment. When evaluating the data only the data of the 101 participants who answered all questions were evaluated.

Data were analyzed by using SPSS (Statistical Package Program for Social Science) 16.0 program. Demographic information of the participants was shown as frequency and percentage table. The Skewness coefficient was used in the normality test of the scale scores. The Skewness coefficient used in the normal distribution characteristics of the scores obtained from a continuous variable remained within ±1 limit, which can be interpreted that the scores did not show a significant deviation from the normal distribution. If the scores do not show normal distribution, square root, logarithmic and inverse transformation can be performed in order to apply parametric tests (5). The logarithmic transformations of the scores of self-esteem, personal development, socialization, physical benefit, integration, psychological development,

emotional development and social integration in sports which did not show normal distribution in the normality test were performed and the unpaired (two-sample) t test was used to compare them in terms of gender and place of residence variables, but ANOVA was used for their comparison in terms of age groups, whom they live with, monthly income, their start time of branch of sports in which they are currently interested and frequency of doing sports variables. When ANOVA test showed significant difference, LSD post hoc test was used to determine the difference between the groups. The Pearson correlation technique was used for the analysis of the relationship between the scale scores. The confidence interval was 95% (significance level 0.05 $p < 0.05$) in the analyses.

4. Results

Table 1 shows the frequency and percentage distribution according to the demographic characteristics of the participants.

Table 1. Distribution of Participants by Demographic Characteristics

Demographic Variable	Groups	N	%
Gender	Female	56	55.4
	Male	46	44.6
Age (19.98±1.99)	18 years	22	21.8
	19 years	30	29.7
	20 years	22	21.8
	21 years and above	27	26.7
Monthly income	500 TL and below	32	31.7
	501-1250 TL	32	31.7
	1251-2000 TL	19	18.8
	2001 TL and more	18	17.8
Place of residence	Village/town	11	10.9
	Municipality	90	89.1
Whom s/he lives with	Family	31	30.7
	Alone	23	22.8
	Friend	47	46.5
her/his start time of branch of sports in which s/he is interested	Less than 1 year	41	40.6
	1-2 years	10	9.9
	2-3 years	11	10.9
	3-4 years	11	10.9
	5 years and above	28	27.7
Frequency of doing sports	Once a month	27	26.7
	Once a week	46	45.5
	Three and more times a week	28	27.7

55.4% of 101 participants were female and 44.6% were male. The mean age of the participants was 19.98±1.99 and 21.8% were 18 years, 29.7% were 19 years, 21.8% were 20 years and 26.7% were 21 years and above. The monthly income of 31.7% of the participants was 500 TL and less, of 31.7% was 501-1250 TL, of 18.8% was 1251-2000 TL and of 17.8% was 2001 TL and more. 10.9% of the participants live in village/town and 89.1% live in municipality or city. 30.7% of the participants live with their family, 22.8% live alone and 46.5% live with their friends. 40.6% of the participants are interested in their sports branch for less than 1 year, 9.9% for 1-2 years, 10.9% for 2-3 years, 10.9% for 3-4 years, 27.7% for 5 years and more. 26.7% of the participants spare time for the sports branch in which they are interested once a month, 45.5% spare time for it once a week and 20.8% spare time for it three and more times a week (Table 1).

Table 2 shows the descriptive statistics of the average, standard deviation and Skewness information of the scale and its sub-dimensions.

Table 2: Descriptive Statistics of Scales

Scale and Sub-Dimension	N	Min.	Max.	$\bar{X}$	SD	Skewness
Self-Esteem	101	1.00	5.00	3.65	0.81	-0.06[1]
Self-Confidence	101	1.22	5.00	3.91	0.69	-0.91
Depressive Affect	101	1.00	5.00	2.27	0.93	0.89
Self-Sufficiency	101	1.80	5.00	4.00	0.68	0.01[1]
Achievement and Productivity	101	1.00	5.00	3.94	0.67	0.16[1]
SELF-ESTEEM	101	1.19	5.00	3.84	0.65	-0.04[1]
Moral Domain	101	1.00	5.50	2.26	1.04	0.79
Social Domain	101	1.00	7.00	5.02	0.96	-0.96
Health Domain	101	1.00	7.00	3.63	1.29	0.23
Recreation Domain	101	1.00	7.00	4.39	1.42	-0.20
Financial Domain	101	1.00	7.00	3.35	1.50	0.61
RISK-TAKING	101	1.20	5.70	3.73	0.90	0.00

According to the score range (1-5) that can be taken from the self-esteem scale, it can be said that the self-esteem (3.65±0.81), self-confidence (3.91±0.69), self-sufficiency (4.00±0.68), achievement and productivity (3.94±0.67) sub-dimension scores and the self-esteem scale scores (3.84±0.5) were "high level"; the depressive affect sub-dimension scores (2.27±0.93) were "low level" (5-1=4/5=0.80; 1.00-1.80: very low; 1.81-2.60: low; 2.61-3.40: medium; 3.41-4.20: high; 4.21-5.0) (Table 2).

According to the score range (1-7) that can be taken from the risk-taking scale, it can be said that the social domain (2.26±1.04) and financial domain (3.35±1.50) risk-taking scores of the participants were "low level"; their health (3.63±1.29), recreation (4.39±1.42) and general risk-taking (3.73±0.90) scores were "medium level"; their social domain scores (5.02±0.96) were "high level" (7-1=6/5=1.20; 1.00-2.20: very low; 2.21-3.40: low; 3.41-4.60: medium; 4.61-5.80: high; 5.81-7.0) (Table 2).

Table 3 shows the unpaired (two-sample) t test results of the comparison of the risk-taking scores by the gender of the participants.

Table 3: *t Test Results of the Comparison of the Risk-Taking Scores By Gender*

Sub-Dimensions	Gender	n	$\bar{X}$	SD	T	p
Moral Domain	Female	56	2.08	0.83	-1.98	0.050
	Male	45	2.49	1.22		
Social Domain	Female	56	5.16	0.88	1.62	0.109
	Male	45	4.85	1.03		
Health Domain	Female	56	3.47	1.36	-1.45	0.150
	Male	45	3.84	1.18		
Recreation Domain	Female	56	4.37	1.43	-0.19	0.846
	Male	45	4.43	1.42		
Financial Domain	Female	56	2.96	1.27	-2.98	**0.004**
	Male	45	3.82	1.63		
RISK-TAKING	Female	56	3.61	0.84	-1.55	0.124
	Male	45	3.89	0.96		

It was determined that the risk-taking scores of the financial domain showed a significant difference in terms of gender (t=-2.98; p<0.05). The risk-taking scores of the financial domain of the male participants were significantly higher than those of the female participants (Table 3).

It was determined that the risk-taking scale score and the risk-taking scores of the moral, social, health and recreation domains did not show a significant difference in terms of gender (p>0.05) (Table 3).

Table 4: *ANOVA Test Results of the Comparison of the Risk-Taking Scores By Monthly Income*

Sub-Dimension	Monthly Income	N	$\bar{X}$	SD	F	p	Significant Difference
Moral Domain	A-500 TL and	32	2.26	1.16	0.07	0.975	

	below						
	B-500-1250 TL	32	2.22	0.84			
	C-1251-2000 TL	19	2.36	1.12			
	D-2001 TL and more	18	2.24	1.12			
Social Domain	A-500 TL and below	32	4.92	0.98	0.75	0.524	
	B-500-1250 TL	32	5.20	0.81			
	C-1251-2000 TL	19	4.83	0.85			
	D-2001 TL and more	18	5.09	1.26			
Health Domain	A-500 TL and below	32	3.30	1.00	1.34	0.265	
	B-500-1250 TL	32	3.91	1.34			
	C-1251-2000 TL	19	3.56	1.41			
	D-2001 TL and more	18	3.81	1.47			
Recreation Domain	A-500 TL and below	32	4.15	1.38	0.62	0.602	
	B-500-1250 TL	32	4.56	1.21			
	C-1251-2000 TL	19	4.60	1.61			
	D-2001 TL and more	18	4.32	1.66			
Financial Domain	A-500 TL and below	32	2.74	1.32	3.33	**0.023**	**B,C,D>A**
	B-500-1250 TL	32	3.46	1.44			
	C-1251-2000 TL	19	3.56	1.53			
	D-2001 TL and more	18	4.01	1.58			
RISK-TAKING	A-500 TL and below	32	3.47	0.78	1.37	0.258	
	B-500-1250 TL	32	3.87	0.79			
	C-1251-2000 TL	19	3.78	1.06			
	D-2001 TL and more	18	3.89	1.07			

It was determined that the risk-taking scores of the financial domain showed a significant difference in terms of monthly income ($F=3.33$; $p<0.05$). According to LSD post hoc test results performed to determine the difference between the groups, the risk-taking scores of the financial domain of the participants with a monthly income of 500 TL and less were significantly lower than those of the participants in the other income groups (Table 4).

It was determined that the risk-taking scale score and the risk-taking scores of the moral, social, health and recreation domains did not show a significant difference in terms of monthly income ($p>0.05$) (Table 4).

Table 5 shows the unpaired (two-sample) t test results of the comparison of the risk-taking scores by place of residence.

Table 5: *t Test Results of the Comparison of the Risk-Taking Scores by Place of Residence*

Sub-Dimensions	Place Of Residence	n	$\bar{X}$	SD	t	p
Moral Domain	Village/Town	11	2.90	1.34	2.21	**0.029**
	Municipalit	90	2.18	0.97		

	y					
Social Domain	Village/Town	11	4.69	0.94	-1.21	0.229
	Municipality	90	5.06	0.96		
Health Domain	Village/Town	11	3.91	0.99	0.74	0.458
	Municipality	90	3.60	1.32		
Recreation Domain	Village/Town	11	4.29	1.15	-0.26	0.793
	Municipality	90	4.41	1.45		
Financial Domain	Village/Town	11	3.48	1.62	0.31	0.760
	Municipality	90	3.33	1.49		
RISK-TAKING	Village/Town	11	3.85	0.84	0.47	0.637
	Municipality	90	3.72	0.91		

It was determined that the risk-taking scores of the moral domain showed a significant difference in terms of place of residence ($t=2.21$; $p<0.05$). The risk-taking scores of the moral domain of the participants living in municipality/cities were significantly higher than those of the participants living in village/town (Table 5).

It was determined that the risk-taking scale score and the risk-taking scores of the social, health, recreation and financial domains did not show a significant difference in terms of place of residence ($p>0.05$) (Table 5).

Table 6 shows the one-way analysis of variance (ANOVA) results of the comparison of the risk-taking scores by whom s/he lives with.

Table 6: *ANOVA Test Results of the Comparison of the Risk-Taking Scores by Whom S/He Lives With*

Sub-Dimension	Whom S/He Lives With	n	$\bar{X}$	SD	F	p	Significant Difference
Moral Domain	A-Family	31	2.02	1.09	1.69	0.190	
	B-Alone	23	2.53	1.37			
	C-Friends	47	2.29	0.76			
Social Domain	A-Family	31	4.60	1.02	5.46	**0.006**	**B,C>A**
	B-Alone	23	5.40	0.78			
	C-Friends	47	5.12	0.91			
Health Domain	A-Family	31	3.09	1.06	4.28	**0.017**	**B,C>A**
	B-Alone	23	3.97	1.42			
	C-Friends	47	3.83	1.28			
Recreation Domain	A-Family	31	4.00	1.37	3.35	**0.039**	**B,C>A**
	B-Alone	23	4.98	1.47			
	C-Friends	47	4.37	1.35			
Financial Domain	A-Family	31	2.82	1.28	4.71	**0.011**	**B,C>A**
	B-Alone	23	4.04	1.60			
	C-Friends	47	3.35	1.47			
RISK-TAKING	A-Family	31	3.31	0.81	7.32	**0.001**	**B,C>A**
	B-Alone	23	4.19	1.00			

	C-Friends	47	3.79	0.79

It was determined that the risk-taking scores of the moral domain did not show a significant difference in terms of whom s/he lives with ($p>0.05$) (Table 6).

It was determined that the risk-taking scores of the social ($F=5.46$; $p<0.05$), health ($F=4.28$; $p<0.05$), recreation ($F=3.35$; $p<0.05$) and financial ($F=4.71$; $p<0.05$) domains and the general risk-taking scores ($F=7.32$; $p<0.05$) did not show a significant difference in terms of whom s/he lives with. According to LSD post hoc test results performed to determine the difference between the groups, the risk-taking scores of the social, health, recreation and financial domains, and general risk-taking scores of the participants living alone and with their friends were significantly higher than those of the participants living with their families (Table 6).

Table 7 shows the one-way analysis of variance (ANOVA) results of the comparison of the risk-taking scores by time of their interest in their sports branch.

Table 7: *ANOVA Test Results of the Comparison of the Risk-Taking Scores By Time of Their Interest in Their Sports Branch*

Sub-Dimension	Time of Interest	n	$\bar{X}$	SD	F	p	Significant Difference
Moral Domain	A-Less than 1 year	41	2.23	1.00	0.86	0.489	
	B-1-2 Years	10	2.79	1.23			
	C-2-3 Years	11	2.10	0.82			
	D-3-4 Years	11	2.03	1.35			
	E-5 years and more	28	2.28	0.98			
Social Domain	A-Less than 1 year	41	4.98	0.93	0.39	0.812	
	B-1-2 Years	10	4.76	1.67			
	C-2-3 Years	11	5.03	1.18			
	D-3-4 Years	11	5.27	0.68			
	E-5 years and more	28	5.07	0.68			
Health Domain	A-Less than 1 year	41	3.49	1.10	1.00	0.411	
	B-1-2 Years	10	4.26	1.33			
	C-2-3 Years	11	3.31	1.72			
	D-3-4 Years	11	3.89	1.18			
	E-5 years and more	28	3.65	1.40			
Recreation Domain	A-Less than 1 year	41	4.23	1.30	0.42	0.797	
	B-1-2 Years	10	4.54	1.76			
	C-2-3 Years	11	4.19	1.60			
	D-3-4 Years	11	4.55	1.68			
	E-5 years and more	28	4.61	1.33			
Financial Domain	A-Less than 1 year	41	2.83	1.25	2.48	**0.049**	**D,E>A**
	B-1-2 Years	10	3.64	1.41			
	C-2-3 Years	11	3.47	2.02			
	D-3-4 Years	11	4.12	1.29			
	E-5 years and more	28	3.64	1.56			
RISK-TAKING	A-Less than 1 year	41	3.55	0.73	0.99	0.418	
	B-1-2 Years	10	4.00	1.26			
	C-2-3 Years	11	3.62	0.98			
	D-3-4 Years	11	3.97	0.99			
	E-5 years and more	28	3.85	0.92			

It was determined that the risk-taking scores of the financial domain showed a significant difference in terms of time of their interest in their sports branch ($F=2.48$; $p<0.05$). According to LSD post hoc test results performed to determine the difference between the groups, the risk-taking scores of the financial domain of the participants interested in their sports branch for 3-4 years and 5 years and more were significantly higher than those of the participants interested in their sports branch for less than 1 year (Table 7).

It was determined that the risk-taking scale score and the risk-taking scores of the moral, social, health and recreation domains did not show a significant difference in terms of time of their interest in their sports branch (p>0.05) (Table 7).

Table 8 shows the one-way analysis of variance (ANOVA) results of the comparison of the risk-taking scores by frequency of doing sports.

Table 8: *ANOVA Test Results of the Comparison of the Risk-Taking Scores by Frequency of Doing Sports*

Sub-Dimension	Frequency of Doing Sports	n	$\bar{X}$	SD	F	p	Significant Difference
Moral Domain	A-Once A Month	27	2.53	1.14	1.38	0.257	
	B-Once A Week	46	2.22	1.09			
	C-Three and More Times A Week	28	2.07	0.79			
Social Domain	A-Once A Month	27	5.11	1.09	1.23	0.298	
	B-Once A Week	46	4.86	1.00			
	C-Three and More Times A Week	28	5.20	0.73			
Health Domain	A-Once A Month	27	4.32	1.40	5.65	**0.005**	**A>B,C**
	B-Once A Week	46	3.40	1.23			
	C-Three and More Times A Week	28	3.36	1.06			
Recreation Domain	A-Once A Month	27	4.51	1.43	0.90	0.410	
	B-Once A Week	46	4.19	1.52			
	C-Three and More Times A Week	28	4.62	1.22			
Financial Domain	A-Once A Month	27	3.78	1.83	2.03	0.137	
	B-Once A Week	46	3.06	1.30			
	C-Three and More Times A Week	28	3.40	1.40			
RISK-TAKING	A-Once A Month	27	4.05	1.03	2.72	0.071	
	B-Once A Week	46	3.55	0.90			
	C-Three and More Times A Week	28	3.73	0.69			

It was determined that the risk-taking scores of the health domain showed a significant difference in terms of frequency of doing sports (F=5.65; p<0.05). According to LSD post hoc test results performed to determine the difference between the groups, the risk-taking scores of the health domain of the participants doing sports once a month were significantly higher than those of the participants doing sports once a week, three and more times a week (Table 8).

It was determined that the risk-taking scale score and the risk-taking scores of the moral, social, recreation and financial domains did not show a significant difference in terms of frequency of doing sports (p>0.05) (Table 8).

Moreover, the self-esteem scores did not show a significant difference in terms of demographic characteristics (p<0.05).

Table 9 includes the results of Pearson correlation analysis showing the relationship between the scale scores.

Table 9: *Results of Pearson Correlation Analysis Between Self-Esteem and Risk-Taking*

Variables	2	3	4	5	6	7	8	9	10	11	12
1.Self-Esteem	0.80**	-0.71**	0.60**	0.67**	0.91**	-0.21*	0.14	-0.17	-0.06	-0.12	-0.13

2.Self-Confidence	1	-0.59**	0.55**	0.68**	0.87**	-0.31**	0.17	-0.13	0.04	-0.11	-0.10
3.Depressive Affect		1	-0.49**	-0.70**	-0.82**	0.12	0.14	0.32**	0.18	0.31**	0.31**
4.Self-Sufficiency			1	0.58**	0.73**	-0.16	0.11	-0.11	0.00	-0.09	-0.08
5.Achievement and Productivity				1	0.84**	-0.24*	-0.04	-0.22*	-0.04	-0.14	-0.19
6. SELF-ESTEEM					1	-0.25*	0.07	-0.22*	-0.05	-0.17	-0.18
7. Moral Domain						1	-0.07	0.47**	0.25*	0.47**	0.58**
8. Social Domain							1	0.34**	0.48**	0.22*	0.52**
9. Health Domain								1	0.54**	0.56**	0.83**
10. Recreation Domain									1	0.49**	0.79**
11.Financial Domain										1	0.80**
12. RISK-TAKING											1

*p<0.05 **p<0.01

A negative and significant relationship was determined between the self-esteem scores and the risk-taking scores of the moral domain (r=0.21; p<0.05). Individuals with high self-esteem had low risk-taking behaviors of the moral domain (Table 9). There was not any significant relationship between the self-esteem scores and the risk-taking scores of the social, recreation, health, financial domains, and the general risk-taking scores (p<0.05) (Table 9).

A negative and significant relationship was determined between the self-confidence scores and the risk-taking scores of the moral domain (r=0.31; p<0.05). Individuals with high self-confidence had low risk-taking behaviors of the moral domain (Table 9). There was not any significant relationship between the self-confidence scores and the risk-taking scores of the social, recreation, health, financial domains, and the general risk-taking scores (p<0.05) (Table 9).

A positive and significant relationship was determined between the depressive affect scores and the health (r=0.32; p<0.05), financial (r=0.31; p<0.05) sub-dimension and risk-taking scale (r=0.31; p<0.05) scores of the moral domain. Individuals with high depressive affect had high risk-taking behaviors in general and in terms of health and financial domains (Table 9). There was not any significant relationship between the depressive affect scores and the moral, social and recreation domain scores (p>0.05) (Table 9).

There was not any significant relationship between the self-sufficiency scores and the risk-taking scale and sub-dimension scores (p>0.05) (Table 9).

A negative and significant relationship was determined between the achievement and productivity scores and the risk-taking scores of the moral (r=-0.24; p<0.05) and health (r=-0.22; p<0.05) domains. Individuals with high level of achievement and productivity had low risk-taking behaviors of the moral and health domains (Table 9). There was not any significant relationship between the achievement and productivity scores and the risk-taking scores of the social, recreation, financial domains, and the general risk-taking scores (p<0.05) (Table 9).

A negative and significant relationship was determined between the self-esteem scores and the risk-taking scores of the moral (r=-0.25; p<0.05) and health (r=-0.22; p<0.05) domains. Individuals with high self-esteem had low risk-taking behaviors of the moral and health domains (Table 9). There was not any significant relationship between the self-esteem scores and the risk-taking (r=-0.22; p<0.05) scores of the social, recreation, financial domains, and the general risk-taking scores (p<0.05) (Table 9).

A negative and significant relationship was determined between the depressive affect scores and the socialization (r=-0.23; p<0.05), psychological development (r=-0.20; p<0.05), moral development (r=-0.22; p<0.05), emotional development (r=-0.22; p<0.05), social integration in sports scale (r=-0.20; p<0.05) scores. Individuals with high depressive affect had low level of perception that sports provides socialization, psychological development, moral development, emotional development and integration in sports (Table 9). There was not any significant relationship between the depressive affect scores and the personal development, physical benefit and integration sub-dimension scores (p>0.05) (Table 9).

5. Discussion and Conclusion

When the data obtained from the research were examined;

1. When the self-esteem scores of the participating students were examined, they were "high" level (Table 2),
2. The participating students showed "medium level" of the risk-taking behavior (Table) according to their scores of the risk-taking scale; the risk-taking scores of the financial domain of the male participants were

significantly higher than those of the female participants (Table 3) and the risk-taking scores of the financial domain of the students with a monthly income of 500 TL and less were significantly lower than the participants in the other group (Table 4). However, the risk-taking scores of the moral domain showed a significant difference in terms of place of residence; the risk-taking scores of the moral domain of the participants living in municipality/cities were significantly higher than those of the participants living in village/town (Table 5); the risk-taking scores of the social, health, recreation, financial domains, and the general risk-taking scores showed a significant difference in terms of whom s/he lives with; the risk-taking scores of the social, health, recreation and financial domains, and general risk-taking scores of the participants living alone and with their friends were significantly higher than those of the participants living with their families (Table 6),

3. The risk-taking scores of the health domain showed a significant difference in terms of frequency of doing sports; the risk-taking scores of the health domain of the participants doing sports once a month were significantly higher than those of the participants doing sports once a week, three and more times a week (Table 8),
4. A negative and significant relationship was determined between the self-esteem scores and the risk-taking scores of the moral domain. Individuals with high self-esteem had low level of the risk-taking behaviors of the moral domain (Table 9),
5. A negative and significant relationship was determined between the self-confidence scores and the risk-taking scores of the moral domain. Individuals with high self-confidence had low level of the risk-taking behaviors of the moral domain (Table 9),
6. A positive and significant relationship was determined between the depressive affect scores and the health and financial sub-dimensions and risk-taking scale scores of the moral domain. Individuals with high depressive affect had high level of the risk-taking behaviors in general and in terms of health and financial domains (Table 9),
7. A negative and significant relationship was determined between the achievement and productivity scores and the risk-taking scores of the moral and health domains. Individuals with high level of achievement and productivity had low level of the risk-taking behaviors of the moral and health domains (Table 9),
8. A negative and significant relationship was determined between the self-esteem scores and the risk-taking scores of the moral and health domains. Individuals with high self-esteem had low level of the risk-taking behaviors of the moral and health domains (Table 9),
9. A negative and significant relationship was determined between the depressive affect scores and the scores of the socialization, psychological development, moral development, emotional development and social integration in sports. Individuals with high depressive affect had low level of perception that sports provides socialization, psychological development, moral development, emotional development and integration in sports (Table 9).

The research was conducted on the university students by Baskara (4) and found that students in the 20-25 age groups had high self-esteem. The result of current study indicated that male students have high level of self-esteem than female students (3) but in this research not found any differences between gender.

Similarly, it was observed that students had generally high level of self-esteem, there was not any significant difference between the self-esteem of the female and male university students and there was not any significant relationship between their self-esteem and their departments and class levels as a result of Odaci' s research (14) on the levels of loneliness, self-esteem and close relationships of the university students.

When the studies on the risk-taking behavior were examined, the young people exhibited higher risky behaviors due to their increased autonomy generally in their late adolescence compared to their mid-adolescence period (6).

Many studies demonstrated that gender was an important determinant and men showed more risk-taking behaviors than women (16,18).

Irmak et.all (13) states that university students, who are separated from their families and begin to take decisions on many issues (choice of friends, time to go home, not using alcohol and drugs, etc.), have the opportunity to try various risk taking behaviors in different friend settings and men have a lower risk perception than women, they evaluate the results of risk behaviors more positively and parents approve the risk behaviors of men more.

Camur et al. (7) indicated in their research that the risky behaviors of the people are influenced by

their place of residence and those living alone, with their friends or in a dormitory showed more risky behaviors than those living with their families or relatives. Then, the people with whom they share their living space have been seen effective in directing risky behavior. Moreover, it has been also considered that the young people who grew in places where more traditional lifestyles such as village/town were dominated turned to risky behaviors to prove themselves and be accepted by new friends when they started their university life and left the house. Karahan et al. (12) listed the reasons of the risk-taking and pawning behavior as being able to participate in groups of friends, opposing family pressure and traditional social structure, desire to control their own life, waiting for approval of their identity and being able to cope with emotions such as anxiety, inadequacy and failure.

As the time spent with peers increases, the opportunity and time for performing risk taking behaviors are increasing. Also peer pressure increases risk-taking behavior (10).

Aktas and Erhan (1) compared the groups that did or did not regularly sports according to their risk-taking scores in their research and indicated that the scores of the group doing sports were significantly higher than those of the group not doing sports. This result conflicts with the results from our research. Doing regularly sports is an important factor in creating awareness of the risks involved in sports. However, it has been considered that doing sports once a month does not raise awareness about the risks that may arise and thus, leads to taking the risk that will provide a basis for the emergence of dangerous results.

When the results of the research are generally evaluated, there is a significant and negative relationship between self-esteem and risk-taking behavior. It is possible to turn to risk behaviors in order to avoid or deal with negative emotions that arise from low self-esteem, such as feeling worthless and unimportant oneself and not being liked by others. When the literature is examined, one of the personal variables associated with the risk-taking behavior has been stated as self-esteem (17).

According to the results obtained from the research, considering that the university is an important turning point in the lives of young people, elective courses should be diversified to help them to know themselves, to meet other people and to increase their self-confidence, and socio-cultural activities should be organized to take important opportunities for self-acceptance and making themselves accepted, and to contribute to their socialization, thereby increasing self-esteem and causing to decrease in risk-taking behaviors.

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Organization of distance learning on "Nursing" specialty: methodological and legal aspects

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Abstract

The article deals with the legal and methodical peculiarities of organization of the distance form of study during future specialists' training in "Nursing" specialty (branch of knowledge – Healthcare) of both first (Bachelor's) and second (Master's) degrees of higher education on the example of I. Horbachevsky Ternopil State Medical University. The current international documents and national legislation of Ukraine, which regulate the problem of realization of people's right to education in the process of obtaining higher education have been studied and analyzed in detail. The content, purpose, tasks and reasons for choosing the distance English-based form of education during training of future specialists of Healthcare branch of "Nursing" specialty have been characterized. A special attention has been paid to the mechanism of ensuring equal access to education during future specialists' training in "Nursing" specialty in the way of developing by establishments of higher education of their own platforms for distance learning, with a help of which the management of study and courses is carried out, the possibility of using computer-based course in the English language for covering all the amount of information with the purpose of mastering professional competence has been provided. The analysis of the organizational dynamic of distance learning process in "Nursing" specialty includes purpose, tasks, grounds (principles), kinds, forms of distance learning courses taught in English; the reasons for choosing such form of study; organizational, methodical, system and technical support. After the successful using of the distance learning in training of future specialists at Ternopil State Medical University, this positive experience has been also used by other Ukrainian establishments of higher education. The increasing dynamics of the number of people, who realize their right to higher education in «Nursing» specialty using the distance learning has also been traced.

Keywords: Distance learning form, Future specialists in «Nursing», Moodle system, Methodological aspect, Normative-legal regulation.

1. Introduction

One of the law system tasks is regulation of social relationships with a help of providing with rights, freedoms and legal interests of man and citizen. One of the biggest groups of constitutional rights is cultural rights, the priority place among which is occupied by the right on education. Ukraine chose direction of international and European integration, implementing international and European standards into national legislation. It is done with a help of different fields of social life reformation, including health care and education. The main task of health care field modernization both in Ukraine, and in the world, is providing the population with quality and qualified medical care that needs reformation of the

national system of future medical workers professional training, in particular "Nursing" specialty. Nursing stuff is the most numerous category of workers in this field, which actualizes study of normative-legal and methodological support for realization of the person's right to higher education on "Nursing" specialty.

Form, process, order and guarantees ensuring the right of the person to education are set in the Universal Declaration of Human Rights, Article 26 (United Nations General Assembly. Treaty Series, 1948). The right to education is also provided in the International Covenant on Economic, Social and Cultural Rights, adopted 16.12.1966 by the General Assembly of the United Nations (Article 13, 14). Provisions of this document foresee that participating States gradually provide free secondary and higher education, establish a system of scholarships and improve the material conditions of the teaching staff (United Nations General Assembly. Treaty Series, 1966).

As Ukraine is one of the founding countries of the United Nations, the implementation of international norms in the legislation of Ukraine is carried out on the basis of the norms of the Constitution of Ukraine and the Law of Ukraine "On the International Agreements of Ukraine". These norms are reflected in the Ukrainian legislation and set out in the Article 53 of the Constitution of Ukraine (1996) and the Laws of Ukraine "On Education" (2017), "On Higher Education" (2014) and others.

Foreigners and stateless persons have possibility to get education in Ukraine according to the legislation and international agreements of Ukraine. This norm is set in the Law of Ukraine "On Education". It is necessary to pay attention to the separate category of persons, which are recognized as refugees or people who need additional protection according to the Law of Ukraine (On Refugees and Persons in Need of Subsidiary Protection or Asylum, 2011) as they also have the same right to education as the citizens of Ukraine. The problem of the research is to create conditions in the establishments of higher medical education to ensure equal access for foreign students for getting higher education regardless of their location, health status, age and study. Providing these conditions for the future specialists on "Nursing" specialty can be realized through the use of distance learning conducted in English.

3. Literature Review

Some scholars revealed the English language significance in self-education of the students of socio-humanitarian specialities. They concluded that combination of self-education with a high level of knowledge of English at a high school allows students to successfully implement their expertise both in the changing conditions of the modern world and in future professional activities (Melnychuk, Rebukha, Zavgorodnia, Bloshchynskyi, 2018). The information and communication technologies usage during the foreign language professional training was revealed in the study of I. Bloshchynskyi (Bloshchynskyi, 2017).

According to O. Yakushyna, state policy in the education field should be carried out in clearly defined directions: creation of conditions for realization of citizens' right to quality education; formation of the common educational space and language environment of Ukraine; provision of education development and education integration of Ukraine into European educational space; improvement of social protection of educators; upgrading of educational material base and informatization of educational institutions etc. (Yakushyna, 2017). In fact, these directions should be regarded as the main state functions in the field of education.

The purpose of the article is analysis of main international and national normative legal acts on ensuring rights of the person to education, including obtaining of higher education on "Nursing" specialty by means of distance learning in the English language.

4. Method

To realize this purpose, the following set of methods has been used: theoretical analysis, comparison, substantiation, generalization, systematization of theoretical and practical material, study of the experience of distance educational process organization with a help of MOODLE system to substantiate the expediency of distance learning for future specialists of "Nursing" specialty, ensuring the person's right to have equal access to higher education; conclusions formulation and systematization.

3.1. Materials

Theoretical bases of research

In Ukraine the right to education is guaranteed to everybody (Art. 53 of the Constitution of Ukraine). Citizens, who belong to the national minority, according to the law, are guaranteed the right to study in their native language or to learn native language in state and communal educational establishments or through the national cultural associations (Tatsii, Petryshyn, 2012, p. 468).

The right to education is guaranteed regardless of age, gender, race, health status, disability, citizenship, nationality, political, religious or other beliefs, color of skin, place of residence, language of communication, origin, social and property status, the existence of convictions, and other circumstances. Thus, in accordance with Art. 24 and Part 4 Art. 53 of the (Constitution of Ukraine, 1996), citizens have equal constitutional rights and freedoms and are equal before the law, in particular to acquire higher education free in state and communal educational establishments on a competitive basis. This prerequisite for getting higher education is fixed in Part 1 and Part 3 of Art. 44 of the Law of Ukraine "On Higher Education", 2014.

The Constitution of Ukraine also includes other guarantees of realization of person's right to education. They include: development of network of educational establishments, which are based on different forms of ownership; availability of different forms of study (full-time, evening, correspondence, distance, external); open type of educational institutions, that provides free choice of such establishment according to abilities and interests of citizens; provision of state scholarships and privileges to pupils and students; possibility to study in native language to citizens, who belong to the national minorities. These constitutional provisions are also strengthened by the Law of Ukraine "On Education", in which the right to education in Ukraine is provided by: extensive network of educational institutions, scientific establishments, institutes of postgraduate education, scientific-methodical establishments, scientific and production enterprises, state and local governments in the field of education; creating conditions for choosing an educational profile according to abilities and interests of citizens, etc. The hierarchical structure of education covers: pre-school education; general secondary education; vocational education; higher education; postgraduate education; self-education (Art. 29 of the Law of Ukraine "On Education"). According to the Law of Ukraine "On Education" there are educational, educational qualification levels and degrees in Ukraine. In turn, the state shall exercise proper control over the activities of educational institutions by verifying compliance with requirements to content, amount and level of education, which are defined in state standards of education. The main form of control is the state certification of educational establishments. For example, higher educational establishments (HEEs) are required to pass certification at least 1 time every 10 years (Skrypniuk, 2014, p. 154).

Higher education is an integral component of educational system, the essence of which is mastering of certain qualification by students, that is based on the combination of systematized knowledge, abilities and practical skills, ways of thinking, professional, ideological and civic qualities, moral and ethical values, other competencies, which are acquired by future specialists of HEE in the relevant field of knowledge (Kalyniuk, 2018, p. 139). Normative legal basis are being constantly renewed with a reforming of educational system and according to the needs of society.

The Sectoral standards of educational qualification characteristics are operating in Ukraine, corresponding to different levels of education and National Qualifications Framework. Training of specialists in the "Healthcare" branch of knowledge "Nursing" specialty 223 is carried out on the first "Bachelor's" degree of higher education in HEEs, which corresponds to the seventh level of the National Qualifications Framework, and the second "Master's" degree of higher education, which corresponds to the eighth level of the National Qualifications Framework. According to the competence approach, students, who study on the "Bachelor's" degree of training in "Nursing" specialty must solve complex tasks and problems in the health care field which involves implementation of acquired knowledge and skills into the professional activity practice, taking a free choice of actions in a particular situation. The professional training of future specialists in "Nursing" specialty of the "Bachelor's" direction of training is provided by ensuring the right to get specialized conceptual knowledge in the process of study and professional activity at the level of the latest advances in medicine. At this level future nurse specialists critically think over the problems and situational questions, which may appear in the process of their professional activity, integrate own knowledge gained during the study in contradictory requirements of the present days. Their knowledge, abilities and skills should fully correspond to the interests of modern informational society. During the proper organization of study process, the abilities to make decisions in complex unpredictable conditions, which the use of new approaches to prediction, are formed by future

specialists of "Nursing" specialty (Melnychuk, 2017, p. 516).

One of the elements of realization of the right to education by future specialists of "Nursing" specialty is possibility of its obtaining in one of the following directions: formal, informal and non-formal. Formal education is regarded as the state system of primary, secondary and higher education, as well as advanced training of specialists according to the approved curricula and terms of study. Non-formal education according to its content is conducted outside of educational institutions and that is why it has unsystematic nature (individual classes with tutors, short-term courses, workshops, etc). Informal education includes unorganized, not always conscious and purposeful process, which continues during the whole life. In fact, it is gaining of necessary knowledge, abilities, skills in the form of life experience (Huseinova, 2011, p. 157).

In the context of realization by future specialists of "Nursing" specialty of their right to education, everyone should have access to the Internet and educational resources, including electronic textbooks in Ukrainian and English and other multimedia academic resources, due to the rapid development of the latest technologies. Achieving this result is possible through the use of distance learning form in establishments of higher medical education. In this case, distance learning in English is a universal form of knowledge transfer in a remote space and time using information technologies that provide quality complex of educational services for population regardless of their territorial affiliation.

5. Results

4.1. The characteristics of distance learning organization in the English language on "Nursing" specialty as a prospective direction of modern higher education development.

As Ukraine integrates into a common European educational space, distance learning is widely used in the training of students of economic and pedagogical specialties, in foreign languages study etc. The organization of study in "Nursing" specialty at I. Horbachevsky Ternopil State Medical University (TSMU) is provided both on the full-time and on distance learning forms (Table 1). Students from such countries as: USA, Poland, Nigeria, Congo, Ghana, Egypt, Turkey, Zimbabwe, Uzbekistan, Pakistan are trained in English in this specialty.

In general, in "Nursing" specialty 185 students (100 %) received diplomas in 2018, among them 43 students (23,2 %) of the full-time education and 142 students (76,8 %) of the distance learning form. As the data from the Table 1 show, the number of students who received diplomas in "Nursing" specialty in the distance learning form (76,8 %) is three times more, than the students who received diplomas having completed full-time education (23,2 %). In the period of 2013 till 2018, future specialists expressed a desire to obtain education in the distance form of learning both at the first "Bachelor's" (52,4 %) and the second "Master's" (24,4 %) degrees, which in two and three times exceeds the percentage of students who want to get full-time education, respectively.

The main principles of the distance learning in foreign language are establishing interactive communication between students and teachers through the use of modern pedagogical, informational, computer telecommunication technologies without the need of their meeting face-to-face. The legal basis for the implementation of distance learning form is the Laws of Ukraine "On Higher Education", "On the National Informatization Program" and the Regulation "On Distance Learning", passed by the Order of the Ministry of Education and Science of Ukraine № 40 on January 21, 2004.

Table 1. *The number of students who completed their studies in 2018 in "Nursing" specialty at I. Horbachevsky Ternopil State Medical University*

Educational and qualification level		Form of study	Number of students who completed their studies in 2018 and got educational and qualification level of training			Percentage of the total number of students (%)		
			Total	Citizens of Ukraine	Foreign citizens	Total	Citizens of Ukraine	Foreign citizens
I	Bachelor's degree	full-time	36	36	-	19,5	19,5	-
		distance	97	83	14	52,4	44,8	7,6
II	Master's degree	full-time	7	7	-	3,8	3,8	-
		distance	45	21	24	24,4	11,4	13,0
Total: 185		full-time	43	43	-	23,2	23,2	-
		distance	142	104	38	76,8	56,3	20,5

Distance education in "Nursing" specialty includes the purpose, tasks, principles, kinds, forms of distance learning, reasons for choosing such form of study, its organizational-methodical and system-technical support. Schematically, the mechanism of functioning of distance learning form is shown as a model on the Figure 1.

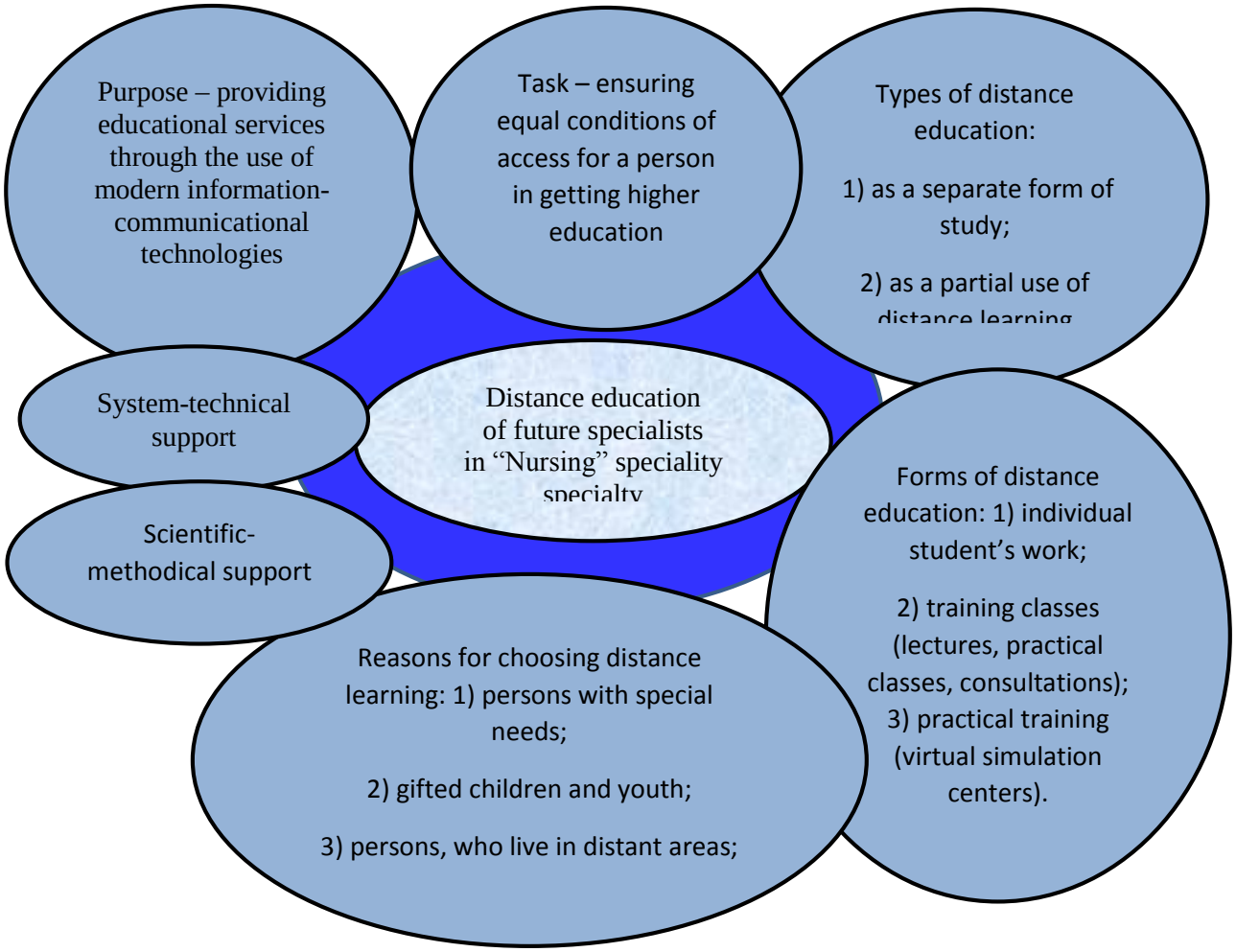


Figure 1. Model of distance education of future specialists in "Nursing" speciality

The organizational support of distance learning in "Nursing" specialty includes two parts: scientific-methodical and system-technical support. Scientific-methodical support includes: methodical (theoretical and practical) recommendations for the developing and using of pedagogical-psychological and information-communication technologies of distance learning in foreign language; criteria, means and systems of quality control of the foreign students' education; the informative, didactic and methodical content of web-resources (distance courses) of study curriculum/study program.

The system-technical support of distance learning form includes: hardware tools; informational-communication support; general and special purpose software; web-resources of educational disciplines, which are necessary for providing distance learning in foreign language (methodical recommendations; documents on study process planning; video and audio recordings of lectures, seminars; multimedia materials; practical tasks with methodical recommendations for their execution; virtual laboratory works with methodical recommendations for their execution; testing with automated checking of results etc.).

In order to provide equal access to education during the future specialists' training in "Nursing" specialty the institutions of higher education develop their own platforms for distance learning in a foreign language, which is mostly English. The most common platform is MOODLE (Modular Object Oriented Dynamic Leaning Environment) system that is modular object-oriented dynamic studying environment, with a help of which the management of study and courses is carried out. The MOODLE system creates an opportunity for future specialists of "Nursing" specialty, who study in the distance learning form, to use informational computerized studying.

In the process of organization of the distance learning TSMU uses modular environment, namely the MOODLE system (Figure 2) for creating and functioning of the electronic study-methodical complex

(ESMC) in order to provide a proper level of foreign citizens' training – future specialists in "Nursing" specialty.

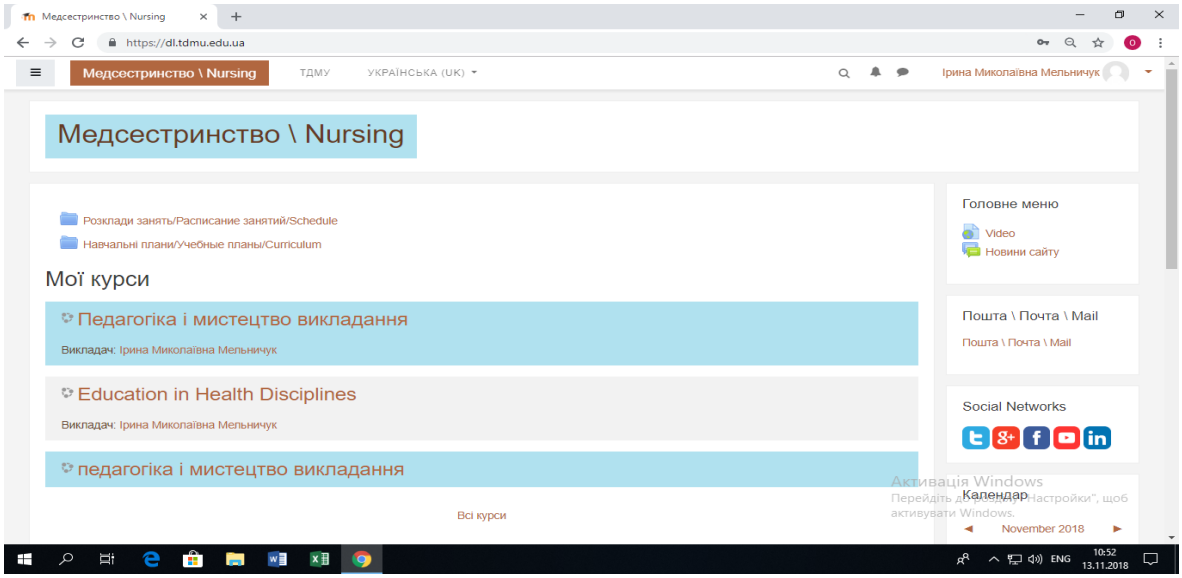


Figure 2. Example of MOODLE system use in the educational process in "Nursing" specialty in Ukrainian and English

Each ESMC consists of three main sections. The first section (Figure 3) has organizational character (schedule of lectures and practical classes, thematic-calendar plans, titles of courses, methodical documents, including work syllabi).

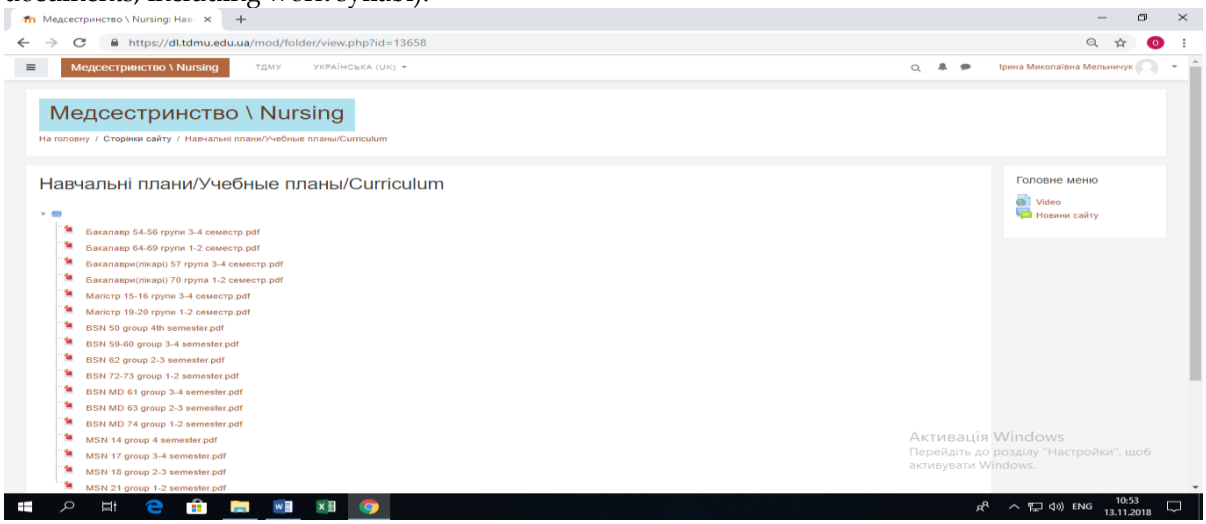


Figure 3. Example of the organizational character section, which includes educational plans for preparing foreign students in "Nursing" specialty

The second section has methodical and didactic character, which includes methodical recommendations and materials for students' preparing for each class, informational materials, video presentations etc. (Figure 4). The third section is aimed at the control of knowledge with a help of test tasks to determine the level of students' mastering of each theme.

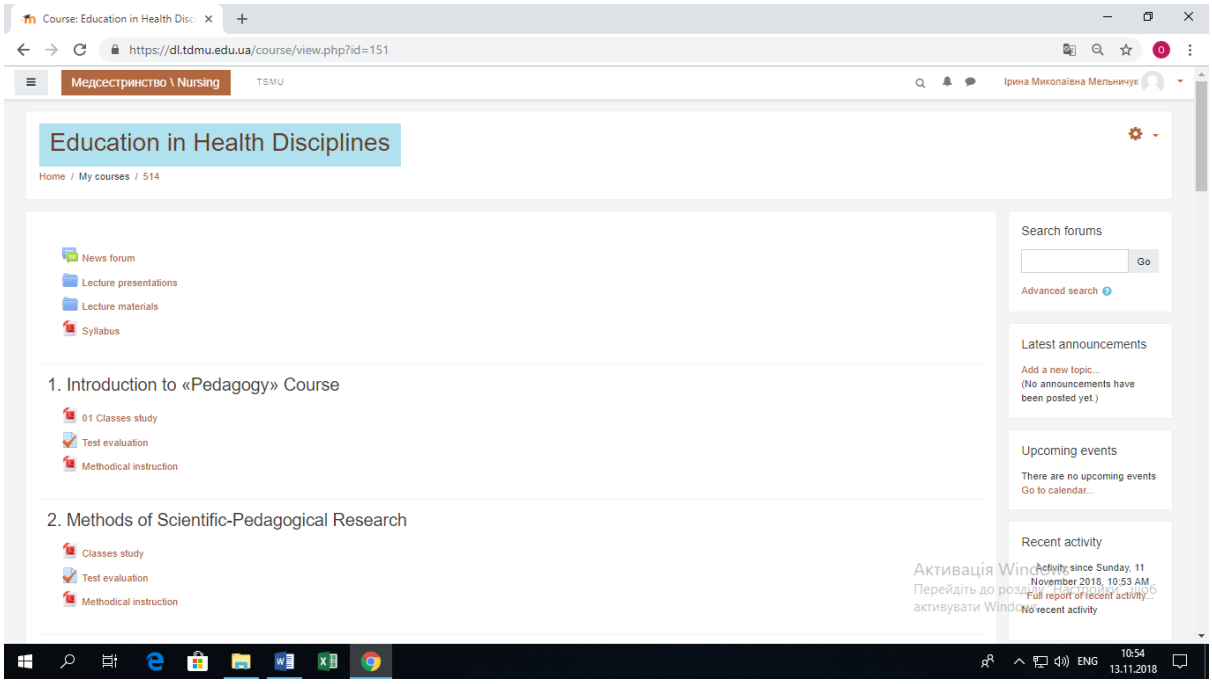


Figure 4. Example of methodical and didactic content of the "Education in Health Disciplines" course

The ESMC may contain electronic tutorials, studying manuals, references, methodical, audio and video materials, Internet informational resources, presentations etc. (Figure 5).

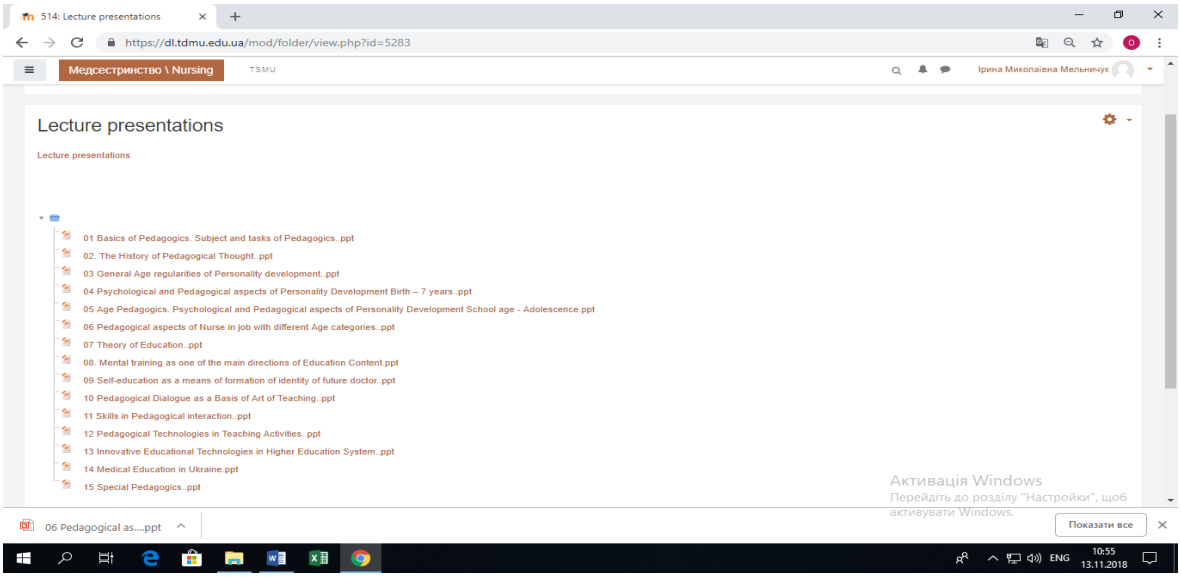


Figure 5. Example of video presentation materials for preparing students for lectures

4.2. Results of the distance learning form use in the process of training of future specialists in "Nursing" specialty.

After the successful use of distance learning in the process of future specialists' training in TSMU, the positive experience was also used by other institutions of higher education in Ukraine. As a result, the distance learning form in training foreigners as future specialists in "Nursing" specialty was introduced at such educational establishments as: Bukovinian State Medical University, Andrei Krupynsky Lviv Institute of Nursing and Laboratory Medicine, Zhytomyr Institute of Nursing, KROK University and others. Since 2018, the number of people who expressed a desire to get higher education distantly considerably increased. The confirming admission results in "Nursing" specialty at TSMU in 2018 are shown in Table 2.

***Table 2**. The number of students who started their studies in "Nursing" specialty at I. Horbachevsky Ternopil State Medical University in 2018*

Educational and qualification level		Form of study	Number of students who study in "Nursing" specialty			Percentage of the total number of students (%)		
			Total	Foreign citizens	Citizens of Ukraine	Total	Foreign citizens	Citizens of Ukraine
I	Bachelor's degree	full-time	84	84	-	16,0	16,0	-
		distance	279	235	44	53,0	44,6	8,4
	Total:		363	319	44	69,0	60,6	8,4
	Master's degree	full-time	30	13	17	5,7	2,5	3,2
		distance	133	37	96	25,3	7,0	18,3
	Total:		163	50	113	30,1	9,5	21,6
526	Grand total:	full-time	114	97	17	21,7	18,4	3,3
		distance	412	272	140	78,3	51,7	22,6

As you can see from data in Table 2, the number of students, who chose "Nursing" specialty is 526 persons (100%); 412 people (78,3 %) of them study distantly, and 114 persons (21,7 %) chose full-time form of study. Herewith, 363 students (69,0%) preferred getting the higher education at the first "Bachelor's" degree, while 163 students (30,1%) chose the second "Master's" degree. It is worth mentioning the fact that distance learning form also provides equal access to getting higher education for both citizens of Ukraine and foreign citizens. For example, 272 foreign citizens (51,7 %) have used the right to receive higher education distantly and 140 Ukrainian citizens (22,6 %), that is three and a half times more than on a full-time form of study. The main number of students, who study in "Nursing" specialty, chose distance learning for getting higher education (53,0 % – "Bachelor", 25,3 % – "Master"), at the same time the full-time education was chosen by three and five times fewer students (16,0 % and 5,7 % correspondingly). Thus, we observe a tendency towards increase of the number of future specialists in "Nursing" specialty, who choose distance form of study. This confirms attractiveness of distance form of study for both Ukrainian and foreign students.

6. Discussions and conclusion

1. According to the results of research, the possibilities of training future specialists in the "Nursing" specialty on the distance learning form have been determined. I. Horbachevsky Ternopil State Medical University is the institution of higher education was among the first to introduce distance learning form for foreign students training in "Nursing" specialty both of the first (Bachelor's) and the second (Master's) degrees. Qualitative distance learning is implemented through a MOODLE modular environment that provided a systematic presentation of the educational material in English, effective search for methodological and academic information, improvement of the self-education level.

2. The educational and methodological content of courses in the modular environment allows providing quality training of future specialists in "Nursing" specialty both for the citizens of Ukraine and for foreign citizens under the conditions of distance learning.

3. The introduction of distance learning form in foreign language in "Nursing" specialty in other medical establishments of higher education is a promising innovative form that enables a student to realize the right to higher education and form equal conditions for access to education in the modern informational society.

The directions of further researches include: study of international experience in implementing distance learning of future specialists in "Nursing" specialty in foreign languages; the methodology of

using modern informational technologies in medical institutions of higher education of Ukraine; ways of autonomization of distance learning in English and other languages at higher medical educational establishments; introduction of a systematic approach to solving the problems of implementing a person's right to higher education through distance learning, to adopt a clear national educational strategy in which the public benefit of such education would be recognized at the state level.

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Evaluation of the Strength of the Physiological Contraction of the Leg Muscles after the Rehabilitation of the Knee Joint Injury of the Volleyball Players

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Abstract

This study aims to measure the level of strength of the physiological contraction of the leg muscles one month after the rehabilitation of the knee joint injury for volleyball players.

A descriptive design (case study) was used among (59) volleyball players who age 17-19-years-old, one month after finishing the period of physiotherapy for moderate-intensity injuries at the Physiotherapy Hospital at Al-Qanat and Baghdad Teaching Hospital. Data were collected over six-month period. The fixed Dynamometer was used to measure the contraction of the leg muscles at the level of the knee joint from the lateral direction of the medial direction. The bottom of the leg from the area above the foot was stabilized with a loop and pulling the leg towards the thigh backward with stabilizing the left leg on the ground (the test is done by standing). The measurements were applied for six months for each player whose training ages in volleyball ranged from (2-4) years in high school, college, and some sport clubs in Baghdad City.

The researchers concluded that it is not possible to rely on the personal experience of the trainer in returning the volleyball players to the stadiums after rehabilitation of their injury unless there is a calendar based on the measurement of the objective devices, and that the weighted standard evaluation achieved (5) levels that can be used to as a parameter of evaluating the Knee joint injuries a month after the completion of rehabilitation programs.

Keywords: Key one: Strength of the Physiological Contraction, Key two: Knee Joint Injury, Key Three, Key four

1. Introduction

The physical and physiological measurement after the recovery of the muscles affected by training exercises or intense movements in competitions does not give an indication or a basis for judging the level of the injured player's condition for the purpose of returning him to the sports environment and giving him the tasks to meet the requirements of training or competition unless accompanied by an objective evaluation. In most of the third world countries, it is noted that there is a lack of physiological measurement of muscle after injury and its evaluation, that is, most trainers involve their players in games relying solely on personal experience which does not qualify most of them to make such written decisions which may lead to aggravating the damage in the muscular tissue after long time and effort in rehabilitation.

Therefore, the importance of evaluation in this regard is very important to address the study according to the determinants of the methodology of scientific research in the science of sports, as Sakarneh believes that "the evaluation is the process of judging that is not limited to quantification of phenomena as in the measurement but goes beyond that, where it refers to judging the value of these phenomena. Evaluation can describe a given phenomenon as excellent, good, or average. A general framework of strength and relationships can be used to come up with such a judgment. Often, there is a confusion between the concepts of measurement and evaluation, the measurement describes a quantitative description rather than the issuance of a given judgment. (2) "The rehabilitation is one of the most important and most effective means of treating various injuries," said Al-Kashif. "It helps to get rid of bloody congestion and accumulations and prevent bleeding that can occur in the joint, which helps to quickly restore muscles and joints to their functions in the shortest possible time." (5)

This opinion, which emphasizes the return of players to play in the shortest possible time may be due to profit motives against their full recovery. The injuries of the muscles of the volleyball players are not minor injuries that can risk the players after recovery, despite the difference in their intensity. Hameed and Fatima stated that "These involve all types of injuries that occur to the player during the exercise or sports competitions in local and international tournaments for many reasons, including (fractures of all types, wounds of all types, spasms, muscular ruptures, bruises, brain injuries, internal organs laceration, skin

injuries, tendon injuries, and other injuries).

These injuries result in (bleeding, various body injuries, disability, malformations, circulatory system, respiratory system, and death). Ligaments, muscles, and tendons come in first rank, followed by knee injuries. [3] Jari Ylinen states that "It is possible to divide the muscle injury into (muscle strain, muscle rupture, or muscular infiltration). According to the American Association for Sport Medicine, the muscular strain; anywhere in the muscle and its complimentary tendon, is considered as of third degree that sometimes occurs in the muscle itself, or in the origin of muscle fibers and when it is bound by bone, when it forms the muscular tendon, its meeting with it, or when merging this tendon with its osteoid place. Muscular ruptures occur either acutely or chronically. [10] Juergen Schaeffer adds that "often, the injuries of excessive effort are difficult to diagnose and treat. In most cases, the internal problem is an inflammation."[9]

Since the strength of the physiological contraction of muscles is a requirement for all athletes who continue their training as most of other training exercises depend on such a strength, it indicates the need to measure and correlate this measurement with the evaluation of the various injuries in volleyball. Such injuries hinder the safety and mechanics of this physiological contraction; regardless the causes or symptoms of these injuries. This; besides the lack of special parameters for volleyball players, which represents an objective evaluation of the reference that can be the normative evaluation to rely upon when returning the player calls for conducting this applied study to:

1 - To identify the measurement of the level of strength of the physiological contraction of the leg muscles one month after the rehabilitation of the knee joint injury of the volleyball players.

2 - To identify the evaluation of the level of strength of the physiological contraction of the leg muscles one month after the rehabilitation of the knee joint injury of the volleyball players.here is a general consensus that...

2. Method

A descriptive case study design was used to guide this study. Such a design involves an intensive exploration of a single unit of study, such as a person, family, group, community, or institution, or of a small number of subjects [12].

2.1. Participants

The particularity of the research problem imposed the identification of the research community to achieve the study objectives. The study sample included (58) volleyball players who age 17-19-years-old after finishing the period of physiotherapy for moderate injuries of one month. Those players were attending Physiotherapy Hospital at Al-Qanaat, and Baghdad Teaching Hospital, Baghdad City. The data were collected over six months. The researchers re-measured them for the strength of the leg muscles one-month after the completion of rehabilitation treatment. Study subjects experience injuries only for the right leg; those who have left leg injuries (n = 4) and those who experience severe injuries (n = 2) were excluded.

2.2. Procedure

The measurement devices included the muscle strength testing. These devices are characterized by high objectivity in measuring weight which is a constant device (Dynamometer) to measure the contraction of the muscles of the leg at the knee joint toward lateral to the medial side. The measurement was accomplished by stabilizing the bottom of the leg from the area above the foot with a ring and pulling the leg towards the thigh backward with the left foot on the ground (test is done from the standing position).

The measurements were applied for six months after obtaining the written consent from each patient, whose training ages ranged from (2-4) years in high school, colleges, and some sport clubs in Baghdad City. This is a common injury that occurs on the decline in the performance of skills that depend on the vertical jump, lateral jump, and defense of the stadium. Furthermore, it occurs when the players are not strong enough to perform these movements; especially as women's sports participation is weak and limited at the local level in Iraq. After collecting the results for each case of players after their rehabilitation, the researchers used the statistical package for social science (SPSS) to manage the study results to derive the criteria required for the strength of the physiological contraction through which can count on the assessment of player's condition in order to bring her back to the sports environment.

3. Results

As shown in Table 1, the mean scores of experimental and control groups are nearly the same, indicating equality of two groups regarding their knowledge of targeted structures.

Table 1. *Raw and standard modified ascendingly assorted grades for the test of the strength of physiological contraction of leg muscles (N = 58)*

ist	Raw Grade	Standard Grade	Adjusted Standard Grade	ist	Raw Grade	Standard Grade	Adjusted Standard Grade
.	12	-1.58679	34.13	0.	20	-.13744	48.63
.	12	-1.58679	34.13	1.	20	-.13744	48.63
.	12	-1.58679	34.13	2.	20	-.13744	48.63
.	14	-1.22446	37.76	3.	20	-.13744	48.63
.	15	-1.04329	39.57	4.	20	-.13744	48.63
.	15	-1.04329	39.57	5.	20	-.13744	48.63
.	15	-1.04329	39.57	6.	22	.2249	52.25
.	15	-1.04329	39.57	7.	22	.2249	52.25
.	15	-1.04329	39.57	8.	22	.2249	52.25
0.	15	-1.04329	39.57	9.	22	.2249	52.25
1.	17	-.68095	43.19	0.	23	0.40607	54.06
2.	17	-.68095	43.19	1.	23	.40607	54.06
3.	17	-.68095	43.19	2.	24	.58724	55.87
4.	17	-.68095	43.19	3.	24	.58724	55.87
	17	-	43.19		24	.587	55.87

5.		.68095		4.		24	
6.	17	-.68095	43.19	5.	24	.58724	55.87
7.	17	-.68095	43.19	6.	24	.58724	55.87
8.	17	-.68095	43.19	7.	25	.76841	57.68
9.	17	-.68095	43.19	8.	26	.94958	59.5
0.	18	-.49978	45	9.	27	1.13075	61.31
1.	18	-.49978	45	0.	27	1.13075	61.31
2.	18	-.49978	45	1.	30	1.67426	66.74
3.	18	-.49978	45	2.	30	1.67426	66.74
4.	18	-.49978	45	3.	30	1.67426	66.74
5.	18	-.49978	45	4.	30	1.67426	66.74
6.	18	-.49978	45	5.	30	1.67426	66.74
7.	19	-.31861	46.81	6.	33	2.21776	72.18
8.	19	-.31861	46.81	7.	33	2.21776	72.18
9.	19	-.31861	46.81	8.	33	2.21776	72.18

***Table 2**. Standard Levels for the test of physiological strength of the leg muscles (N = 58)*

Ranges of Raw Grades (kg)	Standard Grade	Adjusted Standard Grade	Frequency	Percent	Standard Level
≤ 11	≤ -2	≤ 29	0	0.0%	Very poor
12-16	(-1.99) – (-1)	30-39	10	17.241%	Poor
17-20	(-0.99) – (0)	40-49	25	43.103%	Fair
22-26	0.01-1	50-59	13	22.414%	Average
27-30	1.01-2	60-69	7	12.069%	Good
≥ 33	≥ 2.01	≥ 70	3	5.172%	Very good

5. Discussion and Conclusion

According to the results of the tables of statistical treatments, there are five criteria that can be counted when evaluating the restoration of the recovery of the knee one month after rehabilitation, and these results at the same time give an indication of the lack of rehabilitation programs used in the centers and units of physiotherapy; specifically, towards athletes. Despite their service to the general public, athletes are in need of a kind of rehabilitation that enables them to practice without the risk of poor rehabilitation. On the other

hand, this evaluation allows the field trainers to recognize the condition of the female athletes after their recovery and how to adjust the training loads to fit the muscle strength produced by the leg muscles through evaluating them using the results of this study. The researchers attribute the difference in the values derived from the measurement that led to the emergence of variance in frequencies within the five levels to factors that may be related to the different lifestyle of each athlete. Furthermore, such variance could be attributed to the type of food intake as well as continued medical guidance received from the rehabilitation centers with restrictions to help them to continue recovery. Moreover, not wearing muscle after their rehabilitation in the month duration between the completion of the medical program and the direct measurement, which the dynameter device demonstrated its results, which is available and easy to use by the trainers and they can also use it indoor halls in the training sessions for volleyball.

Mohammed and Mohammed state that "There is a need to transform the raw grades to standard raw grades to achieve the criteria. It is well-known that the criteria are one of the key objectives that the process of adjusting the tests where the criteria are derived from the adjustment sample that represents the studied research society. The raw grade is the original result derived from the application of tests before being statistically treated which are the source of criteria [6].

Nawal and Fatima state that "Power is used as a preventive treatment against deformities and physical defects as the power is related to the physiological maturity and human vital functions," [8].

Sami pointed out that "the role of therapeutic exercises in the rehabilitation and treatment of arthritis as they work to reorganize the work of some organs or devices that are affected during the injury through the automatically resuming the work of the internal organs and the regulation of the work of the autonomic nervous work to fit with the functionality of the body by regulating the hormones secretion and metabolism. " [1]

Aed and Hussain think that the normal function of the muscle after recovery "The arrival of the impulse as the terminals release acetylcholin, which is considered as the specialized nerve link between the end of the nerve and the muscular fiber (musculofiber junction) who linked in the sarcolema with the acetylcholine receptors.

This causes the opening of the sodium channels and leads to the flow of sodium down the tendency of the concentration to the muscle fiber, leading to the depolarization of the membrane. Thus, the effect of the impulse applies along the length of the muscle sarcolema in both directions and below the membranous links. It also leads to the complete shrinkage of myocardial fiber. Sending the impulse to the sites where the membranous bonds are adjacent to the sarcoplasmic network (the father) where the latter delays the release of calcium (calcium ion temporarily) and release the sarcoplasm where calcium concentration rises above 10 µM, This allows to form cross bridges in order to begin as described previously. The active calcium pump continuously returns calcium to the sarcoplasmic network (usually within about 30 ms). When the concentration of calcium in the sarcoplasm becomes very low, turbomycin is inhibited again, and this sequence of events is repeated when another neurotransmitter reaches the motor terminals.

When the rush of frequency is high, calcium ions continue to release from the sarcoplasmic network and calcium concentration in the sarcoplasm surrounds the capillaries too much. In this case, the muscle fibers are not fully relaxed between the stimulation and the successive contraction will be stronger and more stable (to some extent) until the stimulation stops. "[4]

The strength of the muscle and the severity of its contraction according to the material, its weight, shape, and size, which is intended to be lifted or transferred or form of motor performance. The movement on heavy weight is better when the speed of contraction up to (30%) of the maximum speed. Furthermore, weight bearing in both hands will be easier to carry with one hand, and the lifting of any body from standing is different from sitting position. [11]

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Interactive Methods of Teaching English for Specific Purposes to Future Border Guard Officers

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Abstract

The article deals with the interactive methods of teaching English for specific purposes to future border guard officers. The aim of the article is to track and validate the influence of interactive methods on the effectiveness of teaching English to future border guard officers. The use of interactive methods of teaching during the English lessons have enabled cadets to develop their speaking skills, eliminate communicative barriers so they can carry out their future professional activities efficiently in the process of dealing with travelers or irregular migrants on the border. Our hypothesis is that interactive methods contribute to development of cadets' English communicative abilities on the basis of problem solving activities that was verified by the experiment which was conducted in May 2018 in the form of a sociological survey of the fourth year cadets (98 people) of the faculty "Security and Protection of the State Border" at the National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi. The analysis of the respondents' answers confirmed cadets' persuasion that only active learning of English in a non-English-speaking setting is very important to experience real communicative situations in which they learn to express their own views and attitudes. Analysis of the results of graduation examinations of future border guard officers has shown that due to the use of the interactive methods of teaching the discipline "English for Specific Purposes" in the educational process of the Academy, both the quality of knowledge and average academic score of cadets have increased. The result of the experiment: the quality of knowledge of future border guard officers taking final examination on the above-mentioned discipline has increased by 5.85%, (from 63.54% to 69.39%). According to the results of the examination of the cadets who studied using interactive methods of teaching, the average academic score has also risen: (from 3.78 to 3.89). It is concluded that instructors need to encourage the educational motivation of cadets to expand their professional English, as a significant part of respondents are aware of the prospects that knowledge of English may develop professionally significant skills.

Keywords: Interactive methods of teaching, English for Specific Purposes,,Future border guard officers.

1. Introduction

New historical conditions require a significant positive change in the level of English of officers of the State Border Guard Service of Ukraine (SBGSU). On the border, the first impression of representatives of foreign countries about Ukrainians is formed based on their communication with a border guard. Thus, the border guards' professional foreign language communication is often a benchmark for assessing the country as a whole. With the expansion of international military cooperation between Ukraine and other states, the growth of the number of international contacts, peacekeeping missions, the cooperation of representatives of the SBGSU with international organizations such as: Organization for Security and Co-operation in Europe, North Atlantic Treaty Organization, International Organization for Migration, European Union Border Assistance Mission to Moldova and Ukraine, Frontex (The European Border and Coast Guard Agency) it is necessary for the border guards to master the ability of intercultural communication, to broaden their knowledge that will help to prevent illegal migration and smuggling in accordance with European standards.

In the future border guards' training process a variety of different methods, technologies and tools are being used. The main methods of teaching English and modern methodological techniques to train the personnel of SBGSU are: Interactive Learning; Learner-Centred Learning; Cooperative Learning; Content-Based Learning; Task-Based Learning. Interactive classes are designed on the assumption that without practical application, cadets often fail to comprehend the depths of the training material. Whereas cadets often lose interest during lecture-style teaching, interactive teaching styles promote atmosphere of attention and participation.

7. Literature Review

Interactive methods include cooperation between students who influence each other in a dialogue or conversation. Thus, these methods provide interaction between not only students and the teacher but also with each other, which requires an active role of students in the learning process (E. Kaminskaya, 2016). According to O. Pometun interactive learning involves the organization of educational process by the instructor with a certain system of methods, techniques that are based on the subject-subject relations between the instructor and the student, multilateral communication, constructing knowledge, using self-assessment and reverse communication, constant student activity (O. Pometun, 2007). Such student-centred methods are highly appropriate, particularly for involving students more actively in acquiring knowledge, skills and strategies (P. Westwood, 2008).

Other scholars, namely (I. Bloshchynskyi, O. Halus, I. Pochekalin, and D. Taushan, 2018) described the use of electronic educational and methodological software packages for improving the preparation of the cadets of Bogdan Khmelnytskyi National Academy of the State Border Guard Service of Ukraine, specializing in "Philology" (humanities branch) for the first (Bachelor's) level of higher education for final examinations on such disciplines as "Operational-service application and management of the actions of state border guard units" and "Major foreign language". The significance of information and communication technologies usage by future border guard officers during the foreign language professional training for state examinations was revealed in the study of I. Bloshchynskyi (I. Bloshchynskyi, 2017).

However, despite the necessity of the English language knowledge for cadets, the problems associated with the broad use of English by border guard officers while performing their service duties remain unresolved. This indicates a shortage of research on this issue. Therefore, we intend to use the in-depth study of this problem to track and test how interactive methods of teaching English for specific purposes improve the cadets' use of English for their future professional activities.

8. Method

The following methods were applied to conduct the research: theoretical – analysis, comparison, generalization, systematization of scientific works in order to find out the state of development of the research problem, specification of essence, content and peculiarities of core points of research; empirical – questionnaire, testing, interviewing, discussion, observance, pedagogical experiment – to check the results of the educational process with the suggested methods applied, mathematical statistic – quantity and quality analysis of the research results.

3.1. Participants

The problem of teaching English effectively exists in each institution of higher education in Ukraine. Therefore, we carried out a thorough research in the natural environment of participants in the educational process on the basis of the National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi (NASBGSU) in 2017-2018. We conducted a sociological survey of the fourth year cadets (98 people) in May, 2018. Four groups (241, 242, 243 and 244) took part in the experiment. They were studying on the speciality 6.160104 "Security and Protection of the State Border" at the bachelor level of higher education. One group (241) was experimental; the suggested set of methods was applied in the educational process to teach cadets the discipline "English for Specific Purposes". The other three groups (242, 243, and 244) studied according to the current curriculum. This allowed us to obtain statistical data to confirm or refute our hypothesis about the practical significance of methods of teaching English for Specific Purposes.

3.2. Materials

The results obtained after analyzing the responses of cadets' survey confirmed that the most effective method to start a topic discussion as a warming up activity is *"Brainstorming"*. The future border guard officers will be able to apply this method in the process of joint work with customs officers when it is necessary to make a general decision or to generate a new idea. The members of each group come up with their ideas. Upon completion of the brainstorming, the group members discuss the suggested ideas, selecting the most rational from the point of view of the majority of participants. Based on selected and grounded group ideas during further discussions, participants from different groups make a joint decision. The benefits of brainstorming are ensuring the equal participation of each member of the group

in discussing the problem and suggested ideas, the same performance at all stages of the decision-making process. The disadvantages include the possibility of dominance in the decision-making process of the most active members of the group, the probability of focusing on the same type of ideas, the limited time of conducting.

Vocabulary, as the core of learning English must be taught clearly and interestingly. Instructors have a very important role in creating an effective strategy in helping cadets to master the vocabulary. They need to guide the cadets by finding and using a fun strategy in learning vocabulary in order to make the cadets more capable in English. The instructor can use game as an activity for cadets in learning a language, especially for learning vocabulary. One of the activities that can be used by the instructor in teaching vocabulary is "Bingo Game". This game is entertaining and interesting; besides this game also makes the vocabularies last longer in the cadets' mind. The suggested lexical material is successfully learnt by cadets on the topic of "Assisting Travelers. Border Crossing Rules and Procedures" by playing the following game (see Table 1, 2).

Activity: Bingo Game. Instructions: 1. Fill in the blank card with the 16 words below, in any order. 2. Your instructor will read the definitions for each word. Cover the word that matches the definition. 3. The first cadet to cover a horizontal, vertical, or diagonal line or 4 corners will shout "Bingo!" If all the words are guessed right, they win the game.

Table 1. *Example of the interactive method "Bingo Game" of teaching English for specific purposes to future border guard officers*

valid	embassy	form	luggage
individual	smuggling	duty	vehicle
ferry	procedure	value	exceed
border crossing point	briefcase	issue	suitcase

Activity: Sorting. Instructions: 1. Work in small groups. 2. Is the information in a passport or not? Divide the words into 2 columns and write in your chart.

Table 2. *Example of the interactive method "Sorting" of teaching English for specific purposes to future border guard officers*

Date of birth	Name	Shoe size	Date of Issue
Sex	Age	Marital Status	Nationality
Weight	Maiden Name	Address	Date of expiration
Amendments	Place of Issue	Place of birth	Citizenship
Blood Type	Height	Given name	Passport Number
Number of children	Eye color	Signature	Former Names
in a passport		not in a passport	
1……		1……	
2……		2……	
3……		3……	

Instructors have to master the strategies to create a fun atmosphere in learning and teaching process, finding the way to make cadets fully involved in the learning process. It is because cadets need an external motivation and supporting environment to learn. That is why the instructors have an important role to make cadets interested in learning English. Vocabulary has a function to make cadets structure the ideas and argument, both orally and in writing.

On the basis of survey, the cadets chose the method of "*Projects*" as the most interesting and effective among others. It is a complex method of training that includes a set of research, search and problem methods that are creative. The use of this method allows constructing an educational process taking into account the interests of future border guard officers, enabling them to demonstrate their independence in educational activities.

Our studies have shown that the effective and intensive method that also brings tangible results is "Communicative Learning". The following forms of work were mostly used during the educational process: individual, pair, group and teamwork.

Activity: Mini Presentations. This activity will probably take most of the class hour. Cadets may also do preparations for homework. Instructions: 1. Get into pairs. You will make a short presentation to the class on how to deal with irregular migrants asking for asylum. In your presentation, outline the following issues: steps you will take when the irregular migrant (asylum seeker) arrives; a list of questions you will ask about the illegal border crossing; a list of clear instructions you will give him. Make a small poster or visual aids to go with your presentation.

The questionnaire survey that was conducted with the cadets of the 4th year of studying showed that a "*Case method*" is very effective especially during self-preparation hours. This method allows bringing the process of learning closer to the practical activities of border guards. It promotes the development of ingenuity, the ability to solve problems, develops the ability to analyze problems, communicate in a foreign language. Case is a description of a real service situation that is used as a pedagogical tool to provoke a discussion in the classroom. The advantage of case studies is the ability to combine theory and practice that is extremely important in teaching of English. The "*Case method*" helps cadets to understand the topic more deeply, develop the imagination, get additional information, apply and develop analytical and strategic thinking, provide the ability to solve problems and make rational conclusions, and develop communication skills. The use of this technology also allows us to diversify the cadets' self-preparation work making it meaningful, interesting and effective. Future border guards study a case beforehand involving the materials of lecture courses and other sources of information. Auditory element of the Case method is a detailed discussion of the content, while the role of the instructor is to monitor and manage the discussion of subjects of learning. When dealing with a case, the future border guard officers use not only the acquired knowledge, but also show their personal qualities, including the ability to work in a group.

Communicative situations for making the dialogue about activities of border guards during service activities. Instructions: 1. Work in groups of three. Read the situations and discuss them in groups. Decide if the traveler can enter Ukraine or not. Explain why or why not. Then report to the class. If the decision is «no», give a reason. (see Table 3).

Table 3. *Example of the "Case method" of teaching English for specific purposes to future border guard officers*

№	**Situations**
	A person arrives in Ukraine on the «Los Angeles – Kyiv» flight. He is an Israeli citizen, but is a permanent resident of the US. He has a valid passport with him.
	A Norwegian citizen arrives at the Hungarian/Ukrainian border by car. During the first-line check, it is found that one page in his passport is missing. The passport is invalid now because of technical damage.
	A family from Ireland arrives at Boryspil airport. They present valid travel documents and papers justifying the purpose of their visit, tourism. They do not have a visa.
	A citizen from Bulgaria arrives at the Polish-Ukrainian border by train. He has a valid service passport, a return ticket, and an official letter of invitation for an international medical conference. He does not have a Ukrainian visa.

"*Pair work*" is often used while learning English for special purposes when cadets learn to ask and answer the questions to each other. It is important to create a process of real situational communication; to simulate such a professional situation to provoke their wish to say something, share their life experiences or views. Activity: Information Exchange. Instructions: 1. Find a partner. Your instructor will give you an example of a visa. 2. Fill out the chart with the information found on your visa. 3. In a class plenary, share the information from your visa orally with your classmates (Ex: "What's the name on your visa? " "It's…"). 4. Fill in the blanks with the information they give you. 5. When you finish filling out the charts, pass around the visas and make corrections (see Table 4).

Table 4. *Example of the interactive method "Pair work" of teaching English for specific purposes to future border guard officers*

Ty	Surn	N	Pla	Num	D	Pass	S	V	V	Nation

pe of vis a	ame	a m e	ce of issu e	ber of entri es	O B	port num ber	e x	al id fr o m	al id u nt il	ality

"Think, pair, share" is a cooperative learning activity in which cadets consider questions using three distinct steps, encouraging individual participation. This is an excellent method for promoting critical thinking and articulate communication in the classroom. Cadets think through questions using three steps - Think: cadets think independently about the question that has been posed, forming ideas of their own; Pair: cadets are grouped in pairs to discuss their thoughts; Share: the pairs share their ideas with a larger group, such as the whole class.

Researchers have found that students' learning is enhanced when they have many opportunities to elaborate on ideas through talk (*Pressley 1992*). The "Think, pair, share" strategy increases the kinds of personal communications that are necessary for students to internally process, organize, and retain ideas (*Pimm 1987*). By sharing their ideas, students take control of their learning and negotiate meanings rather than rely solely on the teacher's authority (*Cobb et al. 1991*). "Think-pair-share. Instructions": 1.What documents do people need to cross the border? Think about traveling by car, plane, train, etc. Make a list. 2. Compare your list with a partner. Make one complete list together. 3. Share your list with the class.

The following techniques are used to create *"Problem situations"*: the cadet gets to know the different interpretations of a certain phenomenon, fact, etc.; the cadet faces the new practical aspects of the acquired knowledge implementation; the contradiction between the theoretically possible way of solving the problem and the practically achieved result of the task.

Developing speaking skills can be organized in the form of different kinds of discussions. Both partners in the discussion should be good at listening so that a question-and-answer sequence develops into a conversation. Since foreign language teaching should help cadets acquire communicative skills in the foreign language, all situations in which real communication occurs naturally have to be taken advantage of. Of course, talking about something which affects cadets personally is motivating. Learning is more effective if the learners are actively involved in the process. The degree of learner's activity depends on the type of material they are working on. The cadets' curiosity can be aroused by texts or pictures containing discrepancies, mistakes, or missing information. Discussions help cadets think independently, defend own views, develop the ability to analyze and ground statements, respect the opinions of others.

A "Buzz groups" method is used to discuss a problem in small groups for a few minutes before views or solutions are reported to the whole class. This method is relevant and effective during the practice of contradictory situations between a border guard and the traveler at the lesson while studying the discipline "English for Specific Purposes" (topic "The State Border Guard Service of Ukraine") with the aim to study the necessary lexical material, mastering the extralinguistic factors, background knowledge, practice the appropriate behavior of border guards. Cadets discuss the following situations: a traveler lost the baggage with his/her documents; a foreigner does not have a visa or enough money to stay in Ukraine; foreigners rented a car in Poland but their rental agreement does not allow them to leave the EU.

Activity: "Hide and Seek". Instructions: 1. Find a partner. One of you is A and one of you is B. Person A: Choose one of the following objects: a handgun, a case of vodka, a carton of cigarettes, 200 grams of hash, a homemade bomb, or something of your choice. Hide the object somewhere in your car and write down where you put it (but don't show your partner). Person B: You are a border guard officer working at a border crossing point. You stop a car and you think the person has something illegal in his car. Try to find the object. Ask the person questions to find the object. When you are finished, change roles.

The "Fishbowl" method involves all the members of the group. They sit in a big circle. There are five chairs in the middle of the circle. Three are occupied by cadets whose views (preferably controversial) on the topic or question are known beforehand. These three start the discussion. They may be joined by one or two cadets presenting yet another view. Cadets from outer circle may also replace

speakers in the inner circle by tapping them on the shoulder if they feel confident that they can present the case better.

Activity: Circle Talk. Instructions: 1. Stand up and make two concentric circles. Each inner-circle cadet is facing an outer-circle partner. 2. The inner-circle cadets speak first. Introduce yourself to your partner. Their outer-circle partners respond. 3. At the instructor's signal (clapping hands works very well), all inner-circle cadets move one place to their right and have a talk with a new partner. 4. Continue the activity with new partners each time. 5. Repeat the activity with the outer circle cadets moving and introducing themselves. The future border guard officers discuss the following situations trying to get consensus for solution of problems that can happen on the border during the passport control. The cadets try to make a decision as for the allowing or forbidding the foreign travelers to cross the State border of Ukraine. Such communicative situations are worth discussing: 1) the foreigner came to Ukraine from New York. He is a citizen of Egypt. He has a passport but no visa; 2) the citizen of Belgium arrives in Ukraine by car. During the first line check, it was revealed that one page is missing in the passport.

While applying the "Network" method the group is divided into subgroups which should not have more than 10 cadets each. Each subgroup receives a ball of string. Whoever is speaking on the topic holds the ball string. When the speaker has finished he gives the ball of string to the next speaker, but holds on to the string. Thus, a web of string develops, showing who talked the most and who the least. The instructor can suggest different topics for discussion that are related to the future professional activity: the problem of illegal migration, the reasons of illegal migration in Ukraine, necessary measures to combat illegal migration in Ukraine.

The "Role play" method helps to simulate the reality and gives the participants a possibility to act like in a real situation. Activity: Dialogue Sequencing. Instructions: 1. Get with a partner. Put the dialogues in order. Write a number 1 in the box for the first line, a 2 for the second line, etc. 2. When you are finished, read the dialogues with your partner.

Dialogue 1

- ☐ Alright then. Welcome to Ukraine.
- ☐ And your visa?
- ☐ Are you carrying any controlled substances into the country?
- ☐ At Ukrainian Embassy in Beijing.
- ☐ Good morning, sir. Can I see your passport, please?
- ☐ Hello. Here you are.
- ☐ I was in Poland.
- ☐ In Warsaw.
- ☐ No.
- ☐ Visiting my brother.
- ☐ What country did you visit before coming to Ukraine?
- ☐ What were you doing in China?
- ☐ Where did you get this passport?

According to the "Onion" method, the group is divided into two equal subgroups. They are arranged in a double circle, sitting on the chairs in the outer circle facing inwards and those of the inner circle sit facing cadets in the outer circle. After a few minutes of discussion, all the cadets in the outer circle move on one chair and now have a new partner to continue with. The instructor suggests discussing certain topics, defining those that are safe for discussion with other border guards during such events as conferences, trainings, symposiums, joint exercises, etc. The cadets get the tasks to meet the counterpart during the conference, have a small talk on different topics.

In the "Star" method four to six small groups try and find a common view or solution to a problem. Each group elects a speaker who remains in the group but enters into discussion with the speakers of the other groups. The instructor suggests problem situations for discussion, the cadets try to think over and discuss the following problems in groups using the extralinguistic knowledge concerning the border guards' behavior and smuggling activities on the border. This method enables cadets to consider the problem in detail and to prevent negative situations during service activities. These are the possible topics of discussion: stressful situations on the border, border guards' behavior during stressful situations, the ways to detect smuggling goods and illegal migrants.

The "Market" method means that all the cadets walk around the room; every cadet talks to several

other peers. The instructor organizes the discussion on the relevant problem situations that can occur between a border guard and a traveler. During the discussion, the cadets express their ideas concerning prevention of problems on the border and the ways to solve them. They comment on verbal and non-verbal behavior of the border guard, define the necessary background knowledge for solving the conflict or dispute on the border. It is appropriate to discuss the following topics: 1) possible hiding places of smuggled goods, smugglers' behavior; 2) do's and don'ts during the inspection of a vehicle, plane, and train to detect smuggled goods.

Activity: Class Survey. Instructions: Walk around the classroom. Ask questions and write down your classmates' responses in the chart below (see Table 5).

***Table 5**. Example of the "Market" interactive method of teaching English for specific purposes to future border guard officers*

Name	Rank	Place of service	Position	Length of service	Present job	Service duties

The "Carousel" method is a variant of cooperative training. This method is effective at simultaneously involving all participants in active work with various partners, for communication and discussion of controversial issues.

Activity: Sequencing. Instructions: 1. Get together with a partner. 2. Your instructor will give you 9 sentences. 3. Put them in order to make a complete text. Look up any words you do not know:

- ☐ A border guard will ask them about the purpose of their visit and some additional questions about the details of the trip
- ☐ After passport control, the traveler must pass through customs
- ☐ The stamp shows the date and place of the border crossing
- ☐ Customs officers have the right to inspect any baggage to check that the value of goods is within the duty-free limit
- ☐ If the total is more than 350 euros, foreigners need to pay customs duties
- ☐ First, they should fill out an immigration card, a customs declaration, and have their passport and visa checked
- ☐ Then the officer will stamp their passports and immigration cards
- ☐ There they are asked about what they are bringing into the country
- ☐ All visitors to our country must enter Ukraine through an international border crossing point

Activity: Spot-the-Differences. Instructions: 1. Read the text again. Work in pairs and make a list of the differences between crossing the border by air and by train. 2. Share your list with the class.

Activity: Pair Summaries. Instructions: 1. Get with a new partner. Person A will read the first paragraph from the text. Person B will read the second paragraph. 2. Cover your paragraph and tell your partner what it is about.

The "Microphone" method is a group discussion that provides an opportunity for each cadet to learn something quickly by answering the questions, expressing their opinions or views.

Activity: Story-Telling. Instructions: 1. Work in small groups. Put all of the information from the lesson together to create the irregular migrant's story. Who is he? Where did he come from? How did he get from his country to Ukraine? Who helped him? 2. One person in the group will make notes of your story. 3. Then one cadet will present the group's story to the class. 4. Vote for the best story.

The "Press" method can be used at different levels of speech competence for mastering lexical cliché. The discussion needs a high level of foreign language proficiency.

Activity: Silent Viewing. Instructions: 1. You will watch a part of the movie "The Terminal." The sound will be turned off. The volume should be turned down/off when cadets are watching the clip. 2. With a partner, create a conversation between the official and the traveler. Cadets may write their conversations down on paper. If time is limited, they may role-play in their seats. Choose one or two

groups to present to the class. They can role-play while the video is playing (sound off). 3. Watch the video with sound and compare your conversations with the real one. How are yours different? Follow-up with a discussion of vocabulary: *walnuts, cocaine, smuggling, wedding ring, divorced, to handcuff*.

The "Mind Mapping" method was first developed by Tony Buzan. It is a map with a central image, main themes radiating from the central image, branches with key images and words. It enables a learner to draw the information in diagrams instead of writing it in sentences, makes it possible to compress vast amount of information on a single page, thus making it easy for the students to refresh the information just by a glance (*M. Sachou, 2013*). This technique makes complex text simpler improving self-learning. The use of attractive colours, pictures and flowcharts capture the interest of students bringing about enthusiasm in the classroom. The mind mapping technique is suitable for remembering things better than the routine way of reading texts. The study reveals that the use of mind mapping technique in language teaching gives cadets the possibility to take active role, while an instructor becomes a facilitator and a coordinator. The results of the study testify that mind maps are useful for solving problems, brainstorming the ideas, learning new vocabulary, taking notes, improving reading skills and preparing presentations.

The "Problem-solving" method encourages discussions of the importance and relevance of statements, ideas or procedures. It demands that the learners themselves decide upon the items to be ranked. The cadets need to make suggestions, give reasons, and accept, modify or reject suggestions and reasons given by others. These are the examples of problem solving activities that were the most efficient during the educational process while studying the topic "Checking Travelers' Documents", "Working with Irregular Migrants. Daily Schedule in a Temporary Holding Facility (THF)".

Activity: Sorting. Instructions: What can irregular migrants do in a THF? Use the expressions to fill out the chart.

Activity: Listing. Instructions: 1. Get into groups of 2-3 cadets. Make a list of do's and don'ts for a border guard who will search a vehicle. 2. Present your ideas to the other groups. 3. Vote on the best list.

Whatever method is chosen, the instructor should be careful not to correct cadets' errors too frequently. Being interrupted and corrected makes the cadets hesitant and insecure in their speech when they should be practicing communication. It seems far better for the instructor to use the activities for observation and to help only when assistance is demanded by the cadets themselves; even then they should be encouraged to overcome their difficulties by finding alternative ways of expressing what they want to say.

3.3. Procedure

Upon completion of the discipline "English for Specific Purposes", the cadets must know: lexical material on topics that have been learnt; grammar material defined by the curriculum; border guard terminology; speech patterns for professional communication. The cadets must be able to read and translate the texts in their field of specialty; to conduct a conversation on professional topics in a foreign language; to understand the information concerning the performance of professional duties; to render the articles on the border guard topics from Ukrainian into English; to make decisions in the service situations that may arise during performing the service duties and require knowledge of the foreign language.

Testing is conducted to verify the level of proficiency in lexical and grammatical material and is based on the topics that were studied throughout the course. The test is based on the principle of choice of the correct answer from the four suggested options (multiple choice). The task is considered to be fulfilled if the cadet chose the correct answer and marked it in the answer sheet. The task is considered not to be fulfilled in cases if: a) the wrong answer is indicated; b) two or more answers are indicated, even if there is a correct option among them; c) none of the answer options is selected. The test includes 25 lexical and grammatical tasks aimed at verifying knowledge of professionally oriented vocabulary and grammar material and their practical use.

English language tests include lexical and grammar material on the following topics: "Border Guard Service", "Checkpoint Service and Document examination", "Duties of the Border Crossing Point officer", "Border control", "Documents for the right to cross the state border of Ukraine", "General information about passports", "Visa problems", "Detention and identification", "Interviewing of people crossing the state border".

Text rendering. Oral rendering of a text is conducted to test the skills and abilities of summarizing the content of the text, while preserving its most important parts in English. It takes into account the content, as well as the lexical, grammatical and stylistic features of the rendered abstract of the text. The first stage of work on rendering of the article is careful reading of the text, its distribution into semantic fragments, definition of the topic and the main idea of the text. The topic is usually reflected in the title and is disclosed in the text. The main idea is a general idea that was defined when reading a text.

While breaking a text into semantic fragments, paragraphs can provide considerable help. The frame of the paragraph and the semantic fragment often coincide. Semantic fragments are highlighted in the text or written in a short form. The second stage of rendering is the unification of semantic fragments and the definition of the logical structure of the text. This means that the semantic fragments are given certain ranks and they are placed in the order of their importance. The content of the article for rendering should be presented in chronological order. The third stage is the final design of rendered article on the border guard topic.

Oral reports on the actions of the border guard officer in the service situation and making of a list of questions in accordance with the problem situation. Service situations are developed according to the topics studied throughout the course. The topics of service situations are the following: "Border Crossing Point", "At the highway BCP", "At the maritime BCP", "BCP at the airport", "Border control", "Documents for the right to cross the state border of Ukraine", "General information about passport documents", "Types of passports", "Visa problems".

Oral report about the activities of the border guard officer in the service situation. A monologue is based on the suggested service situation and is conducted to test the English skills of the cadet to explain the actions of the border guard officer while performing his professional duties. Understanding of the service situation, the use of the appropriate lexical material, grammatical constructions, as well as the ability to make a specific decision in the current situation are taken into account. The examinee must provide solution to the problem and ground own decisions in accordance with the current legislation of Ukraine, regulations and treaties, requirements of international law and standards of the SBGSU.

One of the tasks for the final test is to make a list of questions in accordance with the suggested problem situation. The interviewing according to the suggested service situation is carried out in order to test the skills of conducting interviews of a border violator in English in a situation that may occur during the performance of service duties. The instructors check the cadets' answers in terms of their appropriate lexical material, proper grammar constructions and correspondence of the list of questions to the suggested situation. The cadet must make a list of questions for a certain category of foreigners (for people who cross the state border of Ukraine, violators of border crossing legislation, illegal migrants, etc.) in accordance with the current legislation of Ukraine, regulations and treaties, requirements of international law, and standards of the SBGSU.

9. Results

The final exam was conducted with the cadets of the faculty "Security and Protection of the State Border" who were studying on the specialty 6.160104 "Security and Protection of the State Border" for the preparation of the bachelor level of higher education (241, 242, 243 and 244 training groups) at the NASBGSU on the discipline "English for Specific Purposes". The exam was conducted in order to test the level of knowledge and skills of professional foreign language communication based on the requirements of the English language curriculum at the NASBGSU. This exam on the discipline was being held for 6 academic hours and involved a lexical and grammar test on professional subjects; oral rendering of the articles in English on the border topics in the volume of 200-300 words; oral speech on the actions of the border guard officer in the suggested service situation and making a list of questions for interviewing in accordance with the professional situation.

The materials for the examination were prepared in accordance with the requirements of the Ministry of Education and Science of Ukraine. The exam on this discipline was conducted in an organized way; the programs of the examination were discussed and approved at the meeting of the English language department. The members of exam commissions notified that the system of foreign language training of cadets of the faculty of "Security and Protection of the State Border" meets the requirements of the administration of the SBGSU, educational and professional training programs on the basis of the NASBGSU.

The result of the examination confirmed that the cadets generally acquired a good level of texts translation rendering skills, knowledge of professional lexical material, ability to explain the actions of the border guard officer in the suggested service situation and making a list of questions for interviewing in accordance with the professional situation. Particular attention was drawn to the use of border terminology, its equivalents and the ability to conduct interviews on the suggested situation.

In general, the exam has been conducted at appropriate scientific and methodological levels. As a result of the examination conducted on May 21, 2018, the following grades were received: "Excellent" (A) 15; "Good" (B) 18; "Good" (C) 29; "Satisfactory" (D) 23; "Satisfactory" (E) 13. Thus, the quality of knowledge of future border guard officers taking the final examination on the above-mentioned discipline has increased by 5.85%, respectively. According to the results of the examination on "Foreign Language for Specific Purposes" the average score has also risen by 0.11 for the cadets who studied according to the interactive methods of teaching.

10. Discussions and conclusion

In general, all these methods can be combined as "Interactive learning". It is a specific form of organization of educational and cognitive activity. It means that the educational process takes place under the condition of constant interaction of all its participants. This is team, group, cooperative learning, where all the participants are equal. The interactive model of learning involves the ability to interact, to discuss. During interactive learning, cadets learn to communicate with others, think critically, and make decisions.

According to the purpose and organization of educational activities of future border guard officers, the following methods and activities have been used: interactive methods of cooperative learning ("Work in pairs", "Rotating (changing) triples", "Carousel", "Small groups work", "Microphone", "Buzz group", "Fishbowl", "Onion", "Role play", "Dramatization", "Discussion", "Press" "Case study", "Brainstorming", etc. The effectiveness of all forms of organization of educational activities is determined by the variety of methods.

Dynamic analysis of the results of graduation examinations of future border guard officers has shown that due to the use of the interactive methods of teaching on the discipline "Foreign Language for Specific Purposes" in the educational process of the NASBGSU, both the quality of knowledge and average score of cadets increased significantly. Thus, the quality of knowledge has increased by 5.85%, (from 63.54% to 69.39%). According to the results of the examination of the cadets who studied using interactive methods of teaching, the average academic score has also risen: (from 3.78 to 3.89). All cadets showed a sufficient level of professional lexical material and terminology during rendering of professional texts. The reports on the suggested situations were quite full; the cadets showed that they knew vocabulary on the topics they had learnt. Cadets' answers have shown that most of them have a sufficient level of English to deal with situations that may arise while performing their professional duties. Most of the cadets were successful in conducting interviews with the travelers crossing the border of Ukraine and made correct decisions on their right to cross the border.

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Rally length and rest time in women's volleyball

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Abstract

The aim of the present study was to investigate rally length and rest time according to the intensity of the match and sets, set periods, and match results (winer-loser) in women's volleyball. 226 sets and 9,285 rallies and rest times sampled from 58 matches played in the highest-level Turkish Women's Volleyball League were analyzed in this study. Mean values for rally length and rest time was found as 6.88±5.94 s and 28.92±18.21 s, respectively, and W:R ratio was 1:4.20. Classified as short, medium, and long, the distribution of rally length clusters were 24.7%, 59.3%, and 16.1%, and rest time distribution was 77.2%, 10.7%, and 12.1%, respectively. Rally length according to the intensity of the match and sets, set numbers and set periods was similar ($p>0.05$), while rest time was found to be extended as the intensity of the match and sets, the number of sets, and set periods increased ($p<0.05$). Rally length was also observed to be similar in winner teams ($\bar{x}$=6.96s;SD=6.07s;Med=5.22s) and losers ($\bar{x}$=6.79s;SD=5.78s;Med=5.23s) ($p>0.05$), while rest time clusters were longer in winner teams ($\bar{x}$=30.36s; SD=19.80s; Med=22.18s) when compared to losers ($\bar{x}$=27.15s; SD=15.88s; Med=21.74s) ($p<0.05$). In conclusion, this study revealed that only rest time values varied in different variables of the match; that rest time was more decisive on work-to-rest ratios in women's volleyball than was rally length; and that rest time clusters were longer in winners than in losers. These findings were recommended to be exploited in planning training programs for competitions in women's volleyball.

Keywords: Volleyball, Game analyses, Work-to-rest ratio

1. Introduction

Volleyball is a highly dynamic sport characterized by active movement patterns such as jumps and sprints and by short and explosive actions performed repeatedly (1). Therefore, volleyball is considered sport with high intensity and anaerobic metabolic needs (2). Hard rallies and relatively long brakes vary in terms. It is necessary for modern volleyball players to be able to exert a lot of energy in a very short period of time (explosiveness) and also to recover between rallies, during time-outs (30-60 s), and between sets (3mins) (3). Considering these high-intensity actions taking place during matches, each lasting 60-90 mins on average, volleyball players need high level oxidative capacities and creatine phosphate and glycolytic energy systems (3-5). As far as planning training programs is concerned, it is highly important to have the knowledge of rally length and rest time parameters during volleyball matches in order to prepare players in line with physiological and metabolic requirements of the game (1, 6). Accordingly, work-to-rest ratio (W:R) is necessary to design adequate and specific training protocols and tasks in order to improve the physical abilities of players and their performance on competition (7). Since these variables can be changed independently of each other, a variety of physiological responses are possible and it is likely that different combinations of exercise work rate, exercise duration and interval length may yield similar physiological responses (8). While research has mainly focused on match analysis and factors affecting performance in men's volleyball, there are also studies which investigated rally length and rest time and W:R obtained from the calculations of these variables (7, 9-11). Although there are some studies that analyzed matches and related factors in elite women volleyball (11-14), the number of studies on rally length, rest time and W:R ratio is limited in the current literature (15-18). Although results of previous studies suggested that rally time was longer for women's volleyball than men's (11, 18), it was thought that the relation between rally and rest time periods and the match and its components was needed to be determined more clearly. As a result, the aim of the present study was to investigate [1] rally length and rest time according to match competitive load, set competitive load, set number, and set period in women's volleyball and [2] rally length and rest time according to the winner and loser teams. The results of this study might be used as norm data for women's volleyball to aid strength and conditioning professionals and coaches working with women volleyball players in developing appropriate conditioning programs.

2.Method

2.1. Sample

226 sets and 9,285 rallies and rest times sampled from 58 matches played by 12 teams in the highest-level Turkish Women's Volleyball League were analyzed in this study.

2.2. Variables

In this study, rally length and rest time periods were investigated according to set period, the number of sets, set competitive load, match competitive load, and match result (winner/loser), all known as match components.

Rally length was calculated as the time from the moment the serving player first touched the ball until the exact moment when the last player contacted the ball before the referee whistled to stop playing (7, 9). Rally length was considered as pseudo-rallies if the ball fell directly into the opponent's side of the court after serve is made or if the serve was failed because the ball contacted the net or traversed outside antennas or out.

Rest time was defined as the period between the last legal hit by a player in one rally and the next server hit on the ball in the subsequent rally. The last rally of each set and the following rest time (intervals between sets) were not analyzed.

Work-to-rest ratio was obtained by dividing rally length values by rest time values.

Set period was determined according to the time-out during the match: first period, from the first point until the 8th point (the first technical time-out); second period, from the 9th point until the 16th point (the second technical time-out); and third period, from after the second technical time-out until the end of the set. The fifth sets were also divided into three periods as 1st-5th point, 6th-10th points, and from the 11th point until the end of the set, respectively.

Set number was determined according to the order in which each set was played.

Set competitive load indicated the intensity of the competition inferred from the difference in the final score of the set: 1) low: more than 5 points of difference in the score; 2) medium: 4-5 points of difference; and 3) high: 2-3 points of difference (7).

Match competitive load was defined according to the number of sets in the match as 1) low: 3-0; 2) medium: 3-1; and 3) high: 3-2.

Match result defined the winner and loser team. All variables were analyzed separately for the winners and losers.

2.3. Data Collection

The matches were recorded using SONY HDR-PJ670 video cameras positioned nearly 4 m above the ground level at the middle of the court and about 7-8 meters behind the end lines in a way that all the court could be monitored thoroughly and continuously. Rallies and rest times in previously recorded data were then analyzed by a single observer experienced in data logging analysis. Rally length and rest time values were calculated from videos played on WMP software program.

2.4. Data Analysis

Mean, standard deviation, frequency, and median values of the descriptive statistics were calculated and presented in tables. Partial Cluster Analysis Methods K-means analysis was used in classifying rally length and rest time into short, medium, and long clusters. Shappiro-Wilk test was used to detect normality/non- normality in the groups compared, and it was found that dependent variables of rally length and rest time had a highly skewed distribution. Therefore, to ensure normality of the data Box-Cox transformation was used; however, the data was still observed not to have a normal distribution. As a result, a non-parametric test, Kruskal-Wallis test was applied in comparing rally length and rest time according to match and set competitive load, the number of sets, and set period, and when a significant difference was observed, Mann-Whitney's U test was used for the paired comparisons. Although descriptive statistics (mean±SD) were presented in tables for variables, it is well-known that Kruskal-Wallis analysis is a test used to compare the distribution of the groups rather than their arithmetic mean. In addition to mean values, median (Med) values were also calculated and presented in tables, since the distribution of all the variables analyzed in this study was inconsistent. Additionally, rally length and rest time values were analyzed for winner and loser teams using Mann-Whitney's U test. Statistical data were obtained using Stata 13, and significant level was set as α=0.05.

3. Results

Percentage distribution of rally length and rest time according to match competitive load, set numbers and set periods were presented in Table 1. It was observed in this study that the highest number of rallies (59.3%) were 5-11 s (medium rallies), while the majority of rest time (77.2%) were short rest time periods. While rally length distribution according to match competitive load, set numbers, and set period remained relatively similar, rest time seemed to increase to medium and long as the set period and set number became greater.

Table 1. *Percentage distribution of rally length and rest time according to the intensity of the match, set number and set periods*

	Short Rallies (<4 s) (n=2289)	Medium Rallies (5-11 s) (n=5503)	Long Rallies (>12s) (n=1493)	Short Rest Time (<27 s) (n=7168)	Medium Rest Time (28-54 s) (n=989)	Long Rest Time (>55 s) (n=1128)
3 set matches	24.3%	58.3%	17.4%	80.0%	8.7%	11.4%
4 set matches	25.0%	60.7%	14.3%	76.5%	10.9%	12.6%
5 set matches	24.6%	58.7%	16.7%	74.8%	12.6%	12.5%
1st sets	23.2%	61.0%	15.8%	80.0%	8.1%	11.9%
2nd sets	26.0%	57.9%	16.1%	77.3%	10.8%	11.9%
3rd sets	24.2%	59.2%	16.6%	76.6%	11.5%	11.9%
4th sets	25.6%	58.5%	15.9%	75.0%	12.6%	12.4%
5th sets	24.7%	59.9%	15.4%	69.3%	14.5%	16.3%
1st periods	25.6%	58.1%	16.4%	85.1%	4.6%	10.3%
2nd periods	25.0%	59.3%	15.8%	77.3%	8.4%	14.3%
3rd periods	23.6%	60.2%	16.2%	70.6%	17.8%	11.6%
TOTAL	24.7%	59.3%	16.1%	77.2%	10.7%	12.1%

Results of the present study also revealed that the average number of rallies per set was 43.2±0.36, and 160.0±32.3 per match. Mean values of the total rallies and rest times were 6.89±5.94 s and 28.94±18.19 s, respectively, and W:R ratio was 1:4.20.

Descriptive statistics of rally length and rest time values according to match competitive load, set number, set period, and set competitive load were presented in Table 2. Rally length did not show any significant difference in any independent variable analyzed in the study ($p>0.05$). On the other hand, rest time appeared to increase significantly as the intensity of the match became higher. It was found that rest time values for matches with 3, 4, and 5 sets were significantly different from each other ($H= 81.505; p=0.000$).

When rest time values were analyzed according to set numbers, the difference between sets was found to be statistically different ($H=72.536; p=0.000$). As regards the results derived from paired comparisons, it was determined that the 1st sets tended to have significantly shorter rest time periods than others, and the longest rest time period was observed in the 5th set ($p<0.05$). While rest time values for the 2nd and 3rd sets were relatively similar ($p>0.05$), the figures for the other sets were significantly different from each other ($p<0.05$). In addition, analyses of rest time according to set periods showed that there were significant differences between all of the set periods ($H=142.878; p=0.000$). While the shortest rest time was seen in the first period, rest time was observed to increase as the set period progressed.

The analysis of rest time according to set competitive load showed that while sets with low and medium intensity had similar durations ($p>0.05$), rest time extended significantly as the intensity of the set increased (high) ($H=31.414; p=0.000$).

Table 2. *W:R, rally length, and rest time according to match competitive load, set competitive load, set number, and set period*

		n	Rally length (s)			Rest Time (s)			W:R ratio
			$\bar{x}$	Standard Deviation	Median	$\bar{x}$	Standard Deviation	Median	
Competitive load	3 set match	3202	7,02	6,12	5,24	28,13	18,16	21,41[a]	1:4.00
	4 set match	3274	6,69	5,71	5,22	29,21	18,35	22,04[a]	1:4.36
	5 set match	2809	6,94	5,98	5,21	29,50	18,11	22,60[a]	1:4.25
Sets	1st	2536	6,86	5,81	5,24	28,27	18,18	21,38[b]	1:4.12
	2nd	2504	6,78	5,95	5,15	28,89	18,10	22,10[bb]	1:4.26
	3rd	2495	7,01	6,02	5,27	29,01	18,25	22,07[bb]	1:4.14
	4th	1418	6,93	6,14	5,25	29,53	18,51	22,56[b]	1:4.26
	5th	332	6,66	5,25	5,38	31,05	17,66	23,63[b]	1:4.66
Set periods	1st periods	2788	6,86	6,10	5,16	27,34	18,37	21,28[c]	1:3.99
	2nd periods	3136	6,87	5,86	5,24	29,93	19,64	21,94[c]	1:4.35
	3rd periods	3361	6,91	5,87	5,24	29,30	16,55	22,78[c]	1:4.24
Sets Load	Low	3881	6,87	6,05	5,21	28,54	18,21	21,67	1:4.16
	Medium	1956	6,73	5,64	5,20	28,67	17,98	22,02	1:4.26
	High	3448	6,99	5,97	5,26	29,51	18,35	22,37[d]	1:4.23
Match Results	Winner Team	5061	6,96	6,07	5,22	30,36	19,80	22,18[e]	1:4.36
	Loser Team	4224	6,79	5,78	5,23	27,15	15,88	21,74	1:4.00
TOTAL		9285	6,88	5,92	5,23	28,76	17,84	21,98	1:4.20

In the present study, rally length and rest time were also analyzed according to match result, i.e. winner and loser teams. Results showed that rally length for winners ($\bar{x}$=6.96s; SD=6.07s; Med=5.22s) and losers ($\bar{x}$=6.79s; SD=5.78s; Med=5.23s) were relatively similar (U=0.336; p=0.716). However, rest time was significantly longer in winners ($\bar{x}$=30.36s; SD=19.80s; Med=22.18s) than in losers ($\bar{x}$=27.15s; SD=15.88s; Med=21.74s) (U=4.961;p=0.000). While W:R was 1:4.36 for winners, the ratio was calculated as 1:4.00 for losers.

4. Discussion

The aim of this study was to investigate rally length and rest time, as well as W:R ratio (calculated from these variables), according to match competitive load, set competitive load, set number, set period, and match result in women's volleyball. In a previous study on women's volleyball, only rally length data collected from FIVB World Grand Prix final matches were analyzed, where it was reported that mean really length was 7.25 s (18). Another study focusing on women's beach volleyball showed that rally length was 6.46 s, rest time 22.69 s, and W:R ratio 1:5.09 (17); however, no studies were currently available in literature that had investigated all the variables analyzed in the present study in indoor volleyball for elite women's volleyball. Except for those few studies, previous research seemed to have focused exclusively on men's volleyball, making the present study the first to analyze all of these variables in high level women's volleyball.

Results of the present study revealed that mean rally length was 6.88±5.94 s, rest time 28.92±18.21 s, and W:R 1:4.20. In their study on elite men's volleyball, Sanchez-Moreno et al. (7) reported that rally length, rest time, and W:R were 4.99±4.35 s, 29.02±19.44 s, and 1:5.81, respectively. When Sanchez-Moreno's findings were compared with the results of this study, it could be seen that rallies lasted longer in women's volleyball, compared to men's volleyball. This finding supported previous studies which reported similar results (11, 15, 16, 18).

In this study, rally lengths were mostly of medium (5-11 s) and short duration (<4 s) (59.3% and 24.7%, respectively), while the majority of rest time periods were found as <27 s (77.2%). No notable differences

were observed in the distribution of rally length according to match competitive load, set number, and set period; however, it was observed that rest time increased to medium and long durations as the intensity of the match, set point, and set period became greater. In another previous study on elite men volleyball players, it was reported that 76% of all rallies lasted approximately 12 s or less, and the mean time of a single rally was 11 s. The range of variability of rallies extended from 3 s (serve) to more than 40 s. Furthermore, approximately 44% of all breaks between rallies lasted 12 s or less, with the mean time of 14 s (5). Sanchez-Moreno et al. (7) reported that the distribution of rally length clusters was: short 74%, medium 14.38%, and long 11.62%; and rest time clusters: short 81.71%, medium 10.83% and long 7.46%. It was suggested that the reason for the longer rally length observed in women's volleyball than that of men's might have resulted from anthropometric and physiological differences between men and women (11). In addition, it was reported in another study that women produced less power in the spike, which could result in numerous consecutive exchanges of the ball between the two teams and promote higher continuity in attack and defense (19). Continuity is a concern from the point of view of attraction and entertainment. Therefore, Women's volleyball is characterized by the continuity of actions in effective defense and attack (11). In the study report by FIVB (18) on elite women's and men's volleyball, it was stated that there were more two- or more-attack rallies in women's volleyball (%34) than men's (%24), which stands out as another factor to explain longer rallies observed in women's volleyball.

In this study, rally length was found to be similar for all variables ($p>0.05$; Table 2), in which rally length and rest time were analyzed according to different variables of the match, namely, match competitive load, set competitive load, set number, and set period. In contrast, there were statistically significant differences in rest time values for all the variables ($p<0.05$; Table 2). W:R ratio, calculated from rally length and rest time values, ranged between 1:3.99 and 1:4.36. Based on the results derived from paired comparisons, it was verified that rest time increased significantly in matches with 3, 4, and 5 sets, as the intensity of the match (i.e., the number of sets in the match) increased. This finding might suggest that W:R ratio was higher in matches with 3 sets when compared to those with 4 or 5 sets, which means 3-set matches were played faster. Similarly, it was also found that rest time became longer as the set number increased during the match, and that the shortest rest time was observed in the 1st set and the longest in the 5th. In addition, when set periods were analyzed, it was revealed that the shortest rest time was in the 1st period and the longest in the 3rd. When this variability was analyzed as W:R ratio, the lowest value was found in the 1st period as 1:3.99, but in the following periods, W:R tended to become greater due to the increase in rest time duration. This result might be explained by the fact that players started the 1st period after a complete recovery of their energy resources at the beginning of each set, while they needed longer rest time due to fatigue as the set progressed. In addition, coaches resort to time-out and changing players more frequently during the 2nd and 3rd periods. Such applications might also result in longer rest time durations in the match structure. In this study, the effect of the set intensity on rest time was found to be significant only when the set competitive load increased. The significant increase in rest time when there was a difference of 2-3 points in the set score was suggestive of the efficacy of a balanced competition on rest time. Also, though not statistically significant, rally length appeared to increase with high set competitive load. In their study investigating similar variables in men's volleyball, Sanchez-Moreno et al. (7) reported that rest time was adapting to work time, increasing as both the set and the match progressed. It was also stated in the same study that by remaining nearly constant throughout the game, those results concerning the work-to-rest ratio reinforced the argument that players know how to self-regulate their micro-rest periods despite the limitations of the rules. It was also interpreted that within certain parameters, players exerted a degree of control over the rest-to-work ratio, something that could perhaps be exported to training sessions. Players thus seemed to be trying to delay the accumulation of fatigue through the prolonging of recovery times and self-regulating work-to-rest ratios.

Fatigue in volleyball is mainly due to exhaustion of the nervous system although it can also be caused by metabolic reasons, neuro-muscular and even dehydration (17). In volleyball match, muscle cell´s high-energetic phosphates – adenosintriphosphates (ATP) and phosphocreatine (PCr) – are used. Also glycogenolysis and anaerobic glycolysis are used in working muscles. During the breaks, aerobic metabolism is used to fill the storages of ATP and PCr and to oxidize myoglobin. The longer the rally, the more likely the player´s body is to use anaerobic metabolism to make sure that there is enough ATP. Thus building up of the hydrogen ions used in energy output outnumbers the buffering capacity of cell, when hydrogen concentration rises and acidity increases. During the breaks the buffering of hydrogen ions gets more efficient as the role of aerobic metabolism increases (3). On the other hand, since rest time after

repeated maximal efforts performed during rallies is limited, recovery quality should be developed as well (5).

Sanchez-Moreno et al. (9) reported that since the number of stroke is only one for each team in all net and wall sports except for volleyball, the approximate rally length in those sports can be determined indirectly by calculating the total strokes in a rally, whereas this linear correlation can not be applied to volleyball, in which the ball is allowed to be played with upto three strokes for each team. Therefore, it was suggested that, in volleyball, each rally length should be calculated separately and that this could contribute to the overall success of a team. The present study analyzed, additionally to other variables, the rally length and rest time according to match result, that is, for the winner and loser teams. Results showed that the length of the rallies won by both winners and losers was not different in duration. Based on this finding, it might be suggested that rally length was not a decisive factor in winning the match. However, when rest time values were analyzed for winner and loser teams, it was observed that rest time of the winners was significantly longer than the losers. In other words, the winner team (W:R=1:4.36) was able to rest longer than the loser (W:R=1:4.00). These findings indicated that winner teams benefited from various applications (cheering, longer serve time, etc.) or other strategies adopted by coaches, such as player substitution, time-out, etc., to lengthen rest time periods following the rallies they won.

5. Future research and limitations

Future research should address rally length and rest time in international volleyball competitions for women and different age categories by especially using video check systems, which have become popular recently.

6. Practical implications

The findings of the study revealed rally length, rest time and work-to-rest ratio values according to different variables of volleyball matches in women's volleyball. The results of this study might be used to aid professionals and coaches working with women volleyball players in developing appropriate conditioning programs for the different requirements of the game. As far as researchers of the field are concerned, they should use and further improve the results concerning the game structure of women's volleyball and the effect of rally length and rest time on winning or losing the match in their future studies.

7. Declarations of conflicting interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Methods of Development of Physical Qualities of Schoolchildren of the Sixth Grade Depending on the Volume of the Physical Activity

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Abstract

Study aim. The purpose of the work is to describe special aspects of the experimental methodology for the development of physical qualities of schoolchildren of the 6th grade depending on the exercise load.

In the context of the educational reform in Ukraine, physical education is of great importance since it is an integral element of the general human culture and one of the determinant indicators of national progress and health of the Ukrainians. Physical education is of special significance for schoolchildren in the course of formation of their health, promotion of healthy lifestyle culture, and harmonious physical and spiritual development of the rising generation.

Research methods: theoretical analysis and generalisation of the scientific and methodological literature, pedagogical monitoring, testing, pedagogical experiment, mathematical statistics methods.

Results. The most favourable period for the development of schoolchildren's strength has not been specified yet. According to some scholars, the most appropriate period for boys' strength development is 13-14 to 17-18 years, whereas for the girls it ranges from 11-12 to 15-16, while the muscle percentage in the overall body mass considerably varies depending on the age (it is approximately 23.0 % until the age of 10-11; 33.0 % at the age of 14-15 and up to 45.0 % at the age of 17-18). At the same time, the total body mass increases during this period as well, so the growth of relative strength is not considerable, especially for female pupils. Therefore, the most considerable rates of growth of relative strength of different muscle groups is demonstrated by the pupils of the 3rd, 5th and 6th grades.

Conclusions. The experimental results of the research demonstrate that the strength qualities are mostly subject to the targeted impact during the given school periods. The highest absolute strength indicators of different muscle groups are demonstrated at the age of 25 to 30, though. At the same time, it is known that there are numerous cases in the sport when the maximum level was reached by boys and girls aged 15-16 and 17-18. It is still important to take into consideration morphofunctional abilities of the growing organism in the course of strength development.

Keywords: educational motivation, physical education, differentiated approach, physical qualities, pupils

1. Introduction

The urgent need of changes in educational program approaches and determination of priorities of the development of physical education in schools, as well as the shift in emphasis under new socio-economic conditions, led to the adoption of the following regulatory documents: the Law of Ukraine "On Physical Culture and Sports", National Doctrine of Physical Culture and Sports in Ukraine, the Order of the Council of Ministers of Ukraine of 31 August, 2011, № 828-r "On Approval of the Concept of the National Target Social Program for the Development of Physical Culture and Sports for 2012-2016", as well as the Order of the Ministry of Education and Science of Ukraine: "On Methods to Improve the Work on Physical Education and Preservation of Schoolchildren's Health in Educational Institutions of Ukraine", "On the Mode of Work of Educational Institutions", the Order of the Council of Ministers "On Approval of the Concept of The National Targeted Social Program "Healthy Nation" for 2009-2013", etc., according to which the strategic goals of the physical education system of children and youth are the formation of their physical, moral and psychological health, building an awareness of the need for physical improvement and motivation for the development of interest and habit of independent physical exercises by culture and sports.

2. Literature Review

As Y. A. Kompaniets (2013) notes, nowadays, physical education, sport activity, physical culture are complex, multifactorial, multifunctional social phenomena. The current priority is not only formation of a healthy, spiritually developed personality, but also preparation of youth for participation in hostilities. In addition, the beginning of the twenty-first century is characterized by the need to compensate the adverse effects of hypodynamia and hypokinesia on pupils' and students' organisms. In this article we investigated the influence of experimental method of physical education on sixth-grade pupils of Kyiv secondary schools. The study was conducted with the schoolchildren of secondary school № 303 and the V. Sukhomlynskyi Ukrainian College. The experimental group included students of the secondary school № 303 (EG, n - 56 boys and 55 girls), while pupils of the V. Sukhomlynsky Ukrainian college were the control group (CG, n - 52 boys and 50 girls). Obtained results, in particular, indicators of physical fitness, proved that results of pupils of EG are probably better than those of CG ($p<0.05$-0.001), which confirms the effectiveness of the experimental methodology.

The system of physical education in secondary educational institutions should be a reliable base for a high level of mental working capacity and intellectual development of students under the process of learning, involving them in systematic physical activity, forming the need of physical development and improvement to ensure a high level of health and professional longevity [7; 11; 12; 13; 15].

The educational process of physical culture in secondary school is aimed at achieving basic general secondary education, which implies the development and socialization of students, formation of their national identity, general culture, ideological orientations, ecological style of thinking, behavior and also the abilities of research and life affirmation, self-development and self-learning under global changes and challenges. The increase of motor activity of pupils, which is provided by modern regulation documents, would seem to improve the situation, but an increase of the number of schoolchildren who are classified in special medical groups, points out the need for new approaches in solving this problem.

To substantiate the criteria of the differentiated contents of exercise load in one of the 6th-grade physical education courses in the school program, the results of several studies on successful development of motor activity, organism growth and development of schoolchildren were studied. The present-day scientific research data and methodological solutions related to differentiated physical exercises for pupils of secondary schools were also analyzed, systematized, and generalized.

3. Method

3.1. Participants

To study the development of physical qualities in schoolchildren of the 6th grade, we engaged the schoolchildren of secondary school № 303 (experimental group) and V. Sukhomlynskyi Ukrainian College (control group). The experimental group was engaged in sport activities based on the experimental methodology whereas the control group exercised in accordance with common physical education programme. The total number of the schoolchildren participating in the study was 213 persons.

3.2. Materials

To find out the efficiency of the experimental methodology as compared to the common programme, we used such exercises as standing long jumps for boys and girls, pull-ups for boys and pushups for girls. 60-m, 1,000-m and 1,500-m runs were used to assess the development of physical qualities of speed and stamina. To develop stamina, the schoolchildren in the experimental group performed moderate-intensity work (approximately 50% of the maximum load). The conditions of physical exercise of such intensity promoted the development of stamina, which, in turn, mainly depends on the aerobic capacity of the organism. During such work, functional activity of muscles, other organs and tissues are oxygenated the most. The heart rate during loads of this intensity reached 130–160 beats per minute. The schoolchildren's exercise of the moderate intensity promoted the interaction among the functions of the cardiovascular system, breathing and motor apparatus. It was proven by the research that the maximum time of the schoolchildren's work of such intensity (50.0 %) was 19-20 minutes on average.

3.3. Procedure

The experiment was conducted during the school year. The experimental methodology for physical education lessons was used at the positive emotional background as well as with account of the health condition, level of physical fitness and gender. Furthermore, the schoolchildren in the experimental group did sport in the parkland three times a week in addition to two physical education lessons in the school schedule. The basis of these additional lessons was a recreational run along the "Health path", as well as different physical exercises at the gymnastic apparatus located on the "stations" (sport grounds) of the "Health path", which are located along the path at certain distance from each other. Such lessons considerably increased children's exercise motivation.

That is the fundamental difference between the examined methodology and the generally accepted program of physical culture as simple increase in the number of hours of physical education does not give positive results. That was shown by the numerous results of the scientists [1; 2; 3; 4; 5; 8]. For conducting this experiment during sport lessons, we used the following methods: a word method, a method of circular training, a method of combined exercise with different combinations of task structure, an interval method, a method of continuous variational exercise, a game method, etc. Therefore, the difference between proposed experimental methodology and generally accepted physical culture program at schools lies not only in the increase of a number of hours, but also in the peculiarity of the methodology of conducting training sessions.

Objectives:

1. To determine the impact of differentiated loads on the physical fitness of secondary school pupils (on the example of the 6th grade).

2. To carry out experiments to check the efficiency of the proposed experimental methodology for the development of strength and stamina of schoolchildren of the 6th grade.

Research methods: theoretical analysis and generalisation of the scientific and methodological literature, pedagogical monitoring, testing, pedagogical experiment, mathematical statistics methods.

4. Results

To find out the efficiency of the experimental methodology as compared to the common programme, we used such exercises as standing long jumps for boys and girls, pull-ups for boys and pushups for girls. As of the beginning of the academic year, the boys in the control group had an advantage when performing standing long jumps (162.9±2.37 cm against 162.5±1.53 cm against the boys in the experimental group). However, this advantage is not confirmed by the statistical probability ($p > 0.05$). The results of research into the development of strength and speed and strength qualities are given in Tables 1-2.

Table 1. *Comparative characteristic of indicators of speed and strength, and strength qualities of boys of the 6th grade subjected to the physical load during the academic year*

Research group	Statistical indicators	Test exercises					
		standing long jumps, cm			pull-ups, reps		
		beginning of the academic year	end of the academic year	p	beginning of the academic year	end of the academic year	p

Experimental group, n-56	M	162.5	172.3	< 0.001	1.96	3.85	< 0.001
	±m	1.53	1.59		0.25	0.26	
Control group, n-52	M	162.9	168.6	< 0.01	2.39	2.10	> 0.05
	±m	2.37	1.53		0.41	0.33	
Statistical probability	p	>0.05	<0.02		>0.02	<0.001	

As of the end of the academic year, results of the boys in the experimental group performing standing long jumps improved greatly against the results of the boys in the control group (172.3±1.59 cm against 168.6±2.53 cm against the boys in the control group), which is confirmed by a statistical probability (p>0.02). At the same time, if we compare the dynamics of boys of the control group, at the end of the school year they had a positive dynamics, which is confirmed by a statistical probability (p>0.01).

***Table 2**. Comparative characteristic of indicators of speed and strength, and strength qualities of girls of the 6th grade subjected to the physical load during the academic year*

Research group	Statistical indicators	Test exercises					
		standing long jumps, cm			pushups, reps		
		beginning of the academic year	end of the academic year	p	beginning of the academic year	end of the academic year	p
Experimental group, n-56	M	154.8	164.7	< 0.001	17.8	22.7	<0.001
	±m	1.89	1.51		1.08	1.13	
Control group, n-52	M	148.9	161.2	< 0.001	13.2	16.3	<0.02
	±m	2.19	1.23		1.19	1.35	
Statistical probability	p	<0.01	<0.01		<0.001	<0.001	

As for the pull-ups, the absolute indicators were better among the boys in the control group than in the experimental one (2.39±0.41 against 1.96±0.25) although it was not confirmed by the statistical probability (p>0.2). However, as of the end of the academic year, the indicators of the boys in the experimental group improved by 1.89 times whereas the ones of the boys of the control group decreased by 0.29 times. The advantage of the experimental methodology over the common one is confirmed by the high degree of statistical probability (p<0,001).

During the entire period of the research, the female experimental group had the significant advantage over the girls in the control group. Both as of the beginning and the end of the experiment, efficiency of the experimental methodology is confirmed by the high degree of statistical probability (p<0.001), but it should be noted that there were improvements in the results of the girls of the control group at the end of the school year, in particular, in the results of high-power and strength exercises with high degree of statistical probability (p<0.001) (Table 2).

At the same time, if the results of the research of the girls in both groups are compared, there is a considerable difference between them. Thus, as of the beginning of the academic year, the results of the girls in the experimental group were 154.8±1.89 cm whereas the girls in the control group had 148.9±2.19 cm. The positive dynamics of the girls in the experimental group is confirmed by the statistical probability (p<0.01). The situation remained the same as of the end of the academic year. The absolute results were improved by

the girls in both groups, but when they were compared, the advantage of the girls in the experimental group was evident (164.7±1.51 cm against 161.2±1.23 cm, p<0.01). The results of the development of physical qualities of speed and stamina are presented in Tables 3-4.

At the beginning of the experiment, schoolchildren of the 6th grade in the control group had better speed indicators 10.7±0.11 against 10.8±0.09 of the boys in the experimental group (p>0.05). On the contrary, the girls in the experimental group demonstrated better speed indicators (11.2±0.09 against 11.4±0.11, p<0.05).

As for the end of the academic year, the results of the boys in the experimental group improved considerably and were 10.1±0.05 against 10.4±0.11 of the control group (p<0.001). As of the end of the academic year, the girls in the experimental group were able to improve their indicators (10.6±0.07). The girls in the control group also improved their results (11.0±0.11), but they had worse results in comparison with the experimental group, which was confirmed by the high degree of statistical probability (p<0.001).

The same pattern is observed in relation to stamina indicators (1,000-m and 1,500-m races); the experimental group demonstrated better results in both test exercises both at the beginning and end of the research. In particular, as of the beginning of the academic year, the boys in the experimental group demonstrated the following result in running 1,000 m: 4.41±0.05 minutes, against 4.59±0.09 in the control group, p<0.001; as of the end of the academic year, the results of the boys in the experimental group were also better and made up 4.10±0.03 minutes against 4.57±0.06 in the control group. The advantage of the boys in the experimental group over the boys in the control group is confirmed by the high degree of statistical probability (p<0.001).

The results of 1,500-meter run were similar: schoolchildren of the experimental group showed better results than schoolchildren in the control group both as of the beginning and as of the end of the academic year, which was confirmed by the high degree of statistical probability (p<0.001).

Table 3. *Comparative characteristics of speed and stamina indicators of boys of the 6th grade subjected to the physical load during the academic year*

Research group	Statistical indicators	Test exercises					
		Running 60 m, s		Running 1,000 m, minutes, s		Running 1,500 m, minutes, s	
		beginning of the academic year	end of the academic year	beginning of the academic year	end of the academic year	beginning of the academic year	end of the academic year
Experimental group, n-56	M	10.8	10.1	4.41	4.10	7.23	6.53
	±m	0.09	0.05	0.05	0.03	0.11	0.10
Statistical probability	p	<0.001		<0.001		<0.001	
Control group, n-52	M	10.7	10.4	4.59	4.57	7.55	7.52
	±m	0.11	0.11	0.09	0.06	0.14	0.11
Statistical probability	p	<0.01		>0.05		>0.05	
General statistical probability	p	>0.05	<0.001	<0.01	<0.001	<0.02	<0.001

Table 4. *Comparative characteristics of speed and stamina indicators of girls of the 6th grade subjected to the physical load during the academic year*

Research group	Statistical indicators	Test exercises					
		Running 60 m, s		Running 1,000 m, minutes, s		Running 1,500 m, minutes, s	
		beginning of the academic year	end of the academic year	beginning of the academic year	end of the academic year	beginning of the academic year	end of the academic year
Experimental group, n-56	M	11.2	10.6	5.14	4.56	8.24	7.25
	±m	0.09	0.07	0.08	0.07	0.09	0.10
Statistical probability	p	<0.001		<0.001		<0.001	
Control group, n-52	M	11.4	11.0	5.56	5.50	9.27	8.16
	±m	0.11	0.11	0.17	0.12	0.18	0.14
Statistical probability	p	<0.001		>0.05		<0.001	
General statistical probability	p	<0.05	<0.001	<0.01	<0.001	<0.001	<0.001

The effectiveness of the use of experimental techniques in running exercises was also observed in the experimental group of girls. In particular, the best results of girls in the experimental group on 60-m, 1,000-m and 1,500-m runs at the beginning, as well as at the end of the school year, significantly exceeded the results of the control group, as evidenced by the high degree of statistical probability (from $p<0.05$ to $p<0.001$). In addition, girls of the control group showed positive changes in the dynamics of the test exercises at the end of the school year, which was confirmed by a high degree of statistical probability ($p<0.001$), except for the results of 1,000-m run, where improvement was not confirmed by statistical probability, but showed only a noticeable tendency of results improvement ($p>0.05$).

5. Discussion and Conclusion

Based on the analysis of the data from a number of sources [1; 4; 9; 10; 14; 16, 17, 18] and the results of the pedagogical experiment, the conclusion can be made that individual abilities of schoolchildren, their physical development, gender and physical fitness need to be taken into consideration in the course of development of strength qualities and stamina of the 6th grade pupils by means of the differentiated educational methodology.

Studies of the level of physical development and physical preparedness showed that the sixth-graders showed differences within their age group, both by individual indicators, and on the whole for 12-13-year-old children. Children develop a basic understanding of their physical and mental abilities at this very age [6; 7]. In the 5th and 6th grades, development of such physical qualities as strength, stamina, and speed is especially important.

According to T. Yu. Krutsevych (1999), speed is a complex movement quality including simple and complex forms of display of speed ability. Simple forms are displayed as the latent time of simple and complicated movement reactions, the speed of making a specific move, and frequency of moves. Complex forms of speed abilities of schoolchildren are displayed as complex movement acts typical of training and contesting activity in different types of sport and are provided with elementary forms of display of speed in versatile combinations and in aggregate with other motor abilities.

A. I. Poruchynskyi (1997) determines aiming accuracy as a complex psychophysical quality depending on the spatial, speed, and strength components, differentiation functions, and movement parameter reproduction.

Therefore, any level of display of speed ability is based on psychophysical displays, and the sensitive period of development thereof pertains to the primary and early secondary school age (12-13 years).

The contents of motor components were studied by V. P. Ozerov and Yu. O. Petrenko. It was proven by their research that sensory-motor skills regulate sensory reactions and sensory-motor coordination; motor actions are connected with awareness of task solution with movements; ideomotion discharges the programming and movement regulating function. Ideomotion combines natural abilities to design, reconstruct each future action in your mind and carry out the action. It is provided for by three types of thinking: symbolic, visual and action. Sensory motor abilities are controlled by sensory organs and muscles. Thus, V. P. Ozerov believes that the ability to manage time, space and dynamic characteristics is a sign of psychomotor development [3; 4].

At the current stage, the physical education is based mainly on the principles of age and gender differentiation of schoolchildren, their health and movement fitness, but intensity of biological maturity of the organism, special aspects of physical development (body length and weight), development of psychological traits, and somatometric indicators are hardly taken into consideration. Therefore, age and gender are common factors used to develop the training programme for movement abilities and skills.

It has been proven that one of the dominating factors of change in schoolchildren's physical fitness indicators is the type of constitution, the height, the girth of the body and its weight. Thus, schoolchildren having a longer and heavier body are better at throwing but have much more difficulty in endurance running. Schoolchildren of smaller body dimensions succeed in cyclic exercises demanding stamina, whereas relatively tall and light schoolchildren are better than others in a jumping exercise in the track and field area.

Increased speed of children in secondary school is known to be mainly associated with the high movement rate in the course of running. In their studies, V. L. Volkova, B. M. Shyian, and S. I. Prysiazhniuk determined optimum age period of development of different displays of speed, speed-strength, and strength qualities and stamina. The term of school training is the most suitable for the development of children's strength qualities. Over 10–11 years of school, strength indicators of the basic muscle groups are improved by 200–500 % and more (V. I. Liakh, 1997). The strength indicators of the large muscles of the trunk, thigh, lower thigh and foot grow at the highest rate.

The assessment of the level of physical development and fitness demonstrated that the schoolchildren of the 6th grade showed the uniqueness of the age group, both based on specific indicators and in general, among children aged 12-13. Existing individual differences between boys and girls with the different level of physical development and fitness are a basis for the development of differentiated recommendations during physical education of schoolchildren. Use of the individual approach to the determination of the physical load depending on the physical development, gender, health and physical fitness enables to increase the efficiency of the physical educational process in the secondary school.

Application of the experimental methodology at physical education lessons as well as an additional physical exercise in the parkland enabled increasing the weekly load on the schoolchildren of the 6th grade up to eight hours and improving indicators of development of their physical qualities considerably, whereas weekly physical activity of pupils of the control group was only 2-3 hours.

Therefore, the results of the research among the schoolchildren of the 6th grade confirmed high efficiency of the experimental methodology in comparison with the common physical education culture having two or three physical education lessons per week only.

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The Investigation of Bodily Kinesthetic Intelligence Levels of Secondary School Students

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Abstract

The purpose of this study was to investigate the effect of 8-week-long basic tennis and table tennis drills on the Bodily Kinesthetic Intelligence (BKI) levels of 156 students aged between 12 and 14 years (75 female and 81 male). The data of the study was collected through Bodily Kinestetic Intelligence scale, a sub-dimension of Multiple Intelligences Inventory. BKI levels were not different between tennis and table tennis groups. Statistical analysis was conducted based on gender, age groups (12, 13, 14 years) and exercise type. Independent samples T Test revealed that there was no significant difference between the BKI levels of males and females. One way Anova Test revealed that there was significant difference between the BKI levels age groups (12, 13, and 14) in the post test. However, Paired Samples T Test revealed no significant differences between pre-post test results of student's BKI levels. In conclusion, despite the relatively long term (8 weeks) physical activity, the BKI levels did not show significant differences.

Keywords: Bodily Kinesthetic Intelligence, Students, Tennis, Table Tennis

1. Introduction

Gardner (1993) has written that IQ-based thinking started and people were categorized as bright or not bright through a single standardized performance test. However, in Gardner's view there is no single intelligence that can account for success in life. Gardner's research revealed extensive evidence for the existence of eight relatively autonomous intelligences each with its own set of dedicated cerebral structures.

Gardner defines intelligence as the capacity to create a product that is valued in one or more cultural setting, as the skill to generate efficient and effective solutions to the problems encountered in life and as the ability to discover the problems with complicated nature or that are required to be resolved (Gardner, 2004). According to Gardner, the combination of many abilities and skills that people have cannot be measured with stereotyped tests. Intelligence tests are not sufficient enough to determine children's success on their own. Even though intelligence values differ, children with different qualities are among those who are successful in the society (Gardner, 2004).

Bodily/Kinesthetic Intelligence refers to the capacity of using body in expressing ideas and feelings just as an actor, athlete or dancer do or the talent of using hands and creating things with hands like an architect, surgeon or mechanic. Bodily/Kinesthetic Intelligence capacity also includes physical abilities such as coordination, balance, strength, flexibility and speed and some special skills with kinetic nature that enable all of these abilities to work in harmony (Saban, 2002).

Bodily/Kinesthetic Intelligence is used in activities such as sports that require the use of the whole body by the individual, and those who are dominant in this type of intelligence often use their gestures and mimes and also they can learn best by moving their bodies and using their hands (O'neill, 1996). The current research that is conducted in this study is to investigate the effects of 8 week long basic tennis drills and table tennis drills.

2. Method

The aim of this study is to investigate the effects of 8 week long basic tennis drills (basic stance, racket handle grip, throw the ball, footwork, hand-eye coordination and educational games) and table tennis drills (shakehand grip position, penhold grip position, basic stance, touch the ball, ball control drill and ball bouncing and educational games) performed two times a week on bodily/kinesthetic intelligence of secondary school students aged between 12-14. The sample of the study consisted of 156 students (75female and 85male) attending sports schools in Kocaeli. In the study, bodily/kinesthetic intelligence scale, a subscale of Multiple Intelligence Theory, developed by Gardner in 1983 and adapted to Turkish by Saban in

2002 was used as well as the 8 week basic drills. After the data gathered it was evaluated with descriptive statistics, Independent sample T test, one-way analysis of variance and paired sample T test were applied. The level of significance was determined as 0.05.

3. Results

Table 1: *Demographic Information of Participants*

Variables	Subcategories	N	%	Total
Age	12	46	29,5	156-100
	13	59	37,8	
	14	51	32,7	
Gender	Female	75	48,1	156-100
	Male	81	51,9	
Branch	Tennis	81	51,9	156-100
	Table tennis	75	48,1	

As can be seen from Table 1, 29,5% percent of the participant students are 12 years old, 37,8% are 13 and 32,7% are 14 years old. 48,1 of these students are female while 51,9% are male. As for their branch, 51,9% of these students participated in basic tennis activities while 48,1% participated in basic table tennis activities.

Table 2: *T Test Analysis of Bodily/Kinesthetic Intelligence Scores of The Participants According to Variable of Gender*

		N	M	SS	F	P
BKI PRE	Female	75	27,41	6,08	2,813	,093
	Male	81	25,59	7,24		
BKI POST	Female	75	24,48	6,78	,303	,077
	Male	81	26,46	7,07		

Table 2 reveals that no significant difference was found in the Bodily/Kinesthetic Intelligence pre-test and the post-test scores of the participants according to the variable of gender (p>0.05).

Table 3: *One-Way Variance Analysis of The Bodily/Kinesthetic Intelligence Scores of The Participants According to Variable of Age*

		Sum of Squares	sd	Means of Squares	F	P	Meaningful Difference
BKI PRE	BetweenGroups	111,167	2	55,583	1,223	,297	No
	Intergroups	6955,673	153	45,462			
	Total	7066,840	155				
BKI POST	BetweenGroups	335,260	2	167,630	3,551	**,031***	14-13
	Intergroups	7221,734	153	47,201			
	Total	7556,994	155				

Table 3 indicates that while no significant difference was found in bodily/kinesthetic intelligence pre-test scores of the participants according to age variable (p>0.05), it was found that there is significant difference according to the post-test scores (p<0.05).

Table 4: *T Test Analysis of The Pre and Post Test Scores of Bodily/Kinesthetic Intelligence Levels of All of The Participants*

BKI	N	M	SS	sd	t	P
Pre-Test	156	26,47	6,75	155	1,21	,226
Post-Test	156	25,51	6,98			

Table 4 shows that when the pre and post test scores were compared, no significant difference was found in bodily/kinethetic intelligence scores of the participants (p>0.05).

Table 5: *T Test Analysis of The Pre-Test and Post-Test Scores of Bodily/Kinesthetic Intelligence Scores of The Participants According to The Variable of Tennis Branch*

BKI	N	M	SS	sd	t	P
Pre-Test	81	27,27	5,44	80	1,747	,085
Post-Test	81	25,63	6,99			

According to Table 5, no significant difference was found in the bodily kinesthetic intelligence of the participants according to the variable of tennis branch when the pre-test and post-test scores were compared (p>0.05).

Table 6: *T Test Analysis of The Pre-Test and Post-Test Scores of Bodily Kinesthetic Intelligence Levels of Participants According to The Variable of Table Tennis Branch*

BKI	N	M	SS	sd	t	P
Pre-Test	75	25,60	7,87	74	,175	,862
Post-Test	75	25,37	7,01			

According to Table 6, no significant difference was found in the bodily/kinesthetic intelligence levels when pre-test and post-test scores were compared (p>0.05).

4. Discussion and Conclusion

Individuals who are dominant in bodily/kinesthetic intelligence are expected to be inclined to sports activities. This study was conducted with the aim of investigating the bodily/kinesthetic intelligences of students attending basic sports events.

When the literature was reviewed in general, in most of the studies conducted, is seen that there are research studies on multiple intelligences (Planinsec and Pisot 2006; Kaur and Chikkara 2008; Neto et al. 2008; Swami et al. 2006; Furnham, 2001; Furnham et al. 2009; Saban et al. 2012). Some similar studies are also encountered in the literature such as the study of (Ozgur et al. 2016; Jones, B., D. 2009) However, the number of studies on bodily kinethetic intelligence is fairly limited. The present study carried in this context can be a reference for this type of intelligence.

In this study, no significant difference was found in the pre-test and post-test analysis of bodily kinesthetic intelligence according to gender variable (p>0.05). On the other hand, while the average scores pre-test of the intelligence level is considered, it was seen that male students' scores are higher than those of female students. However; while the average scores post-test of the intelligence level is considered, it was seen that female students' scores are higher than those of male students. In the studies of Kaur and Chikkara (2008), Ozgur et al. (2016) and Emmiyati et al (2014) it was revealed that intelligence levels of males are more dominant compared to those of girls, which is similar to pre-test result of our study.

In this study, it is observed that while there is no significant difference in the pre-test analysis of

bodily/kinesthetic intelligence level according to the variable of age, there is a significant difference in the post-test analysis ($p<0.05$) and this aforementioned difference appears when the age increases (Table 3; 14-13). In addition, in this study, no significant difference was found in the pre and post-test analysis of bodily kinesthteic intelligence levels of all of the participants and the branch variables ($p>0.05$). Contrary to this finding, in the study conducted by Tekin et al. (2008) with high school students who do sports and those who don't and it was found that there is significant difference between the bodily kinesthetic intelligence levels of those doing individual sport and those of the individuals not doing sport.

Consuquently, In this study, some important findings were gathered on the bodily/kinesthetic intelligence levels of school students in the developmental period. Thus, more studies are needed in order to determine and enhance the dominant intelligence levels in students in developmental period.

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The Effect of Sodium Bicarbonate ingestion on plasma Lactate, Bicarbonate and the Anaerobic Performance in female 400-meter runners

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Abstract

Sodium bicarbonate (BICA) supplement by buffering capacity and delaying the metabolic acidosis, may improve exercise capacity, but there are controversial results could be related to the various type and intensity of exercises. The purpose of this study was to investigate the effect of BICA ingestion on blood pH, bicarbonate (HCO3-), lactate (BLa), and anaerobic capacity in the female 400-meter runners. This research method was semi-experimental. 17 female runners (age= 20-27 yrs., BMI= 20.40 ± 1.41 Kg.m-2) participated in this research. The protocol was held in two sessions with one-week rest time between sessions. The blood sampling was collected to evaluate serum pH, HCO3-, and BLa, which was done before and after 400-meter running (Pre1-Post1) in the first session (Control), and three times [before supplementation (Pre*1), 70-minute after supplementation (Post*1), and 2-minute after test (Post*2)] in the second session (BICA). The running time was recorded in each session. The results showed 400-meter running cause significant decrease in serum pH (t= 59.5, sig=0.01*), HCO3 (t= 17.91, sig=0.01*), and increase in serum BLa (t= 50.19, sig=0.01*) in control group. After supplementation (BICA) pH, HCO3 and BLa increase from rest (Post*1) and after 400-meter running pH, HCO3 decreased and BLa increased (Post*2) ($p<0.05$). The comparing Post*2 with Post1 showed BICA caused significantly increase pH, and BLa and decrease the 400.meter running time ($p<0.05$). This research recommends this dosage of BICA supplementation could be effective to reach a better record in 400-meter running that may have related to metabolic acidosis.

Keywords: Sodium Bicarbonate supplement, Bicarbonate, Blood Lactate, 400-meter running

1. Introduction

Sodium bicarbonate ($NaHCO_3$) with wide-ranging effect on metabolisms such as phosphocreatine reaction, glycolytic, intra/extra-metabolic distribution in muscle, the velocity and the force of muscle contraction, motor pathway, and athletic performance [1]. Bicarbonate ions (HCO_3^-) cannot diffuse into intracellular space and combines with H^+ ions extracellular -which could improve the pH and produces carbonic acid which could decompose and produce water and carbon dioxide [2]. $NaHCO_3$ supplementation (BICA) is used to defend against H^+ ion accumulation and muscle fatigue [3] and decrease lactate concentration by enhancing buffering capacity [4]. The metabolic acidosis causes the rightward shift oxyhemoglobin dissociation cure [5], and the $NaHCO_3$ caused leftward shift cure that may correct metabolic acidosis [6]. BICA supplementation is used by regarding different aim in different type (aerobic/anaerobic) and intensity of exercise as before intermittent exercise induce metabolic alkalosis, increase blood HCO_3^- concentration and attenuate the decline blood pH, but there are contradictory results in physical performance [3, 4, 7-9], as Miler et al. reported oral BICA supplementation improve total work in sprit capacity [4] and Carr et al. recommend oral BICA supplementation improve power in high-intensity activity in short duration [3] whereas, Price et al. reported the ingestion BICA before intermittent exercise type had no significant effect on performance [8]. The first aim of this study was the effect of anaerobic activity on pH, bicarbonate (HCO3-), lactate (BLa), and the second aim was the evaluation these variables and anaerobic capacity following BICA supplementation in the female 400-meter runners.

2. Method

2.1. Participants

The participants were informed of the risks and discomforts associated with the experimental procedure completely. All the participants signed written consent. The present study was carried out in Najafabad Branch, Islamic Azad University in winter 2016. The study was approved by the Local Ethics Committee affiliated Islamic Azad University, Najafabad Branch of Medical Sciences

(IR.IAU.NAJAFABAD.REC.1396.75).

The participants were female who had registered in track and field (400m) in Shahin Shahr and Payam-e Noor University of Shahin Shahr. 17 female volunteers participated in our study. The inclusion criteria were female 400-meter runner track and field, the age duration was 20-27 yrs. The exclusion criteria were no regular participating in sessions of team training.

2.2. Materials

The body mass of runners was recorded with light clothing by using a portable scale (seca Vogel 7 Halk German model: 760 1029009), and the high was measured without shoes by a portable wall-mounted ruler in the upright position (accuracy 0.1 cm). Body Mass Index [BMI ($Kg.m^{-2}$)] was calculated [10].

The blood samples were drawn by 5-ml syringes from each subject into heparin tube before/after the running test in the first session, before/after bicarbonate supplementation and after running test in the second session. The blood tubes kept in bag ice and were sent to the laboratory and were centrifuged at 3000 rpm for 10-min. The OPTI®CCA Blood Gas and Electrolyte Analyzer was used to pH determine, and the plasma lactate was measured by using the Erba XL600.

2.3. Procedure

In the first session, after blood sampling (Pre1) the subjects warmed-up for five-minute and performed 400-meter running test, the time was recorded and immediately blood sampling was taken (Post1). One week later, in the second session, after blood sampling as a pre-test (Pre*1), the subjects drank bicarbonate supplement 300 $mg.Kg^{-1}$ (body mass) were solved in 250 ml. water [3, 4] with a slice of cake and drank a half glass of juice to prevent gastrointestinal symptoms. 15-minute later blood sampling was collected as Post*1, 60-minute after supplementation, subjects warmed-up for five-minute and performed the 400-meter running test. The time was recorded, and immediately blood sampling was taken (Post*2). The duration time between first and last blood sampling was 75-minute.

2.4. Statistical analysis

Descriptive analysis was adopted for demographic and clinical characteristics are reported as mean ± Standard Deviation (SD). Data analyzed using parametric tests following conformation Shapiro-Wilk test and Levene's test to determine the normality and homogeneity of distributions respectively, (P> 0.05). The difference between pre and post tests were assessed by using T-dependence test, the difference between groups in performance (record time) was assessed by using T-independence test. Repeated measures analysis of variance (RMANOVA) was used to measure the difference between stages in the second session with LSD post hoc test. The Mauchly's test of Sphericity was used to show the dependent variables, if there were no dependent variables, the epsilon of Greenhouse-Geisser was used to analyze the F static (P<0.05).

3. Results

In the first session, (as control group) the pH, HCO_3^-, BLa were measured before and after (Pre1-Post1) 400-meter running test and t dependent test demonstrated significant decrease in pH (t= 59.5, sig=0.01*), HCO_3^- (t= 17.91, sig=0.01*), and increase in serum BLa (t= 50.19, sig=0.01*) (p<0.05), which has been in Fig 1.

In the second session (BICA group), blood pH, HCO_3^-, and BLa were measured three-time [before supplementation (Pre*1), 70-minute after supplementation (Post*1), and 2-minute after 400-meter running test (Post*2)], that have been in Fig2. The Mean and Standard Deviation of three-stage of levels of all variables, and RMANOVA Test have been shown in Table 1 (p<0.05). Also, the pairwise comparison of RMANOVA Test have been shown in have been in Table 2.

By comparing post-tests (Post1 with Post*2) of variables in first and second session by using T dependence test (p<0.05), pH and BLa. significantly increased, the time of 400-meter running decreased, and HCO_3^- had no change following BICA supplementation and 400-meter running, which has been shown in Table.2.

Table 1. The descriptive and the test of the between subjects' effect of Repeated measures analysis of variance (RMANOVA)

Variable	Pre*1 (n=17)	Post*1 (n=17)	Post*2 (n=17)	F	ig.	P artial Eta	Obs erved Power
	MD ±	MD ±	MD ± SD				

	SD	SD					
pH	7.40 ± 0.06	7.44 ± 0.02	7.27 ± 0.05	42.09	.00*	0.73	1.00
HCO_3^- (mmol.L^{-1})	21.62 ± 0.51	26.14 ± 0.48	16.08 ± 0.74	242 3.92	.00*	0.99	1.00
BLa. (mg.dL-1)	10.93 ± 2.11	14.18 ± 4.40	96.43 ± 21.11	558.87	.00*	0.97	1.00

HCO3$^-$, bicarbonate; BLa, lactate; MD, Mean Difference; SD, Standard Diviation. *Significant (P< 0.05), df = (2,15).

Table 2. The descriptive and T dependence test of post-tests of variables in first and second session

Variable	Post1 First session (Control) (n=17)	Post2* Second session (BICA) (n=17)	T	Sig. (2-tailed)
	MD ± SD	MD ± SD		
pH	7.16 ± 0.04	7.27 ± 0.05	5.85	0.01*
HCO_3^- (mmol.L^{-1})	18.24 ± 0.95	16.08 ± 0.74	2.06	0.05
BLa. (mg.dL-1)	75.46 ± 8.42	96.43 ± 21.11	4.50	0.01*
400-meter running (min)	1.55 ± 0.18	1.43 ± 0.07	3.68	0.01*

HCO3$^-$, bicarbonate; BLa, lactate; MD, Mean Difference; SD, Standard Diviation. *Significant (P< 0.05) (df= 16).

4. Discussion and Conclusion

The results showed that in the first session (Control group) 400-meter running caused 2.49 ± 0.89% and 25.65 ± 7.19% significant decrease in serum pH and HCO_3^-, respectively, and 569.76 ± 176.91% increase in serum BLa. following 400-meter running. In our study the increased BLa. was in line with Froio de Araujo Dias et al. following six cycling capacity test [11], Gough et al. following a graded incremental exercise [12], Carr et al. after hypertrophy resistance training [13], Price et al. following intermittent exercise [8]. and Freis et al. after the exhaustive graded running test [14].

In the second session after BICA supplementation prior every trial, pH, HCO_3^-, and BLa increased 0.53 ± 0.91%, 21.66 ± 11.88% and 30.49 ± 35.78% respectively. The increase of pH, HCO_3^- was in line with Froio de Araujo Dias et al. [11], Higgins et al. [15], Gough et al. [12], Carr et al. [13], Goldfinch et al. [16], Price et al.[7, 8], and Carr et al. [17]. Carr et al. reported from 38 studies, although there is a small correlation between the increase of HCO_3^- after BICA supplementation prior every trial and performance, but the improved performance is affected by pH [3].

After 400-meter running following BICA (second session), pH and HCO_3^- decreased 1.78 ± 1.08%, 25.36 ± 12.63% respectively, and Bla. increased 814.91 ± 263.39%. The depressed HCO_3^- was in line Price et al. following intermittent exercise [8], Gough et al. [12], and depressed HCO_3^- and pH was in line Zabala et al. after Wingate Test in elite bicycle motocross rider [18], Goldfinch et al. following 400-meter running [16], Freis et al. after exhaustive graded running test [14], whereas. Cameron et al. reported higher pH and HCO_3^- in BICA than placebo condition during high-intensity exercise in well-trained rugby players [9]. The elevated lactate was in line Froio de Araujo Dias et al. following six cycling capacity test [11], Carr et al. following resistance training [13], Cameron et al. following during high-intensity exercise in well trained rugby players [9] Price et al. following intermittent exercise [8], Freis et al. after exhaustive graded running test [14], Higgins et al., following graded incremental cycling test [19], Krustrup et al. following high intensity intermittent exercise [20].

Also, by comparing these variables at the end of the first and second sessions the significant decrease had shown in HCO_3^- 36.05 ± 12.06%, and increase in pH and BLa 1.78 ± 1.08%, 664.67± 291.45%, respectively.

The higher pH in BICA group comparing control group was in line with Cameron et al. [9] Higgins et al. that reported an increase in pH, HCO_3^- and BLa following graded incremental cycling test [19]. Krustrup et al. reported higher Bla. following high-intensity intermittent exercise and BICA supplementation [20]. Froio de Araujo Dias et al. reported more elevated lactate in BICA trials comparing to control but not in all subject [11]. The change of pH could effective on BLa accumulation as $NaHCO_3$ by enhancing buffering capacity [4] and may help to lactate transport to oxidative skeletal muscle, that may affect to pH muscle regulation [21].

BICA supplementation caused 7.02 ± 6.45% decreased the time of 400-meter running, which was in line with Goldfinch et al. following 400-meter running [16] Gough et al. following a graded incremental exercise [12], Freis et al. following exhaustive graded exercise test [14]. The BICA supplementation was reported by Miler et al. to improve total work in sprint capacity [4] Carr et al. to improve power in high-intensity activity in short duration, [3], Price et al. to improve peak power express on prolonged intermittent cycling trial [7], and Higgins et al. to increase cycling capacity in untrained- cycling males [19]. Carr et al. noted the ingestion BICA supplementation resulted significantly more total repetitions in hypertrophy resistance training [13], Araujo Dias et al. reported improve in one trial high-intensity cycling capacity, but BCIA supplement could not improve high-intensity cycling capacity [11]. Other studies noted to no significant effect of BICA supplementation on performance, as Price et al. reported BCIA supplement had no significant improve exercise performance [8] in Wingate performance in elite BMX rider [18], and the following rugby specific repeated test in well-trained rugby players [9]. Despite the fact that the organization of BICA supplementation to enhance pH is controversial, but in sports science, BCIA supplementation (300-500 $mg.Kg^{-1}$) by facilitating efflux of H^+ from involved muscle tissue postpones fatigue shows its ergogenic impact. Although, the type of exercises (energy resource, the duration time of physical activity), the physical fitness of subjects, and the side effect of gastrointestinal syndrome following BICA supplementation ingestion may be the effective factors for controversial in results. We chose 300 $mg.Kg^{-1}$ BICA supplementation that showed the greatest effect on performance [22] by facilitating efflux H+ from involved tissue and decrease pH, and by delaying fatigue has an ergogenic effect [16], that could impact on record time of short duration efforts [3].

The side effect of BICA supplementation by increasing gastrointestinal disturbance could decline performance [22] was one our study limitation. Also, changes in the concentration of female reproductive hormones during the menstrual cycle may be associated with changes physiological variables relevant for physical performance was another our study limitation. The results of trials investigated differences in physical performance between cyclic phases are inconclusive- indicating better performance during luteal phase [23], follicular phase [24], or no difference [25], other study support of reduction in maximal endurance performance in luteal phase, but these effects were not observed for sprint performance [26]. Although, none of them controlled in our study.

This research recommends 300 $mg.Kg^{-1}$ dosages of BICA supplementation could be effective to reach a better record in 400-meter running by facilitating efflux of H^+ from involved tissue and decrease pH, by delaying fatigue has an ergogenic impact.

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Investigation of the Relationship Between 2d: 4d Finger Ratio and Aggression Level in University Students According to the Education Area

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Abstract

In this study, the relationship between 2D: 4D finger ratio and aggression level in university students was investigated. "Aggression Inventory" was administered on a total of 354 university students- 119 men and 235 women-studying in different departments and their finger length measurements were taken. Destructive, passive and total aggression values were significant in terms of gender ($p<0,05$). The differences between Left 2D:4D and Right 2D:4D values of men and women were not found to be significant ($p>0,05$). No statistically significant difference was found between destructive aggression, passive aggression and total aggression values in terms of the students' departments ($p>0,05$). Statistically significant association was found in Left 2D:4D value in terms of the students' departments ($p<0,05$). When the Left 2D:4D values were examined, the students in the department of mathematics were found to have higher values than the students of other departments. No statistically significant difference was found between aggression inventory, the subscales and finger length rates ($p>0,05$). Although it was found that there were no associations between the aggression levels and finger length rates of university students studying in different departments, it is recommended to conduct the study with different groups and a great number of participants as the sample group.

Keywords: 2D:4D Finger Ratio, Aggression

1. Introduction

Aggression is an act towards a person or an object, and it is the expression of emotions such as anger, rage, hatred and hostility through behaviours by exerting verbal or physical force. In other words, aggression is an individual's behaviours aiming to hurt oneself or others, making others suffer by hurting them and maltreating them (Can, 2002). Studies conducted have shown a significant positive association between testosterone and aggressive behaviour and criminal acts (George et al.,2001; O'connor et al., 2004). There are different views on using second and fourth finger (2D:4D) ratio as an indicator of aggression and anger behaviours. Robinson et al. (1998), found negative association between testosterone levels and 2D:4D ratios in men and they concluded that the reason for this was the control of Hox genes on the development of fingers and testicles. Robinson et al. (1998), stated that second and fourth finger ratio was positively associated with oestrogen and negatively associated with prenatal testosterone. A great number of studies conducted found that finger development was influenced by hormones individuals were exposed to in prenatal period and the first years of life. Thus, it is possible to speak of a common mechanism influencing finger structure and behaviours. There is no absolute conclusion about the influences of androgens exposed to in prenatal period on finger development. Geschwind and Galaburda (1985) argued that while prenatal testosterone delayed the development of some areas in the left hemisphere of the brain, it increased the development of corresponding areas in the right hemisphere. It is argued that as a result of its influence on the right hemisphere, visual-spatial, mathematical and musical abilities develop. However, it is also argued that high testosterone in prenatal period can influence brain development, increase tendency for depression and also cause aggression with loss of control (Maning, 2002). These studies show the association between 2D:4D ratio and the development of nervous system which can influence human behaviour including violence and aggression. When the literature is reviewed, there are different views on using 2D:4D ratio as an indicator to predict aggression and anger behaviours. Hoxa and Hoxd genes are known to be responsible for the development of both fingers and gonads. It is still being disputed about how the influences of androgens individuals are exposed to in prenatal period on finger development are reflected on individual's behaviours. Doğan did not find a strong association between 2D:4D ratio and aggression in general when all the variables were taken into consideration (Doğan, 2006). There are studies in literature which have examined the associations between finger length and aggression (Austin et al., 2002; Barley&Hurd, 2005;

Benderlioğlu&Nelson, 2004; Fink et al., 2003). It was thought that the association between 2D:4D finger ratio and aggression level should be analyzed and the issue should be clarified. The purpose of our study was to analyze the association between finger length ratio and aggression.

2. Method

2.1. Participants

Participants "Aggression Inventory" was administered on a total of 354 university students-119 men and 235 women- studying in different departments and their finger length measurements were taken.

Procedurs Aggression Inventory: In this study, "Aggression Inventory" developed by İpek İlter (Kiper) was used as data collection tool. The inventory consists of 30 items and includes three subtests. These are destructive aggression, assertiveness and passive aggression. In the inventory, each subtest is determined with 10 questions.

Items about destructive aggression; 1, 2, 3, 13, 14, 15, 22, 23, 24, 29

Items about assertiveness; 4, 5, 6, 10, 11, 12, 19, 20, 21, 28,

Items about passive aggression; 7, 8, 9, 16, 17, 18, 25, 26, 27, 30.

The material used in the inventory is question form and answer sheet.The questions are 7-Likert type questions which are answered as "very untrue of me =-3", "somewhat untrue of me=-2", "untrue of me =-1", "undecided=0", "true of me=+1", "somewhat true of me=+2", "very true of me=+3". Theoretically, a person who answers each question with "very true of me" gets +30 points, while a person who answers each question with "very untrue of me" gets -30 points. However, since minus scores cannot be used statistically and zero will cause a problem in statistical analysis, 31 was added to each total score. Thus, the lowest score one can get from each subscale is 1, while the highest score is 61. Although the inventory did not have one, a general aggression score was obtained for each participant based on the total scores of each subscale (Çiçek, 2006).

2.2. Materials

Finger length measurements: Finger lengths were measured with digital 0-150 mmx 0.05 mm Vernier make calliper. The subject was made to stand with palms of the hand showing up and stiff, and the measurement was made when the thumb was a bit apart and the other four fingers were closed. The distance between the midpoint of the proximal line separating the base of the finger from the palm and the finger tips was considered as finger length (Pheasant, 1990).

Right 2D (Right hand 2nd finger length): The participants' right hand second finger length was measured from anatomical boundary. The second finger length was measured from the distance between mid-metacarpophalangeal joint and the distal tip of the second finger and the measurements were made by the same person.

Right 4D (**Right hand 4th finger length**): The participants' right hand fourth finger length was measured from anatomical boundary. The fourth finger length was measured from the distance between mid-metacarpophalangeal joint and the distal tip of the second finger and the measurements were made by the same person.

The same measurements were made for Left 2D (Left Hand 2nd Finger Length) and Left 4D (Left Hand 4th Finger Length).

Right 2D:4D (The ratio of right hand 2nd finger to right hand 4th finger): 2/4 finger index formula was recorded as (2nd finger length ÷ 4th finger length) x 100.

Staticstical Analysis: IBM SPSS 21.0 software was used to assess the data, statistical significance was determined as $p<0,05$ and Kolmogorov-Smirnov test was used to check normality. It was found that the destructive, passive aggression and assertiveness right2d4d and left2d4d scores were not distributed normally. Kruskal Wallis was used for statistical processes and Mann Whitney U test and Spearman correlation tests were used to find the difference.

3. Results

Table 1. Comparison of destructive, assertive, passive and total aggression and Right2D:4D and Left 2D:4D values in terms of gender

Variables	Gender	N	Mean rank	X² square	p
Destructive	Male	119	215,74	25,06	,000**
	Female	235	158,13		
Assertive	Male	119	180,17	0,12	,726
	Female	235	176,15		
Passive	Male	119	198,83	7,80	,005*
	Female	235	166,70		
Aggression	Male	119	207,08	14,98	,000**
	Female	235	162,52		
Right 2D:4D	Male	119	164,36	2,97	,084
	Female	235	184,15		
Left 2D:4D	Male	119	162,97	3,64	,056
	Female	235	184,48		

*p<0,05 and ** p<0,001

In terms of gender, destructive, passive and total aggression levels were found to be statistically significant (p<0,05). Mean rank average values of male participants were found to be higher when compared with female participants. No significant differences were found between male and female participants in terms of Right 2D:4D and Left 2D:4D values (Table 1).

Table 2. Comparison of destructive, assertive, passive and total aggression and Right2D:4D and Left 2D:4D values in terms of students' departments

Variables	Department		Mean rank	X² square	p
Destructive Aggression	Music (1)	7	185,52	5,77	0,328
	Medicine (2)	0	162,53		
	Mathematics (3)	9	178,14		
	Sport (4)	6	202,82		
	Art (5)	6	173,72		
	Language (6)	6	167,13		
Assertive	Music (1)	7	180,02	6,98	0,222
	Medicine (2)	0	168,74		
	Mathematics (3)	9	174,30		

	Sport (4)	6	208,46			
	Art (5)	6	174,42			
	Language (6)	6	163,34			
	Music (1)	7	174,50	231	0,804	
	Medicine (2)	0	183,93			
Passive Aggression	Mathematics (3)	9	179,34			
	Sport (4)	6	159,99			
	Art (5)	6	179,57			
	Language (6)	6	184,94			
	Music (1)	7	179,54	2,66	0,752	
	Medicine (2)	0	166,32			
Total Aggression	Mathematics (3)	9	182,41			
	Sport (4)	6	193,53			
	Art (5)	6	176,24			
	Language (6)	6	169,48			
	Music (1)	7	171,11	6,99	0,221	
	Medicine (2)	0	161,93			
Right 2D:4D	Mathematics (3)	9	204,51			
	Sport (4)	6	166,54			
	Art (5)	6	172,74			
	Language (6)	6	186,13			
	Music (1)	7	157,87	18,71	0,002*	
	Medicine (2)	0	162,19			3>1,2,4**
Left 2D:4D	Mathematics (3)	9	225,22			3>5,6*
	Sport (4)	6	160,75			
	Art (5)	6	167,58			
	Language (6)	6	186,86			

*p<0,05 ** p<0,001

No statistically significant difference was found between destructive aggression, assertiveness, passive aggression and total aggression values in terms of students' departments (p>0,05). Statistically significant difference was found between Left 2D:4D values in terms of students' departments (p<0,05). When Left 2D:4D values were examined, it was found that mathematics department students had higher values than the students of other departments. These high values were significant in mathematics department according to Mann Whitney u test when compared with music, medicine and sport department at the level of 0,001 and at the level of 0,05 when compared with the departments of art and language (Table 2).

Table 3: Association between aggression inventory and finger length ratios

	height	weight	destructive	assertive	passive	aggression	Right2D: 4D	Left 2D:4D
Age	,256**	,261**	,056	,106*	-,035	,048	-,165**	-,138**
Height		,671**	,271**	,027	,161**	,218**	-,129*	-,080
Weight			,205**	,060	,076	,157**	-,124*	-,104
Destructive				,187**	,590**	,841**	,036	-,027
Assertive					,022	,495**	,035	,004
Passive						,762**	-,025	-,067
Aggression							,015	-,051
Right 2D:4D								,483**

No significant association was found between aggression and subscales and finger length ratios (p>0,05). A positive significant association was found between Right2D:4D and Left 2D:4D (p<0,001), (Table 3).

4. Discussion and Conclusion

Akyol [14] found that finger lengths or ratios could differ in terms of gender In their study, Benderlioğlu and Nelson [10] reported that low 2D:4D ratio was associated with high reactive aggression in women. In their study on 2D:4D ratio of university students, Giffin et al. [15] found that all male subjects had significantly lower 2D:4D ratios than women. Akyol [14] reported that right and left 2D:4D ratios of male and female dancers were very close and argued that these close values in finger ratios could result from endocrine system or genetic factors. Baker et al. [16] compared 2D:4D ratio and hand preference in elite handball players. In their study, they found a high ratio only in men when normal population and left-handed population were compared and found low 2D:4D ratio in both men and women. In a study they conducted on 1.052 individuals, Manning and Pickup [17] found that right hand 2D:4D ratio was lower in men when compared with women. Bailey and Hurd [9] implemented aggression scale on 298 students with an average age of 19 years and found that men had lower 2D:4D ratio when compared with women. Manning et al. [18] found that 2D:4D ratio was lower in men when compared with women and the difference was weak but statistically significant. In their study they conducted on 230 men and 120 women whose ages varied between 18 and 30, Putz et al. [19] found that all the measurements about 2D:4D showed statistically significant differences in gender and men had lower 2D:4D ratio when compared with women. In our study, 2D:4D finger lengths of male subjects were found to be lower than those of female subjects. However, no significant difference was found in Right 2D: Right 4D and Left 2D:Left 4D values between men and women.

In one study, it was found that 2D:4D ratio of professional football players were lower when compared with the control group; elite team players have lower 2D:4D ratio when compared with junior team; while national team players have lower ratios when compared with players who are not in the national team. Low 2D:4D ratio in men has been reported to be associated with high success in many sport

branches, including football [20]. In their study on university student athletes, Giffin et al. [15] found a negative association in the comparison of 2D:4D ratio with many factors such as aggression, physical fitness and athleticism. In their study, they found that both male and female university students who were athletes had lower finger ratio when compared with university students who weren't athletes. In our study, Right 2D:4D finger length ratios of sport students were found to be lower than those of medicine students. Music, mathematics, art and language department students were found to have higher Right 2D:4D finger length ratios than sport students. Left 2D:4D finger length ratios of sport students were found to be the lowest following music department students. Left 2D:4D finger length ratios of medicine, mathematics, art and language department students were found to be higher than those of sport students.

In their study on the effects of 2D:4D finger length ratios on numerical-verbal-equal weight tendency, Cebe and Varol [21] found significant results in left hand finger ratios in terms of fields. In this study, left hand ratios of mathematics department students were found to be different when compared with the other departments. In a study conducted on 75 7-year-old students in Bath University in England, it was concluded that while the testosterone hormone released in the body increased the development of mathematical ability areas in the brain, oestrogen led verbal abilities.

In a study which analyzed the association between fourth finger length and aggression, a significant association was found between physical aggression results and the length of right and left hand fourth finger [6]. In Bailey and Hurd's [9] study, an association with male gender which was argued to develop along with sexual hormones was found between finger ratios and physical aggression. They reported that men with low finger length ratio had statistically significantly high physical aggression scores and finger length ratios in men were not indicators of anger, hostility and verbal aggression. They also reported that finger length ratios in women were not indicators of physical aggression, anger, hostility and verbal aggression. In their study, Austin et al. [8] did not find a significant association between physical aggression, verbal aggression and total aggression scores and finger ratios. Akyol [14] found a positive correlation between the Right-Left 2D, 4D finger lengths and Right-Left 2D+4D parameters of female dancers. Significance was not found in any of the parameters in correlation analysis conducted on male dancers. Austin et al. [8] did not find a significant association between finger ratio and aggression. Doğan [7] found that both right and left 2D:4D ratios of men were lower than those of women and the difference between was statistically significant ($p<0.05$). In another study conducted on 1.052 individuals, Manning and Pickup found that right hand 2D:4D ratio was lower in men when compared with women, which was in parallel with the results of the previously mentioned study. Doğan [7] found a weak association between physical aggression scores which can be considered as a way ofbehaviour associated with right 2D:4D ratio in men. In our study, no significant association was found between aggression and sub-scales and finger length ratios.

It was found that the level of aggression in university students studying in different departments did not correlate with finger length ratio. According to the field of study, there is a difference in the left hand ratio in 2D: 4D fingers in university students. Children who have a high 2D: 4D finger ratio should be directed to be educated in numerical areas. Children with low 2D: 4D finger ratio should be trained to be performance athletes or directed to schools providing sports training. 2D: 4D Children with a high finger ratio should be raised as athletes who use the left hand and the left foot if they are directed to perform sports.

It was found that aggression levels in university students studying at different departments were not associated with finger length ratio. It is recommended that the study should be conducted on different groups and higher number of subjects.

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Health Maintenance of Person: Experience of Waldorf School

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Abstract

The problem of formation of healthy young generation requires analysis of theory and practice of schools which aim at children's health maintenance. The article is dedicated to generalization of world and Ukrainian experience of activity of Waldorf schools that practically solve the problem of ensuring healthy spiritual-mental-physical development of person. For conducting the research, the theoretical methods (analysis, synthesis, systematization, generalization) and empirical methods (observation, assessment, methods of psychological-pedagogical diagnostics) have been used. The results of the study have shown that pupils' health maintenance is carried out due to using health potential of pedagogical means. In pupils have better indicators of physical and mental health. Waldorf school pupils have well-developed qualities of perception of information, mathematical and other abilities. Waldorf school has positive influence on development of such qualities as individual initiative, creativity, independence of decisions, ability to work with people and social mobility. There are almost no unemployed people and people with asocial behaviour among Waldorf school graduates; they work in social sphere, education, medicine etc. So, solving the problem of pupils' health maintenance requires comprehension and creative use of comparison with pupils of traditional schools, Waldorf school Waldorf school theory and experience in pupils' health support. Then, a sentence must be mentioned regarding the implications of the study.

Keywords: Waldorf school, Traditional school, Health maintenance, Person, Experience

1. Introduction

Formation of healthy generation, person's conscious attitude to his health and other people's health is one of the priorities of schools nowadays. However, we should note that school education does not realize its health maintaining function fully. For instance, according to statistic data, more than 80% of schoolchildren suffer from chronic diseases. It is caused by unfavourable social-economic, ecological and hereditary factors. At the same time, didactogenous factors are also among risk factors. These didactogenous factors are: imperfect organization of educational process, informational overload, problems in interaction between teacher and schoolchildren, prevalence of reproductive nature of teaching etc.

In educational practice the problem of schoolchildren's health maintenance is solved mainly due to implementation of medical and hygienic measures, but health maintaining potential of pedagogical means and approaches remains incompletely implemented.

Scientific substantiated solution to the problem of formation of schoolchildren's health due to education encourages scientists to make a thorough analysis of the theory and practice of schools that are aimed at schoolchildren's health maintenance.

One of the examples of such a school is Waldorf school. It practically solves the problem of ensuring person's healthy physical-mental-spiritual development and it organizes educational process on the basis of child's healthcare and health maintenance. It is proved by the results of the researches carried out over the past ten years both in Ukraine and Russia and western countries where Waldorf pedagogy has a long tradition.

2. Literature Review

The analysis of publications and researches proves that philosophic, psychological-pedagogical bases of Waldorf pedagogy were substantiated, first of all, in scientific heritage of a founder of Waldorf school – Rudolf Steiner (1861-1925), a famous European thinker, scientist, pedagogue. The theoretical foundations of Waldorf pedagogy were also revealed by modern scientists, in particular H. Bartz and D. Randoll [1],

O. Ionona [2], A. Pinskyi [3] and other scientists. Moreover, modern researchers study both theoretical basis and practical aspects of Waldorf education. For instance, O. Ionova [4] analyzed Waldorf school experience in the context of Ukrainian national pedagogical theory and practice; S. Luparenko [5] studied the peculiarities of development of junior pupils' cognitive activity by means of Waldorf pedagogy; O. Lukashenko [6] investigated the use of Waldorf school achievements for maintaining health in young learners; V. Partola [7] analyzed the specific features of formation of intellectual skills of junior pupils in the learning process of Waldorf school.

The aim of the article is to analyze world and Ukrainian experience of activity of Waldorf schools that practically solve the problem of ensuring healthy spiritual-mental-physical development of person.

3. Method

A complex of methods was used to carry out this research. They were theoretical and empirical methods. The theoretical methods were analysis, synthesis, systematization and generalization for studying scientific-pedagogical sources, periodicals and statistic data concerning organization of the process of personal health maintenance at Waldorf school. The empirical methods were methods of pedagogical observation, assessment for the analysis of Waldorf schoolchildren's health; methods of psychological-pedagogical diagnostics for comparing the levels of development of schoolchildren at Waldorf and traditional schools (questionnaire for determining the formation of motivational sphere; "Anesthetic scale" by J. Kondash; self-esteem test by S. Budassi; A. Luriia's technique for identifying the ability of short-term memorization; J. Buck's technique "House-Tree-Man" to study personality traits; techniques "Picture by the fairy tale" and "Unknown animal" for diagnosing the mental states of personality; technique "Classification of stories in pictures" for identifying the level of formation of logical thinking, creative fantasy and ability to distribute attention; Horn's test of creativity imagination; Kern-Jiráskův test for determining the level of development of graphic skills, attention, motor skills and sensomotorics).

4. Results

World Studies of Waldorf Schools

The study "School and Health" was conducted by universities in Bielefeld and Helsinki (Finland) in 1990s in order to determine the influence of school learning on children's psychosomatic health. Several thousand schoolchildren of Waldorf schools and traditional schools were examined. It has been found that percentage of children who have mental illnesses at Waldorf schools is lower than at traditional schools. At the same time, this percentage has tendency to decrease at Waldorf schools while at traditional schools it has tendency to grow. The same thing is about children's physical health disorders, in particular frequency of headaches, disorders of the digestive system etc.

The level of interpersonal communication of Waldorf schoolchildren is high enough. Children like to learn, have more responsible attitude to what happens in the classroom; the level of their discipline and self-organization is higher. Incidents of violence among children happen at Waldorf schools less often than at traditional schools [2].

Quite large-scale comparative studies of schoolchildren's health were carried out during 2006. 6630 schoolchildren aged 6 to 13 years (4606 Waldorf schoolchildren and 2024 pupils of other schools) form five Western European countries (Austria, Holland, Germany, Switzerland and Sweden) took part in the studies. The researchers were particularly interested in detection of various types of infection and allergy which are quite common among children nowadays.

The conducted studies have shown that Waldorf schoolchildren have better health indicators than pupils of traditional schools. For instance, Waldorf schoolchildren suffer from pollinosis and eczema 20-30% less often and from allergy 32-39% less often than pupils of traditional schools [8].

Büssing, Ostermann, Jacobi, Matthiessen [9] have found out that in adulthood Waldorf school leavers suffer from allergy, arthose, hypertension and other diseases less often than in Germany in the whole (according to the data of Robert Koch Institute). Former Waldorf schoolchildren have ability to withstand significant loads, life difficulties and crises [1].

In order to determine possible reasons for these results, scientists observed children's lifestyle in their families. The obtained data showed that 40% of Waldorf schoolchildren had never used antibiotics and 43% of Waldorf schoolchildren had never used antipyretics (paracetamol, in particular), while respectively only 15% and 8% of pupils of traditional schools had never used antibiotics and antipyretics. Only a quarter of Waldorf schoolchildren were vaccinated against childhood diseases such as measles, rubella and mumps,

while three fourths of pupils of traditional schools were vaccinated. One third of Waldorf schoolchildren had measles in comparison with one tenth of pupils of traditional schools. There was also rather significant difference in children's nutrition: three fourths of Waldorf schoolchildren eat organic, environmentally "clean" products (in comparison with one fourth of schoolchildren of traditional schools) [10].

The scientists concluded that anthroposophic understanding of a man was justified. According to it, infectious diseases, "childhood diseases" in particular, promote the construction of a strong immune system. That is why Waldorf schoolchildren's parents have restrained attitude to vaccination in order not to take away opportunities to strengthen children's health due to childhood diseases. Also, parents seldom give antibiotics and antipyretics to their children. Moreover, child's ecological nutrition, which is of particular importance at Waldorf schools, maintains child's vitality.

The achievements of Waldorf pedagogy are also confirmed by international independent comparative pedagogical researches which identify the quality of schoolchildren's achievements in different countries of the world. These researches are TIMSS (study of natural and mathematical education), PISA (study of reading and comprehension of texts) and numerous researches carried out by independent experts in the countries where Waldorf schools have already existed for many years (Denmark, Finland, Sweden, Switzerland and Germany) [2; 11; 12; 13].

For example, V.Hiller (Association of Waldorf Schools in Germany) emphasizes that these studies generally confirmed the correctness of the Waldorf approaches: a number of Waldorf principles were similar to those which are the basis for construction of the education system in the countries that showed the best results of schoolchildren's academic achievements. For instance, schoolchildren study in the same class for 9 years in Scandinavian countries and for 8 years in Sweden and Norway; teachers do not put marks to schoolchildren up to the seventh grade in Denmark. As V.Hiller asserts, children's later differentiation on academic achievements is a secret of success of Scandinavian countries as well as Waldorf school [14].

According to the statistic data, quite a large percentage of Waldorf school leavers enters universities. For example, in Germany, the number of Waldorf school leavers-entrants who successfully passed the abitur (state exams that give right to enter universities) is 20-30% more than the national average (such statistics has remained stable for decades) [12; 14]. It means that the number of pupils who can enter universities is more at Waldorf schools, where children study for 12 years on non-selective basis, than at traditional schools which one way or another carry out the selection of pupils. It should be noted that abitur at Waldorf school is taken according to state requirements and under strict control of state educational institutions.

The statistic data on professional orientation of Waldorf school leavers are collected by departments of education and science in different countries and show certain success of Waldorf education.

For instance, German Waldorf school leavers are thoroughly investigated in the work of Barz and Randoll [1]. During 2003-2005, they studied 1124 former Waldorf schoolchildren who left school from 1939 to 1974 [1]. The scientists conventionally divided Waldorf school leavers into three groups. The schoolchildren of the first group (31%) are called „culturally-oriented" and have cultural and educational priorities (visiting museums and theatres, reading etc.). At the same time, they are most interested in anthroposophy: 22% of them considered themselves to be active anthroposophists. We would like to note that this number of anthroposophically-oriented former Waldorf schoolchildren does not confirm the opinion that „Waldorf school brings up anthroposophists", as such an opinion exists among pedagogical community. The schoolchildren of the second group (33%) are called „relationship oriented". Interpersonal, emotional communication with people and „life for others" are of great importance for such people. They like practical-applied activities and try to do everything with their own hands. The schoolchildren of the third group (36%) are called hedonists, and they are interested in sports, entertainments, physical comfort and enjoyment of life.

It has been found that regardless of selected types, the majority of former Waldorf schoolchildren are able to treat things and phenomena of the environment critically and consider them in all encompassing relations. The criterion of social responsibility is a priority for the overwhelming number of Waldorf school leavers. Barz and Randoll [1] explain it by social orientation of Waldorf school, its joint holidays, concerts, performances, due to which pupils can experience strong feelings of community with people who are around them.

Up to 92% of former Waldorf schoolchildren emphasize that they liked studying at school. They identify themselves with the former educational institution, evaluate schooling positively and especially distinguish cultural-artistic and practical-craft cycles. Waldorf school leavers are convinced that the school

gave them an opportunity to get good basic education, acquire such key competences as positive attitude to life, fundamental confidence in own strength, independence and ability to adapt to living conditions [1].

Similar data were obtained during in the written survey of 1586 Swiss Waldorf school leavers who left schools within 1990-1996. The survey was carried out by Swiss Independent Institute in Kilchberg in 1999. The results of the survey allowed to conclude that Waldorf education promotes formation of qualities that are highly relevant for the modern world, namely: independence, ability to interact in a group, creativity, integrated (holistic) thinking [15].

Having asked former Waldorf school leavers how they assess their chances in the labour market in comparison with pupils from traditional schools, the researchers got following results: 70% of former Waldorf school leavers assessed their chances as equally good, 16% of them thought that they are rather better than worse, 8% of them thought that they were better, 3% of former Waldorf school leavers thought that they are rather worse than better and 2.5% of them thought that they were worse. 90% of respondents gave an affirmative answer to the question of whether they have professional and personal goals for the next 3-5 years and described them clearly. The vast majority of the young people considered graduation and promotion in the professional sphere to be their immediate goal [15].

Different studies of former Waldorf schoolchildren note that up to 75-85% of them are satisfied with their profession. According to the results of the survey [15], we can conclude that most Waldorf school leavers managed to make a good choice of profession and develop professional perspectives. Positive assessment of own chances in the labour market is explained by personality strength and indicates a high level of self-confidence. The assessment of own abilities and professionalism was high as well. The school leavers evaluated the school positively and noted that first of all it brought up creativity, abilities to communicate, analyze and to make independent decisions.

So, it is not surprisingly that according to UNESCO, there are almost no unemployed among Waldorf school leavers (and the same thing is observed in the countries where the number of unemployed is constantly increasing), as well as there are almost no criminals, drug addicts, alcoholics [4; 16].

Equally important is the fact that Waldorf school leavers aspire to further education: according to the data of Barz and Randoll [1], 46.8% of Waldorf school leavers received academic education, 68.7% of them graduated from institutes or higher specialized schools.

Waldorf school leavers also show the aspiration to engage in social professions. For example, according to the statistic data obtained in Germany (Results, 1995), 28% of Waldorf school leavers work in education and social sphere. Moreover, 14.6% of them chose teaching profession, which occurs 5 times more often in comparison with other people [1], 12% of Waldorf school leavers chose work in medicine, 12% of them chose work in art and linguistics.

From the whole variety of professions, social sphere (education, medicine, social therapy etc.) is also chosen by Waldorf school leavers in other counties, in Switzerland in particular [15]. A high percentage of those who choose social sphere proves that social and altruistic motives are of great importance for former Waldorf schoolchildren in vocational guidance. However, it is only statistics. In real life, former Waldorf schoolchildren can be met in various spheres of social life where they work proactively and are ready to take responsibility.

For instance, L. Gessler's "Educational success in the light of educational biographies" [17], published by The European Community, was a real sensation in European pedagogical thought. The author analyzes Waldorf educational process and biographies of Waldorf school leavers in detail. According to the results of L. Gessler's work, a lot of famous people were among Waldorf school leavers. They were Andreas Karlgren (a politician and member of Parliament of Sweden), doctor Olaf Feldmann (a member of German Federal Parliament), Carl Otto Pole (President of German Federal Bank in 1980-1991), Jens Stoltenberg (former Prime Minister of Norway, a leader of the Labour Party nowadays), Ken Chenault (Chairman of American Express; in 2002 he was recognized as the second most influential manager in the USA), Michael Ende (world-famous writer and author of bestsellers of children's German-language literature), Ferdinand Alexander Porsche (in 1963 he created Porsche 911 which is considered as cult-car, car-dream, design miracle and "king of sports cars") and many others.

As schools are usually chosen by parents, not children, we should note famous parents of Waldorf school leavers, i.e. people who chose Waldorf school for education of their children.

Thus, a lot of children of famous parents studied at Waldorf school. They are: daughter of Silvio Berlusconi (Prime Minister of Italy), daughter of Mikhail Baryshnikov (American dancer and actor), son of Jean Paul Belmondo (French actor), daughters of Wolfgang Clement (Minister of Economic Affairs in

Germany), daughter and granddaughter of Rudolf Leiding (former speaker of the board of directors of Volkswagen, Germany), children of Jonas Gahr Store (Secretary General of the Norwegian Red Cross, former Executive Director of the World Health Organization), children of Harrison Ford (famous American actor), children of John Paul Jones (musician in Led Zeppelin, the UK), son of Helmut Kohl (former Chancellor of Germany) and many others.

As Barz and Randoll [1] note, 20% of parents choose Waldorf school for their children because they are not satisfied with public school, and 11% of them choose Waldorf school because they consciously give preference to anthroposophically-oriented education. At the same time, most parents consider an attractive Waldorf pedagogical concept (individual assistance in personal development, absence of mark evaluation, artistic and practical orientation of education etc.) to be the main motive for choosing a Waldorf school for their children.

Studies of Waldorf Schools in Russia

In recent years, studies of Waldorf pedagogy began to appear in the countries of the former USSR. For example, in Russia in 2000, psychologists of Moscow State University named after M. Lomonosov (under the direction of N. Yevsykova) studied the dynamics of mental development of children of Russian Waldorf institutions. It has been found that children at Waldorf institutions are not far behind in intellectual development and their development by some indicators (memory, in particular) is better than other children's development, despite the absence of special intellectual training and great educational load. In 2002, the scientists of Psychological Institute of Russian Academy of Education (under the direction of Ye. Smirnova) carried out the comparative studies of children's moral education at Russian Waldorf and traditional nursery schools and received convincing results in favour of Waldorf nursery schools [2; 4; 18].

Since 2000, first children began to leave Waldorf schools. In particular, 53 pupils left Moscow Waldorf school No. 1060 during ten years of its work (as for 2002). These Waldorf school leavers entered prestigious Moscow universities: 14 Waldorf school leavers entered humanitarian universities, 12 school leavers chose social-economic universities, 12 school leavers entered technical and natural science universities and 10 Waldorf school leavers entered artistic and musical universities. The survey of former Waldorf schoolchildren has showed that they are happy and pleased to recall their school that helped them to determine life prospects, formed their abilities to communicate, act and think independently.

Studies of Waldorf Schools in Ukraine

In Ukraine, the first study dedicated to checking the effectiveness of organization of schoolchildren's education according to principles of Waldorf pedagogy was carried out by O. Ionova [4] in the second half of the 1990's.

It has been found that Waldorf approaches contribute to the humanization of the learning environment, realization of educational orientation on child's individuality in the conditions of group and mass work, constant formation of child's thinking, memory, fantasy, culture of feelings and will power and thus they ensure the success of the pedagogical process. It should be noted that Waldorf schoolchildren have basically the same educational level as other schoolchildren have. However, Waldorf schoolchildren have much higher level of their personal abilities (communicativeness, love for the beautiful, hard work, curiosity, discipline etc.) and creative abilities (independence in educational-cognitive activity, development of cognitive interest).

In recent years, within the experiment "Development of Waldorf pedagogy in Ukraine" (Order of the Ministry of Education and Science No. 363, dated May 6, 2001), a number of psychological-pedagogical studies, aimed at comparison of educational results of schoolchildren of Waldorf and traditional schools, have been carried out. The basic educational institutions of the experiment are following Waldorf schools: "Stupeni" (Odesa), "Sofia" (Kyiv), "School of free child's development" (Dnipro), school No. 108 (Kryvyi Rig), educational complex No. 17 (Zhytomyr), educational complex "Buzkove hnizdo" (Gorodenky, Ivano-Frankivsk Region), educational complex "School of free development" (Kharkiv).

During the study, comparative check of knowledge of pupils at Waldorf and traditional schools were performed. The results of state attestations show that Waldorf schoolchildren's progress is higher than other schoolchildren's progress. In particular, according to the data of state attestations in Kryvyi Rig in 2002-2003 academic year, 100% of 4th grade pupils of Waldorf school were doing well at native language (the Russian language) and Mathematics and 92.8% of them were doing well at the Ukrainian language. As for traditional

schools, 81.8% of 4th grade pupils were doing well in native language, 96% of 4th grade pupils were doing well in Mathematics and 92.8% of them were doing well in the Ukrainian language.

The studies of formation of knowledge of primary school graduates and other schoolchildren who took part in the experiment have shown that Ukrainian Waldorf schoolchildren after four-year learning acquire knowledge at a level not below the level of knowledge of pupils at traditional schools.

Evaluating it as an undeniable positive moment of Waldorf schoolchildren's learning, we should note that Waldorf education also aims at formation of children's abilities. The results of the research carried out in the educational complex "School of free development" (Kharkiv) prove it. This research was carried out under the comparative International Project on Mathematical Attainment (IPMA). It was introduced by University of Exeter (the UK) and aimed at both comparison of progress of mathematical education and revelation of effectiveness of the process of teaching Mathematics on the basis of early monitoring of development of schoolchildren's thinking and formation of their mathematical abilities. Relevant studies were conducted by a group of independent experts, using tasks same for all schoolchildren of certain age.

Nine schools took part in this project in Kharkiv. Based on the results of first checking in 2000-2001 academic year, 1st grade pupils of the educational complex "School of free development" took the fifth place by rating among pupils of others schools that took part in the project. In three years, in 2003-2003 academic year, these children, being 3rd grade pupils, took the first place by rating. They demonstrated well-developed verbal-logical and spatial thinking, understanding and ability to use mathematical knowledge and skills creatively.

5. Discussion and Conclusion

Different comparative psychological-pedagogical researches of development of schoolchildren at Waldorf and traditional schools were carried out during the experiment. The obtained results give reason to assert that Waldorf schoolchildren differ from other schoolchildren.

The first point is that Waldorf schoolchildren have higher level of development of motivational and emotional spheres. It is characterized by the fact that they like to learn and go to school with great pleasure, have positive informal attitude to school and teachers, stable cognitive interest. Besides, they are oriented on independent gaining of new knowledge.

The second point is that Waldorf schoolchildren have good memory, creative imagination and concentrated attention. Moreover, at the end of the academic year, the level of their attention increases (unlike the attention of pupils at traditional schools) and the level of aggression and anxiety decreases. It shows children's good adaptation to school and emotional stability.

As for the level of development of graphic skills, motor skills and sensomotorics, Waldorf schoolchildren differ slightly from other schoolchildren.

As for the level of development of logical thinking (ability to classify and establish the sequence of events, in particular), Waldorf schoolchildren almost do not differ from pupils of traditional schools. They have slightly worse indicators of criticality of perception and ability to generalize. However, Waldorf schoolchildren are far ahead in the level of development of verbal-logical, spatial and creative thinking (they do creative tasks better).

Furthermore, Waldorf schoolchildren feel active and free at school, have well-developed empathy and sociality.

Finally, Waldorf schoolchildren know their body well and have good command of it. According to the results of medical examinations, they seldom miss classes because of illnesses in the period of avitaminosis and colds.

So, in comparison with traditional schools, children's study at Waldorf school has positive influence on their intellectual activity, individual initiative, creativity, independence of decisions, mental stability, social competence, coordination of body and movements, and therefore it contributes to child's healthy development.

The generalization of the above analysis gives reason to conclude that some scientists' ideas about Waldorf school as "art school" or "labour school" or a school suitable for sick children did not receive confirmation, as well as the ideas about Waldorf school as an educational institution where "there is good atmosphere but children do not learn anything" and where quality of knowledge is of secondary importance [19].

Furthermore, untrue is the statement that particular practice of Waldorf school leads to formation of pupils' sense of self-exclusivity and emergence of child's certain complexes, situational and personal anxiety [20].

However, it should be noted that the conducted research confirms the conclusions of the scientists [4; 5; 14; 17] about the essence of pedagogical process at Waldorf school as a means of person's holistic harmonious development.

So, we may conclude that Waldorf school theoretical principles and experience in pupils' health maintenance should be creatively comprehended and implemented in modern school for solving the task of formation of healthy young generation.

Conflict of interests

The author declares that there is no conflict of interests.

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The Relationship Between Isokinetic Shoulder Muscle Strength at Diagonal Pattern, Serve Speed and Functional Movement Screen (FMS®) in Female Volleyball Athletes

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Abstract

This study was aimed to investigate correlation between isokinetic shoulder muscle strength at diagonal pattern, serve speed and Functional movement screen (FMS®) scores in female volleyball athletes. Eighteen female volleyball athletes were involved into the study. Shoulder muscle strength at diagonal pattern were evaluated with the Biodex 3® isokinetic dynamometer. Functional movement patterns were evaluated by sports scientist and physiotherapist specifically trained using standard FMS® Test Kits. Measurements were made with a pocket radar speed gun (USA) brand speed measuring device. There was a significant correlation between the peak torque values of shoulder flexion/abduction/external rotation and extension/adduction/internal rotation in dominant and non-dominant side of athletes at 60°/sec and 180°/sec angular velocities. (r= .553-.895 p <.05). In conclusion, a significant relationship was found among isokinetic shoulder muscle strength at the diagonal pattern, serving speed and FMS® scores in elite female volleyball players. We also recommend that it should be considered in the evaluation of shoulder muscle strength and strengthening programs since shoulder movements in volleyball players during serve and spike do not consist of internal and external movements in isolation and they occur in a diagonal pattern along with flexion-extension and abduction-adduction movements.

Keywords: Volleyball, Shoulder, Diagonalpattern, Serve, Functional movement screen (FMS®), Isokinetic

Introduction

Volleyball is a complex team sport based on technique and tactic that requires a variety of explosive (speed, strength and power) physical characteristics and specific motor skills. In this system, the technique of serve, which is the starting point that can be evaluated within the attack technique is highly significant [1]. With an efficient serve technique, direct points can be scored, and the game organization of the opponent may be disrupted. A serve is a complex individual skill that can be adapted to the technical skill and circumstances of a game, skills of a player and tactical needs [2]. The effective serve technique in volleyball players is reported to be associated with muscle internal rotation (IR) strength and external rotation (ER) strength, a balanced strength ratio in agonist/antagonist muscles between these muscle groups and muscle strength difference between dominant and non-dominant side [3]. The asymmetry between shoulder IR and ER muscle strengths is considered to be the greatest risk factor for shoulder injuries in volleyball players [3, 4]. Therefore, the evaluation of shoulder muscle strength plays a key role in preventing injuries in this sports group and increasing sportive performance.

Isokinetic strength tests, which are frequently applied to volleyball players for determining agonist/antagonist ratio and the muscle strength difference in dominant/non-dominant side, is one of the increasingly used major objective strength tests [5] . In the reviewed literature, a large number of studies that evaluate the shoulder IR and ER isokinetic muscle strength in volleyball players are available [5-7]. However, when the serving position of the volleyball players are examined, it is reported that this movement is not an isolated IR and ER movement and that ER movement occurs in a diagonal pattern in combination with should flexion and abduction movements and IR movement occurs in a diagonal pattern in combination with shoulder extension and abduction movements [8, 9]. It is noticed that the number of studies that evaluate the isokinetic muscle strength of the shoulder in the diagonal pattern are very few [10].

Shoulder complex shows a more effective activity in volleyball players during the sports-specific movement. Therefore, shoulder injuries have a significant place in volleyball. The literature reports that there is a significant decrease in the shoulder muscle strength, joint position sense and serving speeds of

volleyball players with shoulder injury [11, 12]. Therefore, the pre-assessment and prevention of the risk of injury and muscle imbalance in these athletes will increase both individual performance and team success. In addition to using sports-specific tests to determine the risk of injury and muscle imbalances in different sports branches, the number of tests that are determined for common use is limited. One of these tests is Functional Movement Screen (FMS®). FMS® comprises of 7 (Deep Squat, Hurdle Step, In-Line Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push-Up, Rotary Stability) tests that involve fundamental movement patterns based on specific points such as mobility, neuromuscular control, balance and stability for monitoring the functionality [13]. According to the researches, the FMS® test not only shows the physical deficiencies in the kinetic chain but also predicts the possibility of future injuries. Recent studies have shown that athletes with an FMS® score under 14 were more likely to sustain an injury than their peers who received more than 14 points. Another study has shown that, regardless of the score obtained in the FMS® test, asymmetry in movements pointed to a more than 2-fold higher risk of injury [14-16]. Therefore, determining the association between the isokinetic muscle strength, functional movement screening and serving speed in the diagonal pattern in volleyball players will play a key role in the prevention of injuries that may occur and increasing both the individual and team success.

The present study focused on the relationship between isokinetic shoulder performance at diagonal pattern, serve speed and FMS® scores in female volleyball athletes. The main aim was to test the hypothesis that there is a strong correlation between isokinetic shoulder muscle strength at diagonal pattern, serve speed and FMS® scores in female volleyball athletes.

Methods

Participants

Eighteen female volleyball players (age= 20.15±2.79 years, height=1.82±0.75 m weight=66.51±7.24 kg, body mass index= 19.92±2.11 kg/m^2, experience in sport= 9±2.34 years) participated in the 2017-2018 season playing in Halkbank sports club in Sultan League. We examined demographic characteristics (age, dominant shoulder, experience in sport, training hours, etc.) using a questionnaire and assessed body composition (TBF-300 GS Pro Body Composition Analyzer; Tanita Corporation, Tokyo, Japan). The dominant shoulder was defined as the hand used for serving or spiking. All the volunteers participating in the research signed the informed consent form and filled personal information form. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ankara Yıldırım Beyazıt University, Ethics Committee of Non-Pharmaceuticals and Non-Medical Device Research with the decision dated 21 November 2018 and numbered 76.

Data Collection

Isokinetic Evaluation

The shoulder isokinetic muscle strength of the female volleyball players participating in the study were measured with a Biodex isokinetic dynamometer (Biodex 3 Pro Medical System NY, Shirley). An explanation of the testing procedure and equipment was given to each subject prior to beginning the test. Volleyball players were given a warming program for the upper extremity for 10 minutes before the test. All volleyball players were fixed to the seat with tapes and standardized. Each subject performed concentric-concentric isokinetic shoulder strength test consisting of five repetitions at 60°/sec angular velocity and 10 repetitions at 180°/sec angular velocity in the movement patterns of flexion/abduction/external rotation (F/ABD/ER) and extension/adduction/internal rotation (E/ADD/IR). Before the test started, the volleyball players were given 3 trials at both angular speeds. Three minutes followed each test speed. The dominant arm was tested first. An offset handle was provided for the non-testing extremity to grip during the testing procedure. Gravity correction was not utilized for this testing position, consistent with the manufacturer's recommendation. The test was initiated with the arm across the pelvis for F/ABD/ER, consistent with the manufacturer's recommendation. Standardized verbal instructions and encouragement were given, with the subjects unable to receive visual feedback during the testing procedure (Figure.1). Bilateral peak torque, peak torque / weight, agonist/antagonist ratio and dominant-nondominant side muscle strength difference values were recorded for each athlete [10].



Figure.1. Isokinetic Shoulder Muscle Strength at Diagonal Pattern

Functional Movement Screen (FMS®)

Functional movement patterns were evaluated by sports scientist and physiotherapist specifically trained using standard FMS Test Kits (Functional Movement Systems Inc., Virginia, USA). The seven movements (tests) examined in FMS are: Deep Squat, Hurdle Step, In-Line Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push-Up, and Rotary Stability. The protocol for administering the FMS is fully described by Cook et al. [17]. According to FMS criteria [17, 18] the athletes were awarded a score of 0–3 for each test and for five of the 7 tests are assigned independent scores for the left and right sides of the body. A 3 score was indicative of completing the movement perfectly and pain free. A 2 score was awarded when the movement was performed pain free but with minor compensatory patterns and is considered 'satisfactory'. A 1 score indicated the movement could not be completed as instructed and a 0 was given when pain was reported whilst performing the movement. The total number of points was 21, and the overall result of the FMS test was only the weak side result. Composite scores ≤14 were operationally defined as indicating dysfunctional movement and players scoring differently on left and right sides were considered asymmetrical.

Serve Speed

Measurements were made with a pocket radar ball coach speed gun (USA) brand speed measuring device. Speed measuring device is a radar-capable device with a precision of ± 1 mph/h that can measure 25/130 mph/h. During the measurements, the athletes were asked to serve with their maximum strength toward the court and they were informed that the outgoing balls would be included in the measurement in an attempt to eliminate the anxiety of throwing the ball out. The measurements are recorded at a distance of 18 m from the other side of the net and across the ball. The athletes were asked not to focus on the target, but to use all their strength to make it over the net, and each athlete served three times and the best score was recorded.

Statistical analysis

SPSS 22 package program was used in the analysis of the data. Whether the variables had a normal distribution was examined via "Shapiro-Wilk Test". The relationship among the data concerning jump float serve speed, isokinetic shoulder muscle strength at diagonal pattern and FMS® scores was examined via Spearman Correlation Analysis test for the data without a normal distribution. In all of the statistics, p significance level was accepted as $p<.05$ [19].

Results

There was strong positive correlation between jump float serve speed and total, shoulder mobility and rotatuar stability FMS® scores of the athletes and their isokinetic shoulder muscle strength at diagonal pattern peak torque values of dominant and nondominant side shoulder at 60°/s and 180°/s angular velocity [r=.558-.895; p<.05) (Table.1).

Results indicated that the mean peak torque values of shoulder E/ADD/IR higher than the mean peak torque values of shoulder F/ABD/ER at 60°/sec and 180°/sec angular velocities in both sides (Table.2).

We were found to be within normal limits in terms of dominant/non-dominant side strength difference percentages at 60°/sec and 180°/sec angular velocities (Table.3).

It was observed that there was significant relationship between the jump float serve speeds of the athletes and their total, shoulder mobility and rotatuar stability FMS® scores (r=.553-.805; p<.05) (Table.1).

Discussion

This study aimed to investigate the correlation between the isokinetic shoulder muscle strength at the diagonal pattern, serving speed and FMS® in elite female volleyball players. It was found that a significant correlation between the peak torque values of shoulder F/ABD/ER and E/ADD/IR in dominant and non-dominant side of athletes at 60°/sec and 180°/sec angular velocities. Moreover, it was observed that athletes with higher isokinetic shoulder muscle strength at diagonal pattern had higher serving speed and less risk of injury.

The results showed that found a strong positive correlation between jump float serve speed, isokinetic shoulder muscle strength at diagonal pattern and FMS® scores in the volleyball athletes. This was an expected outcome. Because shoulder problems are estimated to account for 8% to 20% of all volleyball-related injuries [20]. These problems occur during repetitive high-demand throwing activities, such as spikes and serves [21]. Serve has become a weapon of attack and its tactical use is important. Although the spike is performed to terminate a rally and win the point, the serve initiates every point. Two serving styles predominate: the traditional float jump serves, and the more dynamic jump serve. The float jump serve remains the most popular serve employed by female collegiate volleyball players [8]. Reeser et al determined that athletes who perform the jump serve are more likely to experience shoulder problems than are those who use the float jump serve [22]. Jump float serving is a quicker, generally more powerful movement, designed to speed up the game and put more pressure on the opponent. During serves, hand speed can reach up to 120 km/h, and dynamic shoulder stabilization has a critical role in maintaining glenohumeral joint integrity [23]. In volleyball, strength of the ERs and IRs is related to either serving or spiking performance, which are both important elements of success in volleyball; IR concentric strength correlates well with volleyball spike velocity [24]. Considering the asymmetric nature of shoulder movements in volleyball, one would expect that volleyball practice itself causes strength imbalances that present in the form of strength asymmetries between the dominant (D) and nondominant (ND) shoulders and abnormal strength ratios between the ERs and IRs [7]. Shoulder strength asymmetry above this threshold can be an injury risk factor and is characteristic of volleyball players with shoulder problems [25].

Researchers have documented that collegiate and adult overhead athletes may have adaptive strength changes, such as decreased external-rotator strength and increased internal-rotator strength in the dominant shoulder due to the repetitive overhead activities [7, 21, 25]. This adaptation leads to a lower ER:IR ratio in the dominant shoulder and is an accepted risk factor for shoulder injuries [4]. We found that the mean peak torque values of shoulder E/ADD/IR higher than the mean peak torque values of shoulder F/ABD/ER at 60°/sec and 180°/sec angular velocities in both sides. This profile was reported in volleyball players by Baltacı and Tunay [10]. This result is similar to those found in the present study and show that the mean peak torque values of shoulder E/ADD/IR are higher than the peak torque values of F/ABD/ER and these values decrease as angular velocity increases. This finding is consistent with the literature and it was an expected outcome. Because the muscles that perform internal rotation to the shoulder joint are higher in number and larger in size and stronger than the muscles performing external rotation [26]. The existence of the muscles in the internal rotation pattern of E/ADD/IR causes this pattern to be stronger.

Additionally, we were recorded that agonist/antagonist ratios and the percentages of bilateral muscle strength differences of the athletes. When the percentages of both shoulder agonist/antagonist muscle strengths of the athletes included in the study were examined at the angular velocities of 60 °/sec and 180 °/sec, it was found that this ratio was between 99-102% at 60°/sec angular velocity and 90-94% at 180°/sec angular velocity (Table.3). Baltacı and Tunay was reported that this ratio was between 50-60% in both

shoulders at 60°/sec angular velocity and 60-70% at 180°/sec angular velocity [10]. The higher value of this ratio, as determined by our study, results from the fact that shoulder external rotator muscle strengths of the athletes are weaker than the normal limits compared to the internal rotators. It was observed that strength difference percentages of dominant/non-dominant sides for diagonal movements of E/ADD/IR and F/ABD/ER at 60°/sec and 180°/sec angular velocities varied between 3.50-9.53%. Lertwanich et al. [27] reported in their study on the isokinetic evaluation that the strength difference between dominant and non-dominant extremities above 10% was abnormal. We found no asymmetry between dominant and non-dominant sides of shoulder F/ABD/ER and E/ADD/IR at both angular velocities and this was consistent with the findings of the study conducted by Baltacı and Tunay [10].

The results demonstrate the ranges for jump float serve speed among female performance volleyball players (57-69 km $\cdot h^{-1}$) (Table.2). In the reviewed literature, reference data for the jump float serve test have not been found. When comparing the results with the available information on the jump float serve, the values found in this population are similar to the jump float serve speed of Spanish Queen's Cup players (40-62 km $\cdot h^{-1}$) [28] and below the results of the Spanish Division I National team (76,36-77.27 km $\cdot h^{-1}$) [29]. It is necessary to carry out further studies to provide reference values for the jump float serve speed test for different levels of performance, different age groups and men.

In the studied population, the average FMS® test score was 15.38±2.25 (Table.2). Chorba et al. [15] reported an average FMS® score of 14.3±1.77 in their study of NCAA Division II female soccer, volleyball, and basketball players taken within the first 2 weeks of the competitive season. The average FMS® score found in this study is higher than the data provided by Pourheydari et al. [1] (average FMS® score of 13.60±2.74). In other studies, recorded a FMS® results of 15.20±1.48 [30] and 15.28±1.73 [31]. These results are similar to those found in the present study. FMS® test is designed to identify individuals with a compensatory movement pattern develop in the kinematic motor chain. It is can be employed as a test for screening individuals and allows specialists to make an accurate evaluation of movement disorders [1]. Tests assessing the risk of injury suggest that athletes who have received 14 or fewer points on the FMS® test are more likely to sustain an injury (specificity of 0.91 and sensitivity of 0.54). The odds of sustaining an injury were 17.7 times higher in those with an FMS® score ≤ 14 compared with those with a score of > 14 points [32]. Thus, the research of Kiesel et al. [32] indicates that such a low FMS® test result is associated with a higher risk to injury. Furthermore, the study of Letafatkar et al.[33] also suggests that a better FMS® test result may still indicate greater likelihood of injury. That study showed that subjects who scored less than 17 on the FMS® were 4.7 times more likely to sustain an injury of the lower extremity. In the present study, the subjects obtained an average FMS® score above 14 points. We were found a significant relationship between the test results of shoulder mobility and rotation stability of the athletes and isokinetic shoulder muscle strength and serving speed. The shoulder mobility movement pattern represents the natural complementary rhythm of the scapula-thoracic region, thoracic spine and thoracic cavity during reciprocal upper extremity shoulder movements. Rotation stability pattern evaluates the stability of the pelvis, core and shoulder girdle during the combined movement of upper and lower extremities [17, 34]. Thus, loss of shoulder mobility and rotation stability in volleyball players results in a decrease in the upper extremity muscle strength and serving speed.

Our study had limitations. First, the results were limited to female volleyball players. Secondly, the number of studies evaluating the isokinetic shoulder muscle strength in the diagonal pattern was limited, thus limiting the comparison of study results. Finally, this study may be repeated at different serving types and with different groups based on the gender or playing position of the athletes.

Conclusion

In conclusion, a significant relationship was found among isokinetic shoulder muscle strength at the diagonal pattern, serving speed and FMS® scores in elite female volleyball players. Therefore, in order to improve both individual and team performance in volleyball players, applying shoulder muscle strength and FMS® tests in the pre- and post-season periods will play a key role in preventing existing or possible injuries. We also recommend that coaches, physiotherapists and sports scientists working in the field should be considered in the evaluation of shoulder muscle strength and strengthening programs since shoulder movements in volleyball players during serve and spike do not consist of IR and ER movements in isolation and they occur in a diagonal pattern along with flexion-extension and abduction-adduction movements.

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Conflict of interest statement

All authors state that they do not keep any commercial, financial or personal relationships which may lead to a conflict of interests that could inappropriately influence their work. No research grant sponsor had any involvement in the study design; in the collection, analysis and interpretation of data; in the writing of the manuscript; or in the decision to submit the manuscript for publication.

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We certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated.

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Table.1. The Relationship Between Isokinetic Shoulder Muscle Strength at Diagonal Pattern, Serve Speed and Functional Movement Screen (FMS®)

*p<0.05, ** p<0.01, FMS: Functional Movement Screen, D: Dominant Side, ND: Nondominant Side, PT: Peak Torque,

Variables Spearman's rho	FMS Total Score	Deep Squat	Hurdle Step	Inline Lunge	Shoulder Mobility	Active Straight Leg Raise	Trunk Stability	Rotatuar Stability	Serve Speed (km · h^{-1})
D 60˚ s^{-1} F/AB/ER PT (N/m)	0.685*	0.369	0.236	0.121	0.708**	0.411	0.290	0.631*	0.731**
ND 60˚ s^{-1} F/AB/ER PT (N/m)	0.604*	0.415	0.014	0.141	0.729**	0.383	0.332	0.664*	0.728**
D 60˚ s^{-1} E/AD/IR PT (N/m)	0.708**	0.373	0.146	0.124	0.864**	0.400	0.307	0.740**	0.984**
ND 60˚ s^{-1} E/AD/IR PT (N/m)	0.645*	0.252	0.264	0.259	0.775**	0.308	0.248	0.607**	0.893**
D 180˚ s^{-1} F/AB/ER PT (N/m)	0.731**	0.388	0.049	0.373	0.645*	0.205	0.424	0.624*	0.805**
ND 180˚ s^{-1} F/AB/ER PT (N/m)	0.592*	0.171	0.122	0.213	0.668*	0.331	0.305	0.562*	0.800**
D 180˚ s^{-1} E/AD/IR PT (N/m)	0.576*	0.358	0.007	0.176	0.714**	0.436	0.318	0.584*	0.895**
ND 180˚ s^{-1} E/AD/IR PT (N/m)	0.585*	0.402	0.253	0.189	0.708**	0.379	0.316	0.558*	0.859**
FMS Total Score	1.000	0.714**	0.365	0.655*	0.643*	0.368	0.783**	0.438	0.698*
Deep Squat	0.714**	1.000	0.000	0.398	0.314	0.233	0.454	0.314	0.122
Hurdle Step	0.365	0.000	1.000	0.102	0.178	0.184	0.386	0.178	0.085
Inline Lunge	0.655*	0.398	0.102	1.000	0.359	0.193	0.637*	0.065	0.000
Shoulder Mobility	0.643*	0.314	0.178	0.359	1.000	0.101	0.461	0.409	0.805**
Active Straight Leg Raise	0.368	0.233	0.184	0.193	0.101	1.000	0.220	0.101	0.290
Trunk Stability	0.783**	0.454	0.386	0.637*	0.461	0.220	1.000	0.033	0.171
Rotatuar Stability	0.438	0.314	0.178	0.065	0.409	0.101	0.033	1.000	0.553*

N: Newton, m: meter, F/ABD/ER: Flexion/Abduction/External Rotation, E/ADD/IR: Extension/Adduction/Internal Rotation

Table. 2. Isokinetic Shoulder Muscle Strength at The Diagonal Pattern, FMS® and Service Speed Values of Athletes

Variables	Mean (SD)	Min	Max
Deep Squat	2.00 (0.70)	1.00	3.00
Hurdle Step	1.69 (0.48)	1.00	2.00
Inline Lunge	1.84 (0.80)	0.00	3.00
Shoulder Mobility	2.84 (0.37)	2.00	3.00
Active Straight Leg Raise	2.61 (0.50)	2.00	3.00
Trunk Stability	2.53 (0.51)	2.00	3.00
Rotatuar Stability	1.84 (0.37)	1.00	2.00
FMS Total Score	15.38 (2.25)	11.00	18.00
Serve Speed (km · h^{-1})	63.96 (3.94)	57.00	69.00
D 60° s^{-1} F/AB/ER PT (N/m)	63.40 (37.09)	37.60	181.20
ND 60° s^{-1} F/AB/ER PT(N/m)	57.85 (14.91)	35.50	82.00
D 60° s^{-1} E/AD/IR PT(N/m)	63.80 (20.57)	41.50	116.00
ND 60° s^{-1} E/AD/IR PT(N/m)	59.57 (32.38)	37.20	159.50
D 180° s^{-1} F/AB/ER PT (N/m)	47.76 (22.87)	32.50	121.00
ND 180° s^{-1} F/AB/ER PT(N/m)	50.83 (12.61)	31.10	80.50
D 180° s^{-1} E/AD/IR PT(N/m)	86.92 (13.50)	34.20	192.30
ND 180° s^{-1} E/AD/IR PT(N/m)	66.75 (19.61)	31.60	106.40

SD: Standart Deviation, FMS: Functional Movement Screen, D: Dominant Side, ND: Nondominant Side, PT: Peak Torque, N: Newton, m: meter, F/ABD/ER: Flexion/Abduction/External Rotation, E/ADD/IR: Extension/Adduction/Internal Rotation

Table. 3. Agonist/Antagonist Ratios and Bilateral Muscle Strength Differences Values of Athletes

Angular Velocity	Agonist/Antagonist Ratios (%)		Bilateral Muscle Strength Differences (%)	
	Dominant Side Mean (SD)	Nondominant Side Mean (SD)	F/ABD/ER Mean (SD)	E/ADD/IR Mean (SD)
60° s^{-1}	99.90 (38.89)	102.10 (36.24)	106.54 (12.06)	112.53 (28.63)
180° s^{-1}	94.29 (32.32)	90.56 (40.67)	102.24 (13.59)	97.50 (32.70)

SD: Standart Deviation, D: Dominant Side, ND: Nondominant Side, F/ABD/ER: Flexion/Abduction/External Rotation, E/ADD/IR: Extension/Adduction/Internal Rotation

Effect of Audiovisual Stimulation Technology on Artistic Gymnastics' Achievement among Students of College of Physical Education and Sport Science for Girls

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Abstract

The study aims to investigate the effect of audiovisual stimulation (AVS) technique on the artistic gymnastics' achievement for female students at the College of Physical Education and Sports Science for Girls. An experimental, pretest and posttest design was used. The study included a sample of (50) sophomores who were recruited from the College of Physical Education and Sports Sciences at the University of Baghdad. Study participants were randomly assigned into two groups; 25 for the study group and 25 for the control group. Participants in the study group sit in a comfortable, noise-free place and received AVD sessions over eight weeks using audiovisual device. In the first two weeks, participants received five sessions per week. In the next four weeks, participants received two sessions per week. In the last two weeks, participants received one session per week. Each session ranges between 20-30 minutes. The researchers compared students' grades between the first and second semesters. Data were analyzed using the statistical package for social science (SPSS), version 25. The study results revealed that using the AVS positively influenced students' practical and cognitive achievement compared to student who did not receive AVS. The researchers recommend that (1) it is necessary to reduce the mental distraction of students and the adoption of modern learning technologies, and (2) the practical classrooms must be equipped with AVE technologies in order to raise the capacity of faculty members and enable them to employ AVE technology with students.

Keywords: Key one: Audiovisual Stimulation Technology, Key two: Artistic Gymnastics, Key Three: chievement, Key four

1. Introduction

Most of the principles and concepts of motor learning are derived from educational psychology, which is one of the branches of general psychology. Many schools have put forward theories; including behavioral and cognitive, for interpreting motor learning. Furthermore, the recommended education methods consist mainly of trying to maintain an atmosphere in which learners do not experience physical, psychological, and physiological pressure, as well as providing options for individuals to learn and in ways they are satisfied with. (10)

Grald Edelman, head of the Biological Neuroscience Unit at the 1972 Nobel Prize-winning Scripts, presents a view of the brain that can affect the future of cognitive and skill learning rooms. Edelman considers the brain to be like a jungle in which systems interact continuously and objectively. Edelman indicates that learners may live in an environment that offers many layers of sensory and cultural problems. Edelman states that students have the abilities of learning, understanding, and growing. If students are provided with forms of learning opportunities, learning, they will establish the links for learning. (3)

Wilmore and Costill think that "When the body responds to external stimuli, complex chemical reactions and simple electrical charges occur, which rapidly move in the axons, followed by another neuronal message by another impulse. Thus, millions, and millions of these impulses of these electro-neural pulses, are released each second throughout conscious and unconscious life. The impulses move to and from the brain, muscles, and glands. Due to the correspondence and binding of millions of these electrical nerve messages in the cerebral cortex and the organization of the cerebellum, emotions arise in different human emotions (happiness, sadness, joy, fear, pleasure, despair, hope ... etc.) (16)

In order to understand the kinetic learning or the skillful cognitive achievement as an output of this learning, the role of the brain cannot be denied. Farraj explains that "the brain is like a forest in which systems interact continuously and objectively. He indicates that individuals may live in an environment that provides many layers of sensory and cultural problems, and these ideas indicate that individuals have the capacity of learning, understanding, and growing". (3)

Studies dealing with skillful learning suffer from the lack of ability of the interested researchers to differentiate between instructional aids and educational media that contain an educational content. Despite that they are partially alike in knowledge acquisition, however, the difference is clear in that the first increases the learners' ability to facilitate the learning process. While, the second includes an educational content in which the learner is subjected to a test of his/her abilities to succeed or fail in relation to the concepts that includes. Samir stated that "the process of communicating information to the student through the teacher recently has become dependent on using different learning and training tools and devices rather than the traditional style which mainly depends on the process of oral explanation and practical model of the coach. Thus, it is necessary to show the importance of using tools and equipment that assist in help to raise the skillful level and motor performance and helps the trainer in skills teaching in the shortest possible time". (11) so, it is vital to pay more attention to that the nerve cell be in a state of rest with the help of stimuli that keep it away from fatigue in order to increase its readiness to learn or raise the level of achievement. Since the senses are the way learners' way to communicate with the outside world, the interest in being not stressed is necessary to achieve learning that is free of mistakes that if the learner continued on, such mistakes may lead to a problem that needs further efforts to reduce this accumulation.Khaliq also stated -Abdul that "Receiving knowledge by means of two senses increases the effectiveness of learning as each sense promotes learning". (9)

The halls of educating the art gymnastics are known to be different from the ordinary classroom owing to the difference in space which that is a source of noise and a hindrance to the process of increasing achievement. Mohammed states that "the effect that noise creates on human behavior from a neurological perspective clearly appears as follows: May lead to mental breakdown, nervous stress caused by an increase in the adrenaline in the body, sleep interruptions, mydriasis which, which in turn, affects the vision strength, the learners' weak concentration and fatigue, nervous and physical weakness and ailment, and neural hearing impairment (temporary, varying by noise type)."(5)

Hasan provides an evidence that stress, regardless of its sources, will fatigue receptors and senses associated with the nervous system, indicating that "by stress, there will be negative effects on the activity of the central nervous system (8). As such, it is crucial to work to maintain the mental process of learning away from distractors or noise, as the process of attention and concentration come first among these processes. Anoyahu mentions that the processes or stages of kinetic learning of the various skills "Performance; according to your maximum capability, requires a 100 percent concentration." (2).

Hence, the study problem clearly calls for the actual need to provide an educational environment that helps increase the cognitive and practical achievements of the Gymnastics course for students of the college of Physical Education and Sports Science for girls. This study seeks to enable these students to access such an environment where they are ready to learn with a state of comfort for sense of hearing and the brain, relying on the advanced technology that assist in the learning process, including audio stimulation, which are necessary for the educational process. Al-Fadhli and Al-Bayyati stated that "There is no debate about the processing of information without checking the information that is processed automatically or these controlled. The automatically processed information uses a series of nerves that become active as a response to specific stimuli. This activity does not require a dynamic control in a part of the subject, which is a result of a good learning. The stimulant either organized as a planner or sent directly to the right response areas in the brain with limited processing." (7)

This study aims to identify the effect of audiovisual stimulation technique in the achievement of artistic gymnastics for students of the College of Physical Education and Sports Science for Girls.

2. Method

To reach solutions to the problem of the current study, the experimental design with experimental and control groups was adopted.

2.1. Participants

The boundaries of this study society are represented by the female sophomore in the College of Physical Education and Sports Sciences at the University of Baghdad for the academic year (2017-2018) for the A and B classes. The study included (53) students who were purposively selected. Three students who are fail were excluded. So, the final sample size is (50) which represents 94.34% of their total population. They were randomly assigned into two groups; the 25 students for the experimental group and (25) for the control group.

2.2. Materials

This study seeks to improve the practical and theoretical achievements of the students in the overall artistic gymnastic course. The researchers reviewed the official records of the faculty that teaches this course and obtained the grades of the two groups in the first semester (the grades were 15 for practical achievement and 10 for the cognitive achievement). These grades are considered the pretest test scores after verifying their baseline. Thereafter, the researchers used the audiovisual stimulation through the adoption of the Brain Booster (AVI) (DVIAD Delight Pro). The device is easily used by every learner who sits in a comfortable, noise-free place. Each session lasts for 20-30 minutes. These sessions were introduced over eight weeks. In the first two weeks, participants received five sessions per week. In the next four weeks, participants received two sessions per week. In the last two weeks, they received one session only. These sessions accompanied the learning process for the artistic gymnastic course.

2.3. Specifications for AVE (DVIAD Delight Pro):

This device generates oscillations and photovoltaic frequencies that stimulate the brain to maintain levels of attention, concentration, and control over the levels of mental alertness during the athletic performance. These frequencies could be light frequencies that are a part of the audio-visual-sensory integration that fit with the electric waves of the brain for the purpose of their modification. This device is used worldwide and licensed by the Canadian authorities as a scientific device first classified to reduce cognitive decline, attention deficit hyperactivity disorder (ADHD), emotional disorders, insomnia, and anxiety. This device is well-thought-out therapeutic technique and a means to achieve the objectives, its serves to give certain light flashes through specialized glasses in the field, with specific vocal impulses. By using headphones, we can gently guide the brain to desirable states of brain waves. After a short period of time, the brain begins to echo (or reflect) the stimulus frequency. The device includes five special treatment sessions: (1) energize, (2) meditation, (3) brain booster, (4) sleep, and (5) mood booster.



Figure 1. DVIAD Delight Pro

2.4. Procedure

After the completion of the learning process for the behavioral and cognitive aspects (practical and cognitive) of the artistic gymnastics course and the completion of the intended experimentation with the aforementioned technology, the second semester grades were obtained to be considered as the post-tests in this experiment. The results of the study were processed by the SPSS version (V25). The percentage, the arithmetic mean, the standard deviation, the independent-sample T-test, and the paired-sample T-test were used.

3. Results

As shown in Table 1, the mean scores of experimental and control groups are nearly the same, indicating equality of two groups regarding their knowledge of targeted structures.

Table 1. *Pretest and posttest results for the study and the control groups.*

Tests	Study group			Control group			*t*	Sig.	Ass.
	n	Mean	SD	n	Mean	SD			
Practical Achievement	25	10.12	1.764	25	9.88	1.563	0.509	0.613	NS
Cognitive Achievement	25	5.92	0.954	25	6.32	1.282	1.252	0.217	NS

Ass. = Assessment; n = Number; SD = Standard deviation; Sig. = Significance; *t*= T-test value
Degree of freedom (n-2) = 48, Significance level = 0.05; t-test value is significant at p-value ≤ 0.05

Table 2. *Paired-sample t-test values for the study and the control groups in the pre and posttest time*

Tests	**Study Groups**	Pretest		Posttest		Mean difference	Std. Error Man	*t*	Sig.	Ass.
		Mean	SD	Mean	SD					
Practical Achievement	Study	10.12	1.764	13.92	0.493	3.8	1.826	10.407	0.000	S
	Control	9.88	1.563	11.32	1.547	1.44	0.87	8.277	0.000	S
Cognitive Achievement	Study	5.92	0.954	9.6	0.577	3.68	1.314	14.003	0.000	S
	Control	6.32	1.282	7.36	1.221	1.04	0.351	14.807	0.000	S

N = 25 for each group; df = *n* – 1 for each group at p-value = 0.05; measurement unit is grade

Table 3. *Posttest results for the study and the control groups*

Tests	Study group			Control group			*t*	Sig.	Ass.
	n	Mean	SD	n	Mean	SD			
Practical Achievement	25	13.92	0.493	25	11.32	11.32	8.006	0.000	S
Cognitive Achievement	25	9.6	0.577	25	7.36	7.36	8.294	0.000	S

Ass. = Assessment; n = Number; SD = Standard deviation; Sig. = Significance; *t*= T-test value
Degree of freedom (n-2) = 48, Significance level = 0.05; t-test value is significant at p-value ≤ 0.05

4. Discussion and Conclusion

The results of the pretest and posttest in Table (2) reveals a noticeable improvement in both achievement of the students of the two groups of research. The review of the results of Table (3) displays that the students who received the audiovisual stimulation associated with their learning may outperform the students of the control group. The researcher attributed this to their use of learning aids, namely, auditory stimulation, which helped to ease the burden and tensions that affect the nervous system as a result of the pressure of practical and theoretical lessons on female students and control the preservation of the mind of distractors. This was the purpose of this technique "maintaining the state of non-distraction of learners' attention" considering that the level of sound targets the hearing and images of the sense of vision.

It is the brain that is in control of the instructions to control the cerebellum in the organization, for the lack of studies that concern the level of sound and images. The physiology of vision-hearing is the focus of this study for what it receives of waves that are processed in the brain. The brain regulates the stimuli as the cerebellum control its regulation. There is a scarcity in studies that deal with the level of sound and images psychologically and physiologically stimulated and its influence on the learners in the educational units in the physical education courses to improve the mental processes in which the attention and focus come in front. The artistic gymnastics has plenty of common errors in the performance of motor skills in which the hearing and vision senses a key role in obtaining corrective feedback information as well as observing the correct model and reconstructing the kinetic program for the performance. Therefore, it is necessary to improve the abilities and perceptions of hearing and sensory perception for their role in learning.

Al-Abood; according Mahmood, thinks that "The sensory abilities are one of the most important factors that support the mental processes which in turn play a role in giving meaning to our sense of different sport movements. They are considered as an important part of the information processing system, that is analyzing and understanding the sensory information coming from the environment". [13]

Mustafa and Sameer think that "Mental preparation is one of the most important elements of training,

to achieve the best performance of the athlete. The athlete learns how to endure the long hours of hard training without boredom and learn how to deal with cases of bad luck owing to unexpected injury or uncontrollable factors with effect on his/her sports activity according to his/her training program." (12)

The aids enable both the player and the trainer to reduce many of the efforts in learning and training to be suitable for the game or specialized activity and be suitable for the age of the players and their training history. (14)

Abdul-Kareem and Al-Doori mentioned that "Good and positive feelings reflected in the good image of man about the world make all our success and tasks depend on our sense of continued optimism, which in turn fosters self-esteem and self-confidence, that are necessary to prepare for learning. (1)

In the opinion of Shaker and Abdul-Latif, "Imagination is considered as one of the important mental processes used by the human to get new ideas and experiences. Many studies point out the importance of introducing the concepts of imagination in the educational process. This emphasized the importance of including imagination in the teaching of science, arts, and literature, etc." (6)

5. Conclusions and Implications

1. Using the audiovisual stimulation technology has a positive role in increasing the practical achievement of female students of the College of Physical Education and Sports Science for girls in the artistic gymnastics.

2. Using the AVS technology has a positive role in increasing the cognitive achievement of female students of the School of Physical Education and Sports Science for girls in in the artistic gymnastics.

3. Using the AVS technology helps students to their superiority in increasing the practical and cognitive achievement in the artistic gymnastics course for students without learning.

6. Recommendations

1. It is necessary to pay attention to reduce the mental distraction of students and the adoption of modern techniques associated with the learning process.

2. The practical classrooms must be equipped with AVE because of their role in raising the levels of achievement.

3. It is necessary to raise the capacity of faculty members and enable them to employ AVE technology with students.

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A Comparative Study of the Psychological Alienation among Female Students who Practice and Do not Practice Volleyball in Dormitories of the University of Baghdad

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Abstract

A comparative study on the psychological alienation among female students who practice and do not practice volleyball in dormitories in University of Baghdad.

This study aims to identify the level of psychological alienation among female students who practice and those who do not practice volleyball in dormitories at the University of Baghdad (Al-Waziriyah Complex). The study sample included (96) female students who were purposively selected; of these, (23) students practice volleyball and (26) who do not practice it who together constitute (50%) of the total number of students who live in the dormitory. After identifying the phenomenon under study and analysis of the common characteristics of the study sample, the researchers selected the psychological alienation scale. After the researchers performed the scientific foundations and transactions, they applied it on the study sample. The statistical analyses were performed using the Statistical Package for Social Science (SPSS) version (24). The researcher concluded that the practice of volleyball reduces the psychological alienation and not practicing it increases the alienation among the students.

Keywords: Key one: Psychological Alienation, Key two: Female Students, Key Three: Volleyball, Key four

1. Introduction

During the second half of the twentieth century, researchers became increasingly interested in the study of alienation as a phenomenon that spread among individuals in different societies, perhaps due to the fact that this phenomenon may reflect the contemporary human crisis, his suffering, and conflicts resulting from the huge gap between a financial progress that proceeds very quickly and valuable and moral progress slowly. This may make humans feel unsafety and uncertainty of life in this eon or may look at life as an alien or unbelonging to it. This may justify the spread of the use of the concept of alienation. To say that psychological, social, and personal problems usually arise when the complexity of the conditions of life in society or the consequences of the ill-harmony that makes the members of the community feel the existence of certain segments among its members cannot easily adapt or conform with the circumstances prevailing in it all what is psychological, have social roots, and everything social and has psychological repercussions and implications. Hence, the correlation and organic link between them on topics that address the problems of contemporary human. Alienation is defined as a sense of loneliness, lack of belonging, loss of confidence, feeling of anxiety, rejection of values and social norms, and psychological suffering and pressure. (1)

The alienation is a psychological condition experienced by female students in the dormitories. It is one of the problems that must be studied and controlled due to its negative effects on the individual. The conditions that the students in the dormitories encounter and because of the security and economic situation in the country which often lead to anxiety, tension, and depression. Therefore, practicing physical exercise is a recreational and important aspects in the development of physical, tactic, skill, and psychological aspects.

Where the sports achievement cannot be fulfilled without the integration of elements of achievement. The regular physical activity may serve to get rid of alienation that affects students in the dormitories and reduce the tension and turmoil. Tis study seeks to identify the value of exercise in the elimination or reducing the psychological alienation among students in the dormitories. Through observing the female students in the dormitories and by looking at their problems, the researchers were able to diagnose that there are many students feel psychological alienation in the dormitories. As such, the researchers decided to shed light on this important topic. They also tried to compare between alienation among students who practice volleyball and those who do not practice it and to find out who are less alienation in a serious and identify the role and practice of sport in reducing it.

2. Method

This descriptive study aims to (1) identify the level of psychological alienation among female students who practice and those who do not practice volleyball in dormitories at the University of Baghdad (Al-Waziriyah Complex), and (2) compare the psychological alienation between female students who practice and those who do not practice volleyball. Data were collected for the period from March 15th, 2018 to April 6th, 2018.

2.1. Participants

The study sample included a purposive sample of (96) female students who were recruited from the dormitory. These students are from different colleges and were either practice or do not practice volleyball for more than three hours per week; where the number of students who practice it is (45) compared to (51) students who do not practice it. The final sample size is (49) students which constituted (50%) of the total number of students; of them, (23) students who practice volleyball and (26) students who do not practice it. A pilot study was conducted on (20) students who later on were excluded from the final study sample. The study sample analysis revealed that the study instrument items were clear, and the time required for the participants to fill out the study instrument was around (12) minutes. The researchers did not face any obstacles throughout the pilot study.

2.2. Materials

Determining the studied phenomenon and analyzing the characteristics of the targeted sample:
This is one of the most important procedures in examining the main study variable; namely the phenomenon of psychological alienation of female students who practice and do not practice volleyball. The study sample are of different colleges at the University of Baghdad in the undergraduate program. This procedure allows researchers to select the type of study instrument that fits with their level and age.
Identify the main measurement tool in the study and its specifications:

After analyzing the content of many of the available academic sources and studies that are concerned with the study of psychological extinction, the researchers identified the psychological regression scale, which consists of (105) paragraphs in two negative and positive ways, with five alternatives (fully agree, agree, between, disagree, disagree) (5-1) according to the direction of the paragraph, and with a total scale of 105-525 (Appendix 1) shows the scale.

2.3. Procedure

After analyzing the content of many of the available academic sources and studies relevant to psychological alienation, the researchers determined the psychological alienation scale, which consists of (105) items in two directions; negative and positive, with five alternatives (Totally agree, agree, not decided, disagree, Totally disagree) with 1 to 5 according to the direction of the items, The scores of this scale ranges from 105-525 (Appendix 1).

2.4. Pilot study

The researchers applied the pilot study on March 28th, 2018 to determine the clarity of the scale's instructions and determine the time required for answering the scale items. This scale is not directed toward measuring the capacity and the time required for answering its items does not affect the degree of response. Due to organizational factors in implementing the study later, the researchers had to calculate the response time by summating the time of completion of the first responder with another response time and dividing the output by (2). The result was (12) minutes. However, participants are not restricted to this time when they answer the scale items. The researchers did not face any obstacles in conducting the pilot study.

2.5. Instrument Validity

The researchers used the face validity, which is one of the types of content validity that means "the degree to which the scale measures what is intended to measure in the community. The content validity is the most important type of validity in the psychological measures. It is linked to answering this question: To what extent this scale is capable of measuring a specific area of behavior and depends on what the specialists decide on the scale by examining it." (4)
Thus, the validity of the psychological alienation scale was verified by presenting the paragraphs of the scale to a panel of experts. This is explained by the fact that more than (80%) of their agreement was approved

through a questionnaire that was prepared for this purpose. There was no modification on its instructions, the items content, alternatives, and the correction key.

2.6. Instrument Reliability

The instrument reliability was determined through split-half method. Al-Ajeeli and others mention that "This method requires dividing the scale after answering its items into two sets; the first set includes the even items, while the second set includes the odd items (Odd-Oven). Thereafter, the coefficient of stability between these two sets is calculated." (5: 86). This was done by calculating the correlation coefficient between the scores of the results of the two sets of the scale. The number of items in the two sets of the psychological alienation scale was unequal. The number of odd items was 53 compared to (52) for the even items. This test was done on (20) students on March 15th, 2018. The Hurst correlation coefficient was used for this type of splitting (r = 0.884) which is a high and acceptable value in calculating the equivalence between the two unequal parts and the overall scale stability.

2.7. Instrument Objectivity

The type of items of the psychological alienation is answered in one of the five different alternatives with only one closed answer, and there is no open item to be answered by explaining or departing from the content of the specific item. Thus, there is no disagreement about their correction or bias in estimating the weight of each alternative for their items by the reviewers.

2.8. Main Experiment

After obtaining the official agreement to conduct this study in the universities, the researchers applied the psychological alienation scale on a sample of 23 female students who play volleyball and another group of 26 female students who do not play volleyball. The study was conducted for the period from April 4th, 2018 to April 6th, 2018. Data were analyzed using the statistical package for social sciences (SPSS) for windows, version 24. The statistical measures of percent, arithmetic mean, standard deviation, median, Hurst's correlation, skewness, and paired-sample T-Test were used (6).

Mean = (Sum of weight of alternatives)/(number of alternatives)* number of items

3. Results

As shown in Table 1, the mean scores of experimental and control groups are nearly the same, indicating equality of two groups regarding their knowledge of targeted structures.

Table 1. *Statistical parameters of the level of the psychological alienation scale in relation to the mean of the scale for students who practice and do not practice volleyball*

Group	*n*	Number of items	Overall Grade of scale	Arithmetic mean	Median	Std. Dev.	Skewness	Mean
Practicing	23	105	525	261.61	285	16.32	.864	315
Non-practicing	26			431.35	440	50.875	.930-	

Table (1) displays that the arithmetic Mean for the students who practice volleyball was 261.61, median 285, standard deviation 16.32, The value of skewness is (.864) which ranges between ± 3. This indicates the normal distribution of the students and non-existence of outliers. By comparing the arithmetic Mean to the Mean of the scale which is (315), it is clear that the arithmetic Mean did not outweigh that of the level of psychological alienation.

The arithmetic Mean for students who do not practice volleyball was 431.35, median (440), standard deviation (50.875), and skewness (-0.930), which ranges between ±3, indicating the normal distribution and absence of outliers. By comparing the arithmetic Mean to the Mean of the scale which is (315), it is clear that the arithmetic Mean outweighed that of the level of psychological alienation scale (315).

(Thus, the first objective was achieved).

To achieve the second objectives of comparing the level of two groups, the researchers used independent-sample t-test (Table 2).

Table 2. *Mean, standard deviation, t-value, and significance between groups for the psychological alienation scale*

Scale	Practicing Group			Non-practicing Group			*t*	Sig.	Ass.
	n	Mean	SD	*n*	Mean	SD			
Psychological Alienation	23	261.61	16.32	26	431.35	50.875	15.276	.000	Sig.

Degree of freedom = (*n1* + *n2*)-2 = 47 at p-value = 0.05; measurement unit is grade

Table (2) exhibits that the group who practice volleyball has an arithmetic mean of 261.61 ± 16.32. Whereas, the group who do not practice volleyball has an arithmetic mean of 431.35 ± 50.875 with a t-value for the independent-sample is 15.276 and a degree of significance error of <0.05, a p-value is <0.05, and a degree of freedom of 47. This indicates a statistically significant difference in favor of the group who practice volleyball owing to the absence of psychological alienation. Thus, the second objective was achieved.

4. Discussion and Conclusion

Reviewing table (1) demonstrates that the level of psychological alienation for the group who practice volleyball did not outweigh that of the Psychological Alienation Scale. Whereas, the such a level for the group who do not practice volleyball outweighed that of the Psychological Alienation Scale. Reviewing table (2) displays that the significance of statistical differences was significant in favor of the group who practice volleyball. The researchers attribute this to the influence of volleyball on the attraction of students who practice volleyball due to feeling of no loneliness, isolation, and alienation, the clarity of the social system for their lives, high self-confidence, accountability, the obvious concordance between their thoughts, behaviors, and feeling of importance of life in a way that reduces the psychological stress, and the collaboration. All these factors contributed to decrease the psychological alienation for these students. For the students who do not practice volleyball, they attracted to the negative alternatives of what has been mentioned, which increased the phenomenon of psychological alienation. This illustrates the role of practicing volleyball in reducing the psychological alienation because of its recreational and psychological benefits that enable students to encounter different life circumstances in an acceptable manner in terms of integration and belonging to society.

Al-Quraidhi and Al-Shakhsi view that "This topic derives its importance from being one of the topics that have received the attention of researchers in various disciplines, especially the psychological and social studies. Hence, the importance of studying the phenomenon of psychological alienation, and this may be due to such a phenomenon has indications that express the suffering of contemporary humans and their conflicts with their society. The reasons of the conditions that Iraq went through rendered students to feel insecure and not contented. Thus, students became alien to themselves as they became alien to others. That is, the psychological alienation has become as a kind of social epidemic that threatens the stability of modern societies" (7)

Mohammed mentions that "The psychological alienation is not merely a condition related to a particular society, rather a human phenomenon existed in different social lifestyles, in all cultures due to socioeconomic conditions" (8). Furthermore, Walash and others mentioned that "Belonging is a key human need for connect to others and establish strong, stable relationships with them." (9).

5. Conclusions

1. Practicing volleyball serves to minimize the psychological alienation among female students who live in the dormitories, University of Baghdad.
2. Not practicing volleyball increases the psychological alienation among female students who live in the dormitories, University of Baghdad.
3. Students who practice volleyball are better than those who do not practice it in terms of experiencing psychological alienation.

6. Recommendations

1. It is necessary to activate the students' activities units in the dormitories for female students and provide sport equipment for various sports and activities.
2. It is necessary to raise the awareness of dormitories' supervisors about the importance of practicing volleyball for female students.
3. There is a need to conduct similar studies that target students who live in dormitories.

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The Module of Information Technology in Researches and in Sports Education

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Abstract

Need of information technologies for scientific research for biomechanics of movements of athletes by means of the three-dimensional optical cameras Qualisys, tenzoplatform Amti and an electronic boxing bag Kicktest-100 is proved in this article. Use of the module of information technology in the course of training in biomechanics, for bachelors, masters and graduate students, performed by an experimental part of final qualification works and theses.

Keywords: education in physical culture and sport, innovative methods of a research on biomechanics, the optical cameras Qualisys, a tenzoplatforma Amti, an electronic boxing bag Kiktest-100, the automated systems.

1. Introduction

Education becomes more and more computerized, it is difficult to find educational institutions where the computer facilities would not be used. Due to the rapid growth of information technologies there is a need for the equipment which gives new opportunities necessary for scientific research and allowing to obtain more exact data [10, 13, 14].

Now need of use of modern information technologies in the field of physical culture and sport is about to happen. New requirements of federal state educational standards, development of various master programs with dissertation researches demands on new to look at information equipment of institutes of physical culture and sport.

With the advent of information technologies of processing of large volume of information the possibility of use of the modern computerized equipment in scientific research and in the course of training in higher education institution is appeared [1,2,3].

2. Literature Review

Earlier at scientific research and in training of biomechanics of movements of the athlete for receiving a real picture it was necessary to carry out measurements by optical devices (a photo and video) on three planes separately and difficult calculations to combine the obtained data. Now in connection with implementation of the modern automated technologies all these calculations are carried out by the computer in three planes at once with an incomparable accuracy. At automation the software which develops continuously and improved has an important role. With its help the technical device gains "intelligence", becoming the computer perceiving and performing special tasks. The technology of optical tracking Qualisys also known as occupation of the optical movement, allows to measure the provision of moving objects with very high precision. This technology is used by researchers, biomechanics, physicians and engineers. Anybody who is interested in obtaining objective information about biomechanical parameters of the movement can use this technology. The systems of occupation of the movement can be used for detection of mistakes in performance of technical actions of the athlete and prevention of injuries, increases in efficiency of biomechanics of the movement and assistance to trainers in creation of optimum structure of the sports movement and increase in efficiency of educational and training process [10,11].

3. Method

Purpose. Justification of need of distribution of use of information technologies in sports education.

Bases of the Qualisys system are the three-dimensional optical cameras of occupation of the

movement developed and released in Sweden. The principle of work of a system consists in creation of three-dimensional model of a moving human body with a possibility of the mathematical analysis of the main aspects of a locomotion, such as angles of turns in joints, angular speeds and accelerations, calculation of force of reaction of a support, the moments of forces in joints and energy. In a combination to specialized program Qualisys Track Manager (QTM) modules, Visual 3D the system proposes the full solution for occupation of the movement which can be used for researches, from data collection to the analysis and the report. Qualisys offers high performance, accuracy and usability in biomechanics with the relevant data of occupation of the movement obtained by means of the automated processes.

Application of QTM simplifies coordination of work of a complex system of the video analysis of movements and gives the chance to obtain the accurate image quickly and exact data on the movement of objects. Possibilities of QTM combine as advanced functions of the processings and the analysis of data which are required for experienced users and the simple methods of work making it available and for personnel inexperienced technically. When carrying out measurement data on the movement of objects can be displayed in the computer in real time that allows the user to control process of data collection [12].

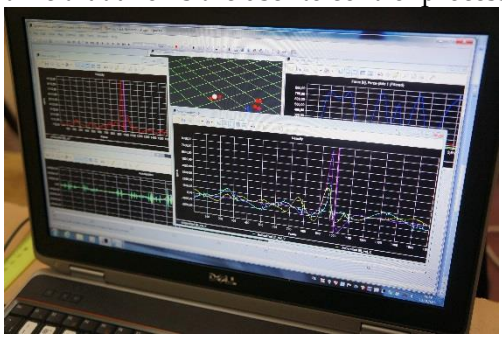


Fig 1. Application of QTM.

The software Qualisys has a possibility of work with 32 cameras, in our case 4 cameras were bought in the beginning but in communication by shortcomings of quality of data acquisition the number of cameras was added up to 8, for work in laboratory conditions . The software Qualisys supports collaboration with 2 acquired tenzoplatform Amti of USA production. Power tensometric platforms are intended for measurement of forces applied to the platform. In combination with three-dimensional model of a body, the moments of forces in joints and force can be calculated automatically. Three components of force, the rotation moments around the corresponding x. y, z axes are measured by vertical, horizontal or tangent components of force [11].

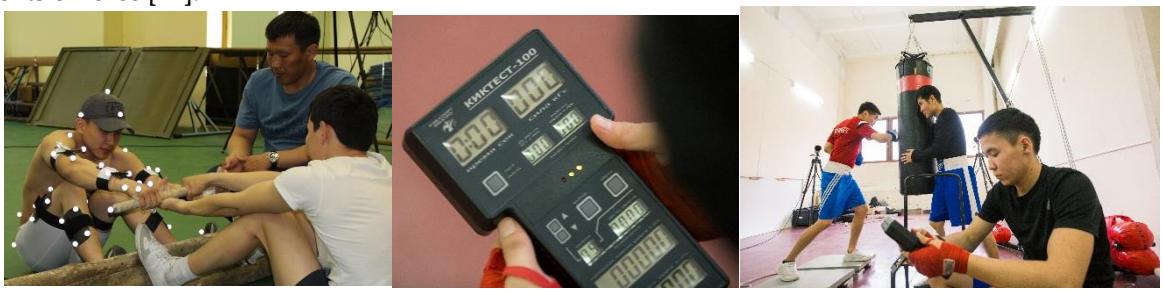


Fig 2. The electronic boxing bag "Kiktest-100".

The electronic boxing bag "Kiktest-100" is the dynamometer indicator device for testing and measurement of the main characteristics of blows. The electronic system is programmed on 48 operating modes allowing to carry out various types of measurements (forces, sharpnesses, energy of blow, etc.)[6,7]

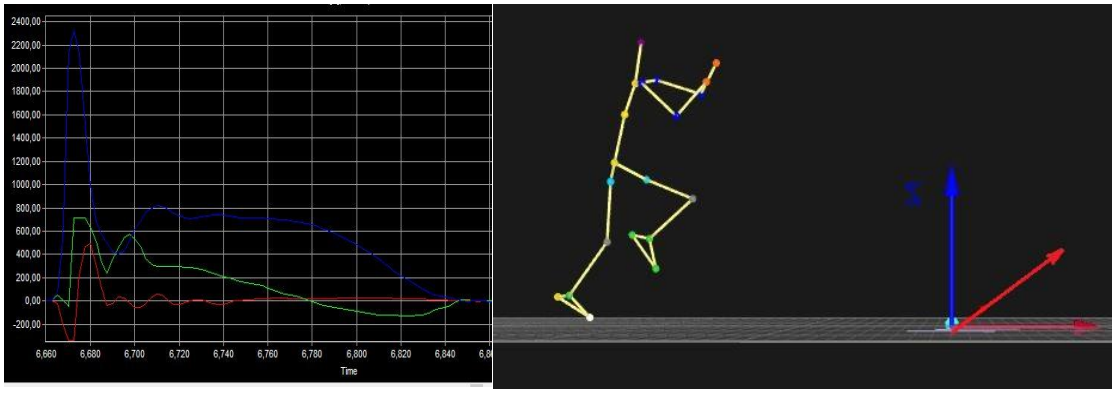


Fig 3. Sample of the three-dimensional image of force of pushing away at a jump.

One of current problems of modern higher education is real transition from theoretical to the practical-focused approach. In our scientific education center of the Olympic and national sports a practical training on biomechanics among bachelors, scientific research practice of bachelors and undergraduates take place. Researches for degree projects of bachelors, master and postgraduate theses are conducted. Researches on national sports: Yakut jumps, mas-wrestling, northern all-round are conducted. On the Olympic kinds, boxing, the free-style wrestling track and field for athletics. Masters and graduate students participate in conferences approving results of the scientific research realized in the theses. Accuracy and a variety of the obtained data become fundamental in studying of their researches [3,4,5,8,9].

4. Results

Under the contract with MGAFK No. 2016.12710 from 14.11.2016. Registration number NIOKTR: AAAA-A16-116122810019-0 scientific research on the subject "The Analysis of Biomechanical Indicators of the Athletes Practicing Mas-wrestling and Boxing (after Recovery Influences)" is carried out.

2 dissertations are defended. - Zakharov A.A. " Development of force and endurance of muscles of hands of the qualified masrestler with use of technical means ", Kudrin E.P. "Development of technical and tactical actions of the qualified athletes in mas-wrestling with use of the technical tool". Use of modern information technologies significantly increased quality of scientific and educational activity.

5. Discussion and Conclusion

To achieve good results in training now it is necessary to realize about need of application of innovative educational technologies for teaching and educational process. Use of modern pedagogical technologies in educational process broadens horizons of students, develops them intellectually, contributes to the development of research skills and also creative qualities.

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Investigation of Perceived and Preferred Leadership Behavior in Terms of Gender of Athletes: A Meta-Analysis Study

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Abstract

In sports teams, team leaders play an important role for the success of athletes and their high level of performance. The ones who lead the team are generally the coaches. Therefore, this study aims to examine the athletes' perceptions and preferences of leadership behaviors by gender of athletes. A total of 20 studies that included 173 studies using Chelladurai & Saleh's sport leadership scale were included in the study. Effect sizes for random effects model; the study included 20 studies, which were sub-dimensions of training and instruction, democratic, autocratic, social support and positive feedback by using Hedge "g" coefficient. Different methods were used to examine publication bias in funnel plots, Duval and Tweedie's trim and fill method and meta-analysis such as Egger's regression test. As a result of the findings, it was found that there was no differences in gender in training and instruction, autocratic, social support and positive feedback - except democratic- which are sub-dimensions of leadership behaviors in sports, and it was found that the gender of the athletes were not related to their perception of leadership behaviors and preferences This result shows that the gender of the athletes is not a demographic variable that is effective in their perceptions and preferences of leadership behaviours except for democratic behavior. This study provides valuable information for understanding the dynamics of sports leadership among young athletes and the importance of the gender of the athlete in the athlete-coach interaction.

Keywords: leadership scale in sport, effect size, meta-analysis, coach leadership style

1. Introduction

The concept of leadership is one of the concepts that are widely discussed and researched in social sciences, especially in the fields of management, psychology, sociology and educational sciences. One of these aforementioned fields where leadership is being investigated is sports management. In the past decade, studies on sports management and sports psychology have mainly focused on the athletes and the effects of different psychological variables on the performance of athletes [1-3]. One of the most important factors that affect performance and success of athletes is leadership [4].

Leadership is defined as the process of influencing the activities of the individual or group to achieve specific goals under certain conditions [5]. According to another definition, leadership is defined as a behavioral process of influencing individuals and groups towards set goals [6]. When it comes to sport environment, leadership, in terms of effective coaching, is a necessary group function with significant impacts at both individual and team level for top performance. In this direction, effective coaches are defined as the one who are prepared to meet the individual needs of their athletes and realize that they can make a difference in the team performance by improving their own coaching skills and understanding the effect that their behavior can have on their athletes [7].

2. Literature Review

As a result of researches on leadership in sports, it is seen that there are different approaches and researchers working in this field have developed their own leadership models by using these theories. The first of these theories is the Normative Model of Decision Styles in Coaching, developed by Chelladurai and Haggerty [8]; the second theory is developed by Smoll et al. [9] with the name of the Mediatioal Model of Leadership in Sport; and the third model is the Multidimensional Model of Leadership, developed by Chelladurai and Saleh [10] and Chelladurai [11-12]. The last model in the literature to determine the effectiveness of the coach is developed by Horn [13] with the title of the Model of Coaching Effectiveness.

Among these models, Leadership Scale for Sport (LSS), developed by Chelladurai and Saleh [10] the most commonly used scale in the literature. There are 3 different versions of the Leadership Scale for Sport developed by Chelladurai and Saleh [10]. The first version is athletes' preference version; the second one is the athletes' perceptions of their coaches' behaviour and the last one is coaches' perception of their own behaviour. The scale was adapted and used to identify formal and informal athlete leaders [14]. All three versions of the scale define the following subscales:

Training and Instruction, which refers to the behaviour of the coach that is directed towards improving the performance of athlete's and behaviours including instructions in the skills of the athlete's; Democratic Behaviour, which relates whether the coach allows athletes to participate in important coaching decisions associated with group goals; Autocratic Behaviour, which refers to the authority and independent decision making of the coach; Social Support, which is related to the coach's concern for the welfare of his/her athletes, creating a positive environment and interpersonal relationships with athletes; and Positive Feedback, which refers to the coach's behaviour of reinforcing athletes and recognizing and rewarding good performances [10]. In summary, this model includes the conceptualization of coach behaviour, the direct task factor (eg, training and instruction), the decision-making style factor (eg, democratic and autocratic behaviour), and the motivational factors (eg, social support and positive feedback).

Some studies have focused on the factors that affect the behavior of a leader. According to Chelladurai [11], these factors are situational factors (type of sport, socio-cultural environment), demographic characteristics of the leader (age, gender, experience, personality) and characteristics of the athletes (age, gender, skill level, psychological characteristics). Other studies have focused on the results of the behavior of the leaders, how the behavior of the leaders affect the performance of the athletes and the satisfactory levels of the athletes [15-17]. To give an example for these studies from the literature, those following ones can be considered: Athletes' Preferences for Coach Behaviour [18-20]; leadership in sports and satisfaction [21-25]; leadership in sports and motivation [26-27]; Kim and Cruz [1] have conducted a meta-analysis, which is more comprehensive with more sample (n= 24), and investigated the influence of coaches' leadership styles on athletes' satisfaction and team cohesion. In these studies, the determination of the leadership types of coaches according to various variables. At the same time, in the literature, it is investigated how the leadership preferences and perceptions of the athletes vary according to their gender [28-30]. For instance, Hastie [31] found that young female athletes preferred a coach that exhibited less autocratic and more positive feedback behavior com-pared to boys, whereas Sherman et al. [32] showed no overall gender differences in coaching preferences. Martin and Barnes [15] pointed out that athletes prefer coaches for more education and training, positive feedback and democratic behavior, and less autocratic behavior. Hastie [33] stated that there is an increasing tendency of athletes to autocratic choice. For example, Riemer and Toon [22] investigated the reasons for differentiation of leadership preferences of male and female athletes and stated that the gender of the coaches of the athletes was an effective variable. When the obtained results are examined, while in some studies, the athletes' perceptions of leadership differed by gender [30, 32, 34-35], there were no differences in some other studies [3, 36]. When the results of these studies are examined, they are inconsistent with each other, therefore, it is difficult to obtain generalizable information. Different gender combinations of the coach and athlete (ie, male coach and male athlete, male coach and female athlete, female coach and female athlete and female coach and male athlete) are known as a critical factor affecting athlete perception. In this context, meta-analysis studies come into prominence.

Different gender combinations of coach and athlete (i.e., male coach and male athlete, male coach and female athlete, female coach and female athlete, and female coach and male athlete) have been known as a critical factor influencing athletes' perception. It is considered that an overall image of the studies in the literature is important and it is thought that whether the gender of the athlete perceives leadership behaviors and whether it is effective or not is an important factor. Therefore, it is thought that this study will guide the use of this demographic variable in future studies. Therefore, gender variable was considered in this study. The purpose of this study is to provide some evidence for possible revisions and to provide the conceptual model of sports leadership perceptions and preferences according to their gender.

2.1. Research Questions

Based on this thought, it is planned to present a contributory study to the literature by evaluating the leadership studies in sports in terms of gender among the demographic characteristics. From this point of view, it was tried to find the answers of the following questions:

- According to the gender variable, are there any statistically significant differences between the athletes' perceptions and preferences of leadership behavior, and the sub-scale means of training and instruction behavior?
- According to the gender variable, are there any statistically significant differences between the athletes' perceptions and preferences of leadership behaviour, and the sub-scale means of democratic behaviour?
- According to the gender variable, are there any statistically significant differences between the athletes' perceptions and preferences of leadership behaviour, and the sub-scale means of autocratic behaviour?
- According to the gender variable, are there any statistically significant differences between the athletes' perceptions and preferences of leadership behaviour, and the sub-scale means of social support behaviour?
- According to the gender variable, are there any statistically significant differences between the athletes' perceptions and preferences of leadership behaviour, and the sub-scale means of positive feedback behaviour?

3. Materials and Methods

In the field of sports, the scale, which is developed by Chelladurai [8] and Chelladurai and Saleh [10] and the sole scale that deals both the athletes' perceptions of leadership and preferences, and coaches' perception of their own

behaviour together, enables the athletes to evaluate the leadership behaviors. This scale, which is commonly used in studies related to leadership in sports, has been the main starting point of this study.

3.1. Procedure

This study was designed according to meta-analysis method. Meta-analysis, a quantitative study, is performed by merging the results of the studies related to the determined subject in the literature. In the study, in order to determine whether the leadership characteristics of actors of the sport change by gender, the following databases were reviewed: Emerald, ISI Web of Science, SAGE, Science Direct, Eric, Taylor & Francis Online, EBSCO host, Scopus, Google Scholar, ULAKBIM (Turkish Academic Network and Information Center) and Thesis Center of CHE (Council of Higher Education)

3.2. Inclusion Criteria

The review criteria of this research were conducted as "Chelladurai and /or Saleh" and "leadership scale for sport", and year limitation was activated during search phase. During this search, conducted within the first and second criteria of the study, a total of 173 studies have been reached. All studies meeting other criteria are included in the meta-analysis. The following criteria's were used for the studies to be included in the meta-analysis:

- The necessity of having been used "the leadership scale for sports" developed by Chelladurai [8] and Chelladurai and Saleh [10],
- The necessity of having been conducted or published online between 2008-2018,
- The necessity of having been used the forms developed for athletes,
- The necessity of having been used of gender variable,
- The necessity of sample size, mean and standard deviation, "t" or "p" values or the data required to calculate these values to be given.
- The necessity of being a quantative study.

A total of 18 studies meeting all these criteria have been reached and been included in meta-analysis. In two of these studies, two different forms of the scale were used. therefore, the findings of the studies in the meta-analysis were included separately. Based on this, 20 studies were included in the meta-analysis.

3.3. Study Characteristics

This process yielded 173 articles have been reached in the reviwed databases. In addition, five sub-dimensions of the reviwed scale were defined as a sub-group for each studies, and the 20 studies included in the analysis were dealed according to five sub-dimensions. (Emerald = 1, ISI Web of Science = 8, SAGE = 14, Science Direct = 7, Eric = 4, Taylor & Francis Online = 52, EBSCO host = 5, Scopus = 15, Google Scholar = 44, ULAKBIM = 8, Thesis Center of CHE = 15). In the study, firstly the number of studies was determined for the research question, and the samples used in these studies were examined. Table 1 shows the meta-analysis of the study.

3.4. Data Analysis

In meta-analysis, the effect size can be measured by using fixed effects and random effects models. While the same effect level is being measured in all studies and weighting is carried out by the numbers of observations in the sample; the effect level in the random effects model differs depending on the characteristics of the sample and offers generalizable results. Therefore, random effects model was used in this study. In the research, the effect levels of each population and each study were measured by "Hedge's g" method by means of "Comprehensive Meta-Analysis" program. Because the other methods, "Cohen d" and "Glass Δ", have slight bias for small samples in measuring the effect sizes of populations [37].

4. Results

As shown in Table 1, the mean scores of experimental and control groups are nearly the same, indicating equality of two groups regarding their knowledge of targeted structures.

Table 1: Summary of Studies

No	Author	Year	Gender	Sample Size	Players	Scale
	Martin et. al.	1999/ 2008(online publish)	Male/Female	239	Atlethes	Preferences
	Riemer&Toon	2001/ 2013 (online publish)	Male/Female	108	Tennis atlethes	Preferences
	Riemer&Toon	2013 (online publish)	Male/Female	108	Tennis atlethes	Perceptions
	Shapie et. al.	2016	Male/Female	132	Atlethes	Preferences
	Nacar&Gacar	2013	Male/Female	94	Volleyball players	Perceptions
	Paradis&Loughead	2010	Male/Female	205	Soccer and basketball players	Formal (perceptions)
	Chiu et. al.	2016	Male/Female	201	Swimmers	Perceptions
	Yalcın	2013	Male/Female	422	University athletes	Perceptions
	Eskiyecek et. al.	2015	Male/Female	173	Atlethes	Preferences
0	Paradis &Loughead	2010	Male/Female	205	Soccer and basketball players	Informal (perceptions)
1	Sharma	2015	Male/Female	82	Badminton players	Preferences
2	Sirin et. al.	2012	Male/Female	110	Atlethes	Perceptions
3	Sirin et. al.	2012	Male/Female	110	Atlethes	Perceptions
4	Bilir et. al.	2018	Male/Female	118	Hockey players	Perceptions
5	Ilhan & Gencer	2012	Male/Female	57	Badminton players	Preferences
6	Sarı et. al.	2012	Male/Female	250	University athletes	Perceptions
7	Cengiz et. al.	2012	Male/Female	222	Taekwondo athletes	Perceptions
8	Rodriguez	2009	Male/Female	237	Swimmers	Perceptions
9	Cruz & Kim	2017	Male/Female	167	Badminton players	Preferences
0	Machado & Costa	2015	Male/Female	30	Futsal players	Preferences

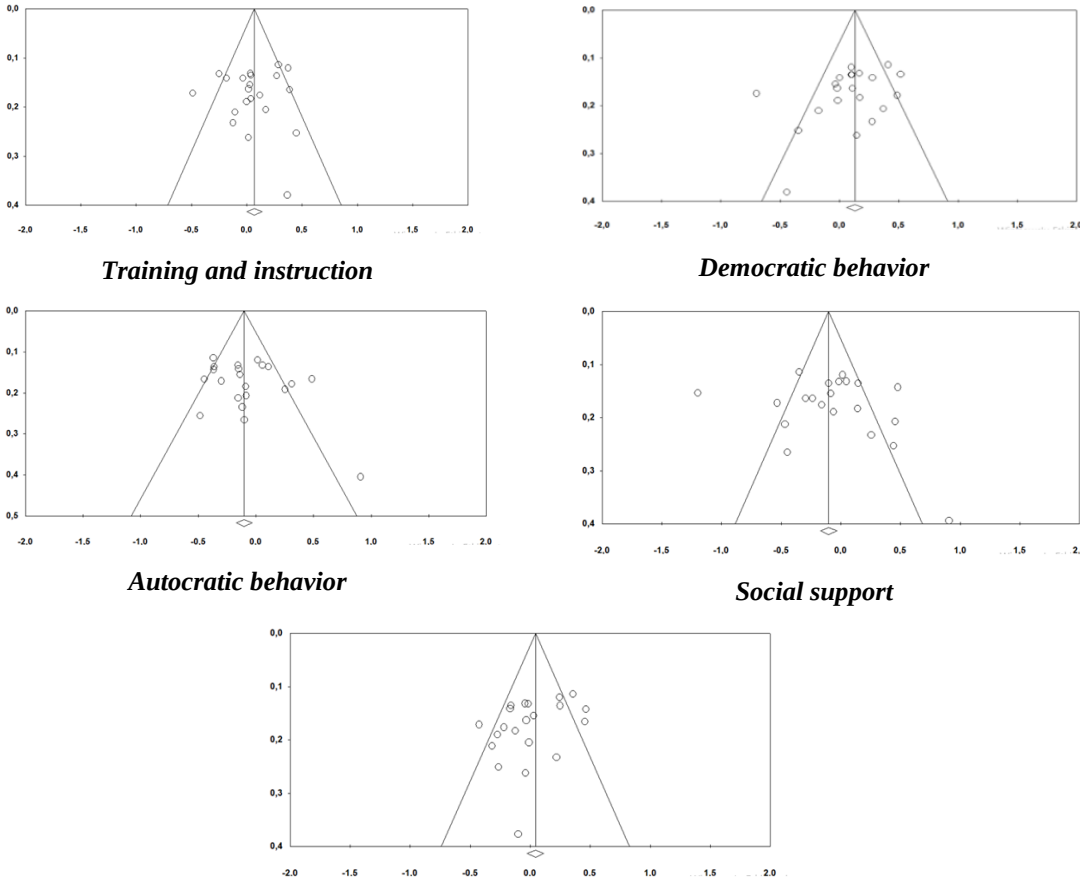
Table 2: Descriptive table for gender variable studies

Sub Dimensions	Studies Number	Gender	Sample Size
Training and Instruction	20	Female	1447
		Male	1771
Democratic Behavior	20	Female	1447
		Male	1771
Autocratic Behavior	20	Female	1447
		Male	1771
Social Support	20	Female	1447
		Male	1771
Positive Feedback	20	Female	1447
		Male	1771

According to Table 2, it is seen that each sub-dimension of 20 studies and gender variable in five sub-dimensions are discussed. The total sample size in these sub-dimensions is 3218. It was determined that in this sample, females were represented with 1447 and male with 1771.

4.1. Publication Bias

Publication bias refers to the failure to represent all the studies by the studies selected from the ones on a specific subject. Different methods are used to determine publication bias. Some used methods in this direction are as follows: Funnel Scatterplot, Duval and Tweedie's Trim and Fill, Egger's Linear Regression Test. The Funnel Plots used in this study to determine the publication bias is given below:



Training and instruction

Democratic behavior

Autocratic behavior

Social support

Positive feedback

Figure 1*.Funnel Plot Charts*

According to Sterne et al. [38], if the plots, which were measured for each studies and showing the effect value,

are symmetrically distributed on both sides of the vertical line within the funnel, then it means there is no publication bias. According to the Figure 1, in each of the sub-dimensions, it is seen that the studies are symmetrically distributed on both sides of the vertical line within the funnel. Therefore, it can be said that there is no publication bias in the study. However, it is difficult to say that the funnel scatter plot always gives a clear result. The results concerning the Duval and Tweedie's Trim and Fill test and Egger's Linear Regression test are given in Table 3.

Table 3: Regarding the publication bias Duval and Tweedie'strim and fill, Egger's linear regression testing results

	Duval And Tweedie' s Trim and Fill Test		Egger's Regresyon Test (*p*)
Sub Dimensions	Trimmed Studies	Observed /Adjusted	
Training and Instruction	0	$-0.09_{(-0.21, 0.02)}$ / $-0.09_{(-0.21, 0.02)}$	0.230
Democratic Behavior	4	-0.14 (-0.24, -0.25)/-0.20 (-0.29,-0.10)	0.051
Autocratic Behavior	1	$0.09_{(-0.03, 0.21)}$/ $0.08_{(-0.04, 0.20)}$	0.171
Social Support	1	$-0.06_{(-0.19, 0.08)}$/ $-0.08_{(-0.22, 0.05)}$	0.419
Positive Feedback	3	$-0.05_{(-0.18, 0.07)}$/ $-0.10_{(-0.22,0.02)}$	0.081

The results of Duval and Tweedie's Trim and Fill test, which is performed to determine publication bias, is given in Table 3. This method gives the number of works that need to be trimmed in order to make the funnel scatter plot symmetrical. Thus, the effect size of the trimmed studies is re-calculated. Inexistence of statistically significant difference between the observed and corrected values indicates that there was no publication bias [39]. According to Table 3, the difference between the observed and corrected values in five sub-dimensions in 95% confidence interval was not statistically significant. Therefore, we can suggest that there is no publication bias in this study. In addition, Egger's Linear Regression test in another method used to determine the publication bias. The fact that the result of this test was not significant indicates that there is no publication bias [40]. The results obtained in this study show that there are no publication biases for five sub-dimensions ($p > 0.05$).

4.2. Heterogeneity Test

Before the analysis, the heterogeneity test, one of the assumptions found in the random effects model, was carried out. For this purpose, Q-test showing the heterogeneity of the effect sizes of the examined studies and I^2 value showing the level of heterogeneity is given in Table 4.

Table 4: Heterogeneity test results

Sub Dimensions	**k**	**Q**	**I^2**	**df**	**p**
Training and Instruction	2	48.0	60.	19	.
	0	02	418		000
Democratic Behavior	2	30.9	38.	19	.
	0	03	516		041
Autocratic Behavior	2	51.2	62.	19	.
	0	20	905		000
Social Support	2	62.4	69.	19	.
	0	13	558		000
Positive Feedback	2	54.9	65.	19	.
	0	46	420		000

The heterogeneity value is evaluated by examining I^2. According to Higgins et al. (2003); a lower value than 25% means the heterogeneity value is low, 50% means a moderate value and a value higher than 75% means that the heterogeneity value is high [41]. For this study, when I^2 value is examined, it is seen that the heterogeneity value in the sub-dimensions of training and instruction, autocratic behavior, social support and positive feedback is at moderate level; and it is at low level for democratic behavior sub-dimension. On the other hand, for the meta-analysis, the value of Q in the x^2 critical values table for the df and the significance level is smaller than the Q value obtained is the heterogeneity [42]. Accordingly, studies are heterogeneous in all sub-dimensions.

Table 5: Effect size results of studies by random effects model

Sub Dimensions	K	z	Hedge's g	p
Training and Instruction	2	-	-	0

	0	1.562	0.092	.118
Democratic Behavior	2	-	-	0
	0	3.064	0.145	.002
Autocratic Behavior	2	1.525	0.0	0
	0		93	.127
Social Support	2	-	-	0
	0	0.841	0.057	.400
Positive Feedback	2	-	-	0
	0	0.851	0.054	.395

As can be seen in Table 5; in the sub-dimension of Training and Instruction; according to the random effects model, while the standardized mean differences were -0.092 in the 95% confidence interval among the athletes including 2343 female and 2629 male, it was found that z score was not statistically significant (z = -1.562, p> 0.05) (See Appendix 1). According to this, in the sub-dimension of training and instruction, there were no statistically significant difference between the female and male athletes' perceptions and preferences of leadership behavior. In the sub-dimension of Democratic behaviour, according to the random effects model, the standardized mean differences of female and male athletes were -0.145in the 95% confidence interval. However, z score was statistically significant (z = -3.064, p<0.05) (See Appendix 2). According to this result, athletes' perceptions and preferences of leadership behaviors do differ by gender in the sub-dimension of democratic behavior In the sub-dimension of Autocratic behaviour, the standardized mean differences were 0.093in the 95% confidence interval and it was found that z score was not statistically significant (z = 1.525, p> 0.05) (See Appendix 3). In the sub-dimension of autocratic behaviour, this result shows that athletes' perceptions and preferences of leadership behaviors do not depend on their gender. In the sub-dimension of social support, the standardized mean differences of female and male athletes were -0.057in the 95% confidence interval and it was found that z score was not statistically significant (z = -0.841, p> 0.05) (See Appendix 4). In this case, it can be suggested that athletes' perceptions and preferences of leadership behavior do not differ according to gender in the sub-dimension of social support. In the sub-dimension of positive feedback behaviour, the standardized mean differences of athletes were -0.054 in the 95% confidence interval. However, z score was not statistically significant (z = -0.851, p> 0.05) (See Appendix 5).This result shows that athletes' perceptions and preferences of leadership behaviours do not differ in terms of gender in the positive feedback sub-dimension.

5. Discussion and Conclusion

This study aims to examine the athletes' perceptions and preferences of leadership behaviors by gender of athletes. For this purpose, the results obtained from the meta-analysis studies were dealed and discussed according to the sub-dimensions below.

In the training and instruction sub-dimension, it was found that the gender of the athletes was not an important variable in their perception and preferences of the leadership behaviour. This result indicates that the technical, tactical and skills training of the athletes does not cause a different perception or preference according to be a female or male athlete. This result shows that both genders have the same perceptions and preferences in learning basic knowledge and skills specific to sports branch. Indeed, it is determined that female athletes have a higher preference than male athletes in the research on the preferred leadership styles and satisfaction of university student athletes [43]. Moreover, in the studies conducted by Cengiz et al. [44], it is stated that female athletes have higher perceptions than male athletes in terms of taekwondo branch in this sub-dimension. On the other hand states that the volleyball athletes' perception of leadership behaviors does not differ according to gender in the training and instruction behavior sub-dimension [45]. In addition, in the studies conducted by Rodriguez [46], Sarı et al. [24] and Eskiyecek et al. [47] it is suggested that there is no differentiation according to gender in this sub-dimension. The results of this study are consistent with the results of the aforementioned studies.

In the sub-dimension of democratic behavior, it is seen that the gender of the athletes is an important variable in their perception and preference of leadership behaviors According to this; female athletes' recognition and preferences under democratic behavior is statistically higher when compared with the male athletes. It is not usual to have differences according to gender in recognition and preferences of this dimension which imply taking care of athletes's opinions, having their involvement in and decision making process, having their contribution while taking common decisions. Because, participation in any decision concerning the group or team concerned is a desired and expected situation by both genders. In the studies conducted by Rodriguez [46], Nacar and Gacar [45], İlhan and Gencer [20], Cengiz et al., [44], Sarı et al. [24] and Eskiyecek et al. [47] it was found that there was no difference in the sub-dimension of democratic behaviors according to gender and they were found to be compatible with the results of this study. However, Shapie et al. [43] stated that female athletes have higher democratic behavior preferences than male athletes. This indicates that female have a high preference for participation in decisions and it was found to be

compatible with the result of this study. In another research Cruz and Kim [35] found that male athletes with female coaches preferred more democratic behavior, autocratic behavior, and social support behavior than did those with male coaches while female players with male coaches favored more democratic behavior autocratic behavior and social support than did those with female coaches

When the sub-dimension of Autocratic behaviour is examined, gender was found to be insignificant variable. The athletes' perceptions and preferences do not differ according to gender in autocratic behaviour, with a single authority, in which the leader individuals are generally the only decision makers, and in which the group or other people who make up the team do not participate in the decisions. This may be an indication that the existing situation is not interpreted differently in terms of genders. While there was no difference between the genders in the studies of Shapie et al. [43], Nacar and Gacar [45], Sarı et al. [24], Cengiz et al. [44], and İlhan and Gencer [20], in the study conducted by Eskiyecek et al. [47] on the athletes' preferences for leadership behaviour, it was found that male athletes have higher autocratic behavior preferences than female athletes in the sub-dimension of autocratic behaviour. In addition, Rodriguez's [46], Windsor [48], Beam et al. [49] and Chelladurai [8] studies also reported that male athletes perceived higher autocratic behaviour than female athletes.

It was determined that gender was not a significant variable in social support sub-dimension. It was found that in this sub-dimension, which refers to the fact that athletes have all kinds of support by their leaders in time outs and in every respect, the difference between perception and preference was not different between the genders. In Nacar and Gacar's [45], study, it is revealed that there is a difference between genders in this sub-dimension and that female athletes have higher perceptions of social support than male athletes.In addition, Machado and Costa [50], found that female athletes' preference of social behaviour was higher that male athletes. However, in the studies conducted by Rodriguez [46], İlhan and Gencer [20], Sarı et al. [24], Cengiz et al. [44], Eskiyecek et al. [47] and Shapie et al. [43], it is stated that there was no difference by gender in this sub-dimension and this was consistent with the results of this study.

It was determined that there was no difference by gender in the positive feedback sub-dimension. Gender is not a significant variable in this sub-dimension which expresses rewarding in leadership behaviors. In Machado and Costa's [50], study, this sub-dimension emerged as the least preferred leadership behaviour sub-dimension in female athletes. In the studies of Rodriguez [46], Nacar and Gacar [45], İlhan and Gencer [20], Cengiz et al. [44], Sarı et al. [24] and Eskiyecek et al. [47], no preference or perception difference was found in this sub-dimension by gender. The results of the a fore mentioned studies are consistent with the results of this study. On the contrary, Pitts (2018) further argued that female student-athletes in the Midwest Conference overwhelmingly preferred positive feedback leadership behavior compared to their male counterparts [51].

6. Conclusions

In this study, it is concluded that there is no differentiation by gender in the sub-dimensions of leadership behaviour including training and instruction, autocratic behaviour, social support and positive feedback and there is a difference in the sub-dimension of democratic behavior. This result shows that the gender of the athletes is not a demographic variable that is effective in their perceptions and preferences of leadership behaviours except for democratic behavior. When it is examined whether the studies on leadership in sports vary according to the gender in terms of coaches, although a finer result is expected; the results of this study were evaluated within their limitations. For the literature, it can be recommended to conduct meta-analysis studies where both athletes and coaches are evaluated together and different demographic characteristics are analyzed together.

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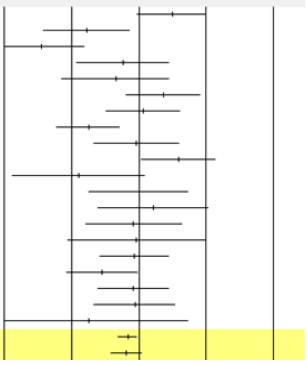
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APPENDIX

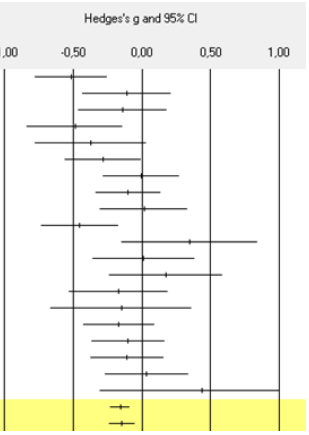
Appendix-1: Effect sizes of studies involving gender variable (Training and instruction sub-dimension)

Model	Study name	Subgroup within study	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Martin et al.,	TI	0,249	0,133	0,018	-0,011	0,509	1,873	0,061
	Riemer&	TI	-0,389	0,165	0,027	-0,713	-0,065	-2,355	0,019
	Riemer&Too	TI	-0,728	0,169	0,029	-1,059	-0,396	-4,304	0,000
	Shapie et	TI	-0,119	0,176	0,031	-0,465	0,226	-0,678	0,498
	Nacar&Gac	TI	-0,172	0,205	0,042	-0,575	0,230	-0,838	0,402
	Paradis&	TI	0,182	0,141	0,020	-0,095	0,459	1,285	0,199
	Chiu et	TI	0,032	0,141	0,020	-0,245	0,310	0,230	0,818
	Yalcin,2013	TI	-0,375	0,121	0,015	-0,612	-0,139	-3,108	0,002
	Eskiyecek	TI	-0,017	0,163	0,027	-0,338	0,303	-0,107	0,915
	Paradis&Lo	TI	0,299	0,142	0,020	0,021	0,577	2,110	0,035
	Sharma,201	TI	-0,449	0,253	0,064	-0,945	0,047	-1,775	0,076
	Sirin et	TI	0,000	0,189	0,036	-0,371	0,371	0,000	1,000
	Sirin et.	TI	0,107	0,211	0,044	-0,306	0,519	0,507	0,612
	Bilir et	TI	-0,038	0,183	0,034	-0,397	0,321	-0,209	0,834
	Ilhan&Genc	TI	-0,017	0,262	0,069	-0,531	0,497	-0,063	0,950
	Sari et al.,	TI	-0,032	0,132	0,017	-0,291	0,227	-0,244	0,807
	Cengiz et	TI	-0,272	0,136	0,019	-0,539	-0,005	-2,000	0,046
	Rodriguez,2	TI	-0,038	0,135	0,018	-0,303	0,227	-0,283	0,777
	Cruz&Kim,2	TI	-0,029	0,155	0,024	-0,332	0,274	-0,187	0,851
	Machado et	TI	-0,368	0,380	0,144	-1,113	0,376	-0,969	0,332
Fixed			-0,082	0,036	0,001	-0,153	-0,011	-2,267	0,023
Random			-0,092	0,059	0,004	-0,209	0,024	-1,562	0,118



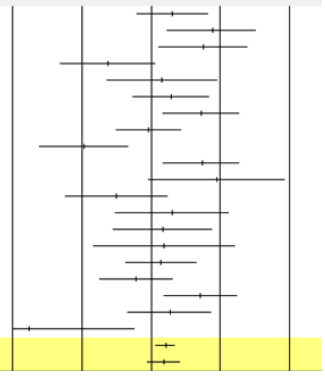
Appendix-2: Effect sizes of studies involving gender variable (Democratic behavior sub-dimension)

Model	Study name	Subgroup within study	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Martin et al.,	DB	-0,516	0,134	0,018	-0,780	-0,253	-3,843	0,000
	Riemer&	DB	-0,109	0,164	0,027	-0,430	0,213	-0,663	0,508
	Riemer&Too	DB	-0,143	0,164	0,027	-0,464	0,179	-0,870	0,384
	Shapie et	DB	-0,487	0,179	0,032	-0,837	-0,137	-2,727	0,006
	Nacar&Gac	DB	-0,370	0,207	0,043	-0,776	0,035	-1,792	0,073
	Paradis&	DB	-0,278	0,142	0,020	-0,556	-0,001	-1,965	0,049
	Chiu et	DB	-0,001	0,141	0,020	-0,279	0,276	-0,009	0,993
	Yalcin,2013	DB	-0,102	0,120	0,014	-0,337	0,133	-0,850	0,395
	Eskiyecek	DB	0,018	0,163	0,027	-0,302	0,339	0,113	0,910
	Paradis&Lo	DB	-0,452	0,143	0,020	-0,732	-0,172	-3,165	0,002
	Sharma,201	DB	0,346	0,252	0,064	-0,148	0,840	1,372	0,170
	Sirin et	DB	0,014	0,189	0,036	-0,357	0,385	0,076	0,940
	Sirin et.	DB	0,175	0,211	0,044	-0,238	0,589	0,832	0,405
	Bilir et	DB	-0,172	0,184	0,034	-0,532	0,187	-0,939	0,348
	Ilhan&Genc	DB	-0,147	0,263	0,069	-0,662	0,368	-0,561	0,575
	Sari et al.,	DB	-0,168	0,132	0,017	-0,428	0,091	-1,273	0,203
	Cengiz et	DB	-0,100	0,136	0,018	-0,366	0,166	-0,737	0,461
	Rodriguez,2	DB	-0,107	0,135	0,018	-0,372	0,158	-0,789	0,430
	Cruz&Kim,2	DB	0,034	0,155	0,024	-0,269	0,337	0,219	0,827
	Machado et	DB	0,442	0,381	0,145	-0,305	1,189	1,159	0,246
Fixed			-0,154	0,036	0,001	-0,225	-0,084	-4,275	0,000
Random			-0,145	0,047	0,002	-0,238	-0,052	-3,064	0,002



Appendix-3: Effect sizes of studies involving gender variable (Autocratic behavior sub-dimension)

Model	Study name	Subgroup within study	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Martin et al.,	AB	0,155	0,132	0,018	-0,105	0,415	1,170	0,242
	Riemer&	AB	0,444	0,166	0,027	0,119	0,769	2,679	0,007
	Riemer&Too	AB	0,376	0,165	0,027	0,053	0,700	2,279	0,023
	Shapie et	AB	-0,311	0,177	0,031	-0,658	0,036	-1,754	0,079
	Nacar&Gac	AB	0,082	0,205	0,042	-0,320	0,484	0,402	0,688
	Paradis&Lo	AB	0,148	0,141	0,020	-0,129	0,425	1,048	0,295
	Chiu et	AB	0,365	0,143	0,020	0,085	0,644	2,556	0,011
	Yalcin,2013	AB	-0,015	0,120	0,014	-0,250	0,219	-0,129	0,897
	Eskiyecek	AB	-0,485	0,165	0,027	-0,809	-0,161	-2,933	0,003
	Paradis&	AB	0,368	0,142	0,020	0,090	0,647	2,590	0,010
	Sharma,201	AB	0,478	0,253	0,064	-0,019	0,974	1,885	0,059
	Sirin et	AB	-0,250	0,190	0,036	-0,623	0,122	-1,317	0,188
	Sirin et.	AB	0,152	0,211	0,044	-0,261	0,565	0,720	0,471
	Bilir et	AB	0,086	0,183	0,034	-0,273	0,445	0,470	0,638
	Ilhan&Genc	AB	0,097	0,262	0,069	-0,417	0,612	0,371	0,710
	Sari et al.,	AB	0,072	0,132	0,017	-0,187	0,331	0,545	0,586
	Cengiz et	AB	-0,108	0,136	0,018	-0,374	0,158	-0,799	0,424
	Rodriguez,2	AB	0,360	0,136	0,019	0,093	0,627	2,640	0,008
	Cruz&Kim,2	AB	0,137	0,155	0,024	-0,167	0,440	0,884	0,377
	Machado et	AB	-0,884	0,394	0,155	-1,655	-0,112	-2,245	0,025
Fixed			0,106	0,036	0,001	0,035	0,177	2,934	0,003
Random			0,093	0,061	0,004	-0,027	0,213	1,525	0,127



Appendix-4: Effect sizes of studies involving gender variable (Social support sub-dimension)

Model	Study name	Subgroup within study	Statistics for each study							Hedges's g and 95% CI
			Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-1,00 -0,50 0,00 0,50 1,00
	Martin et al.,	SS	0,017	0,132	0,017	-0,242	0,277	0,131	0,896	
	Riemer&	SS	0,235	0,164	0,027	-0,087	0,557	1,430	0,153	
	Riemer&Too	SS	-0,160	0,164	0,027	-0,481	0,161	-0,975	0,329	
	Shapie et	SS	0,160	0,176	0,031	-0,186	0,505	0,907	0,364	
	Nacar&Gac	SS	-0,455	0,208	0,043	-0,862	-0,048	-2,189	0,029	
	Paradis&	SS	-0,479	0,143	0,020	-0,759	-0,199	-3,349	0,001	
	Chiu et	SS	0,103	0,142	0,020	-0,174	0,381	0,728	0,467	
	Yalcin,2013	SS	-0,014	0,120	0,014	-0,249	0,220	-0,120	0,905	
	Eskiyecek	SS	0,296	0,164	0,027	-0,026	0,617	1,801	0,072	
	Paradis&Lo	SS	-0,685	0,145	0,021	-0,969	-0,401	-4,724	0,000	
	Sharma,201	SS	-0,443	0,253	0,064	-0,939	0,053	-1,752	0,080	
	Sirin et	SS	0,060	0,189	0,036	-0,311	0,431	0,318	0,751	
	Sirin et.	SS	0,468	0,213	0,045	0,051	0,885	2,197	0,028	
	Bilir et	SS	-0,143	0,183	0,034	-0,502	0,217	-0,778	0,436	
	Ilhan&Genc	SS	0,447	0,266	0,071	-0,073	0,968	1,685	0,092	
	Sari et al.,	SS	-0,048	0,132	0,017	-0,307	0,211	-0,362	0,718	
	Cengiz et	SS	-0,147	0,136	0,018	-0,413	0,119	-1,082	0,279	
	Rodriguez,2	SS	0,101	0,135	0,018	-0,164	0,366	0,745	0,456	
	Cruz&Kim,2	SS	0,083	0,155	0,024	-0,220	0,387	0,538	0,591	
	Machado et	SS	-0,908	0,395	0,156	-1,681	-0,134	-2,301	0,021	
Fixed			-0,056	0,036	0,001	-0,127	0,015	-1,553	0,120	
Random			-0,057	0,068	0,005	-0,189	0,076	-0,841	0,400	

Appendix-5: Effect sizes of studies involving gender variable (Positive feedback sub-dimension)

Model	Study name	Subgroup within study	Statistics for each study							Hedges's g and 95% CI
			Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-1,00 -0,50 0,00 0,50 1,00
	Martin et al.,	PF	0,017	0,132	0,017	-0,243	0,276	0,126	0,899	
	Riemer&	PF	-0,457	0,166	0,027	-0,782	-0,132	-2,754	0,006	
	Riemer&Too	PF	-0,280	0,164	0,027	-0,603	0,042	-1,705	0,088	
	Shapie et	PF	0,217	0,177	0,031	-0,129	0,563	1,230	0,219	
	Nacar&Gac	PF	0,009	0,205	0,042	-0,393	0,411	0,045	0,964	
	Paradis&	PF	-0,464	0,143	0,020	-0,744	-0,184	-3,250	0,001	
	Chiu et	PF	0,166	0,142	0,020	-0,112	0,444	1,171	0,242	
	Yalcin,2013	PF	-0,245	0,120	0,014	-0,480	-0,009	-2,034	0,042	
	Eskiyecek	PF	0,031	0,163	0,027	-0,289	0,351	0,191	0,849	
	Paradis&Lo	PF	-0,661	0,145	0,021	-0,944	-0,377	-4,565	0,000	
	Sharma,201	PF	0,262	0,251	0,063	-0,231	0,755	1,043	0,297	
	Sirin et	PF	0,271	0,190	0,036	-0,102	0,644	1,423	0,155	
	Sirin et.	PF	0,317	0,212	0,045	-0,098	0,731	1,496	0,135	
	Bilir et	PF	0,123	0,183	0,034	-0,237	0,482	0,670	0,503	
	Ilhan&Genc	PF	0,037	0,262	0,069	-0,477	0,551	0,142	0,887	
	Sari et al.,	PF	0,042	0,132	0,017	-0,216	0,301	0,321	0,748	
	Cengiz et	PF	-0,250	0,136	0,019	-0,516	0,017	-1,834	0,067	
	Rodriguez,2	PF	0,159	0,135	0,018	-0,106	0,425	1,178	0,239	
	Cruz&Kim,2	PF	-0,030	0,155	0,024	-0,333	0,273	-0,195	0,846	
	Machado et	PF	0,100	0,377	0,142	-0,639	0,839	0,264	0,792	
Fixed			-0,079	0,036	0,001	-0,150	-0,008	-2,193	0,028	
Random			-0,054	0,063	0,004	-0,178	0,070	-0,851	0,395	

Investigation of Factors Affecting the Shuttle Speed in Football

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Abstract

In this study, it was aimed to investigate whether age, body weight, upper stroke training, leg strength and waist force affect the smoothing speed in the individuals who received football training.

With the aim of this study, the average age of 12.89 ±, 80 years, which is operating in the province of Van, Besiktas football school (23) and Basaksehir football school (15) a total of 38 male individuals were included in the study with the consent of their parents.

In both football schools, the height, body weight, leg strength, waist force and shooting speed of the athletes were measured before the training started. Then, in the two football schools, the same training program was applied for two weeks, two days a week for 12 weeks. However, athletes trained in Besiktas football school were given extra strokes training for 12 weeks. At the end of this period, the measurements taken before the training program were repeated. Data were analyzed by using Paired Samples, Anova and Correlation methods in SPSS 21 package program.

As a result of the analyzes, it was determined that there was a significant increase ($p < 0.01$) between the pre-test and post-test values of body weight, leg strength, waist force and smash speed of Beşiktaş football school athletes. When the same variables were examined in Başakşehir football school athletes, there was a significant increase in $p < 0.01$ level between the pre-test and post-test values of the variables except waist force and smash velocity. A significant decrease ($p < 0.01$) was observed in the shot speed. Again, there was no significant difference between the waist and leg strengths of the two groups in terms of the differences between the pre-test and post-test values, and the difference in p-0.01 was found to be different in favor of Beşiktaş football school. In the correlation analysis, both pre-test and post-test values were found to be positively related to waist and leg strength in terms of smash speed.

As a result, it can be said that the impact of the technical training is more effective as the waist and leg strength of the given upper stroke training positively affects the smash speed.

Keywords: Shot Rate, Upper Stroke Training, Leg Force, Waist Force

1. Introduction

Success in football, technical, tactical, condition and psychological factors arise as a result. Of these, the technique is of different importance for each sport branch. The technique is a key element in achieving success among them.

Agostini (1994), football, high-intensity, intermittent loadings, durability, short sprints, ball skills, coordination, quick maneuvers, consistently correct decision-making and includes a balance of sport as a sport.

Sevim (2002) defines the sportive technique as a result of the experience, which is generally applied in practice, and the movement of a particular movement as much as possible and economical. The technique in football refers to getting ready for being equipped with movement skills and position possibilities to possess and maintain the ball under the toughest match conditions [3]. Ferah (1991), football technique from a practical point of view, the ball and the techniques applied without the ball is divided into two. Çetin (1997); He stated that he covered all kinds of balls, ball control, dribbling, and deception. Armbruster (1975) argued that today's football is based on the ability of all players to play both defense and offense in the game. For this reason, the players have to show high performance in hitting, rusting, striking, dribbling and head-banging skills. It was also stated that the technique would precisely determine how well the nature of the interaction between the central nervous system (brain) and the administration organs (motion apparatus) would be applied [5].

The main purpose of football game; The goal is to shoot in the goal by either shooting or head kick. In order to be successful in football, the first thing that must be possessed is the technique of ball kick [7]. Soccer players, one of the types of strokes used in football and "top strokes" is defined as the upper part of the foot technique is often used by using the beat and from an early age they take this stroke training. The

top shot technique is used mostly when smashing the goal. It is a low-level, hard-hitting style that is usually made with the top of the foot for goal strokes [8].

In the football game, we can define the technique of kicking the ball briefly in the game rules. Football is one of the most important basic techniques. It is a technique that can be used in every situation and position. Strokes, as you can stop the attack of the opponent, the game can be used to pass in the game to shoot and throw shots. The success rate of the athletes who have a good shot technique increases a lot. Strikes are the most powerful tactical weapons we can use to turn the game in our favor [9].

In the top stroke technique, the player, the ball and the target must be in the same direction. Player lays his foot on the ball about 25-30 cm next to the ball. The foot of the foot should be fixed to show the feet of the ankle. The knee joint is slightly twisted and the knee joint should be on the ball. The hip joint forms the origin of the movement and is the joint that affects the speed of the ball. The contact of the foot with the ball is the place where the toe ends and the ankle begins. With this area, the center of the ball should be hit. In this process body weight should be transferred to the support foot.

In this study, it was aimed to investigate whether the top shot training effecting the result in football had an effect on the smash speed.

2. Method

2.1. Participants: 38 volunteer athletes who were trained in football in Besiktas and Basaksehir football schools were included in the study. The average age of athletes is 12,89 ± 80 years.

2.2. Material: The body weights of the participants were determined by electronic scale with 0.1 kg. Back strength Dynamometer dynamometer (Japan) was used to determine back and leg strength. The speed of the shooting was determined by the Stalker sport 2 brand.

2.3. Method: The length and body weights of the participants were taken while wearing lean feet, shorts and uniforms.

Waist force; After placing the feet on the dynamometer stand, the knees and arms were stretched, the back was flat and the trunk was slightly bent forward, and the dynamo-meter bar that they grasped with their hands pulled up vertically to the maximum level [10].

Leg force; After the knees (130-140adan) placed their feet on the dynamometer stand, the arms were stretched, the back was straight and the trunk was pulled up slightly using the legs without using the back until the knee was extensible until the knees were stretched. [10]. All force measurements were repeated twice and the best grades were recorded in kg.

Shot rate; a point was determined at a distance of 15 m to determine the smash velocity of the players included in the study. A speedometer was installed at a distance of three meters from this point. The football school student, who had never received any training on football technique, was asked to shoot the goal. Two attempts have been made. The best result has been saved. Then, the planned program was implemented for the athletes of Başakşehir football school. Besiktas football school athletes in addition to the training program applied to Basaksehir football school in each ant-color about 30 min. upper stroke studies were made. These training programs were carried out twice a week for three hours and 12 weeks. Initial measurements were taken again at the end of this period.

Data Analysis: Data obtained from measurements before and after this study were transferred to the data-sheet. Analyzes of these data were performed using Paired Samples, Correlation and Anova.

Table 1. Weekly training program for participants

Type / Days	School	Besiktas Football School	Basaksehir Football School
Saturday		10 min. Warming up	10 min. Warming up
		10 min. Reciprocating pedestrian pass	10 min. Reciprocal rust
		10 min. Topless station	10 min. Topless station
		10 min. Batch Station	10 min. Batch Station
		20 min. Footstops	20 min. Educational game
		30 min. Couple match the castle	30 min. Double Cup Match
Sunday		15 min. Warming up	15 min. Warming up
		15 min. 5x2 game	15 min. 5x2 game
		15 min. Foot top control and rust	15 min. In-pass pass
		15 min. Foot smash	15 min. Foot smash
		30 min. Match	30 min. Match

3. Results

Table 2. Difference between the pre-test and post-test values of variables according to football schools

School Type	Variables		Pre-Test Mean ± Std.	Post-Test Mean ± Std.	Mean Difference	t	p
Besiktas Football School	Body weight (kg)	3	39.47± 8.25	42.03± 8.61	-2.5565	-9.889	.000
	Leg force (kg)	3	49.52± 11.65	54.33± 9.83	-4.8043	-5.219	.000
	Waist force (kg)	3	52.22 ±15.67	57.39± 16.75	-5.1739	-4.319	.000
	Shooting speed (m/s)	3	50.95± 8.49	57.78± 7.23	-6.8261	-6.014	.000
Basaksehir Football School	Body weight (kg)	5	44.59± 10.35	45.91± 10.12	-1.3200	-2.678	.018
	Leg force (kg)	5	52.53± 12.61	57.93± 12.38	-5.4000	-3.553	.003
	Waist force (kg)	5	56.37± 12.65	58.93± 15.05	-2.5667	-1.842	.087
	Shooting speed (m/s)	5	55.99± 12.55	51.03± 12.49	4.9533	.472	.000

Table 2 shows the pre-test and post-test values of the participants in two different football schools. It was found that there was an increase in pre-test and post-test values in all the variables except the smash rates of the footballers who were studying in Başakşehir football school.

Table 3. Significance levels of the difference between pre-test and post-test values of some variables

Variables	Source of Variance	Total of Squares	Standard	Squares Mean	F	p

			deviation			
Body weight (kg)	Between Groups	13.882	1	13.882	5.892	.020
	In-group	84.821	36	2.356		
	Total	98.702	37			
Leg force (kg)	Between Groups	3.221	1	3.221	.127	.724
	In-group	913.970	36	25.388		
	Total	917.191	37			
Waist force (kg)	Between Groups	61.716	1	61.716	1.959	.170
	In-group	1134.238	36	31.507		
	Total	1195.954	37			
Shooting speed (m / s)	Between Groups	1259.747	1	1259.747	58.520	.000
	In-group	774.962	36	21.527		
	Total	2034.709	37			

Table 4. Correlation coefficients and significance levels of some variables with pre-test and post-test

Variables		Shooting speed (pre-test)	Shooting speed (post-test)
Age (years)	Correlation coefficient	.549**	.300
	P	.000	.068
Body weight (cm)	Correlation coefficient	.172	.134
	P	.301	.424
Length (cm)	Correlation coefficient	.199	.310
	P	.230	.059
Leg force (kg)	Correlation coefficient	.507**	.460**
	P	.001	.004
Waist force (kg)	Correlation coefficient	.594**	.522**
	P	.000	.001

Table 4. When the pre-test and post-test values of the smash velocity were examined in terms of correlations with the variables, it was determined that the pre-test values of the shot speed correlated positively with the age variable. Again, the speed of the pre-test and post-test values were found to be positively correlated with the leg and waist force.

4. Discussion

In the study, body weight pre-test and post-test values of Besiktas football school athletes, the first measurement was 39.47 ± 8.25 kg body weight average weight, after 12 weeks 42.03 ± 8.61 kg was measured. The increase between these two values was statistically significant. When the values of the same variable were evaluated in Basakşehir football school athletes, it was determined that the average of the first

measurement values (44.59 ± 10.35) and the average of the last measurement values (45.91 ± 10.12) were found in this group. This increase was significant at p <0.05 level. There was a significant difference (p <0,05) in favor of Besiktas football school athletes. Baştuğ et al. (2011) found that there was a significant decrease in body weight (p <0.01) of the participants. In addition, Ardic (2012) reported that the body composition also provided positive improvements in exercise, resulting in a slight decrease in total body weight and visceral fat mass. It is thought that the results of the study are different from the literature. Exercises in adults lead to a decrease in body fat by decreasing body fat percentage, and increase in body weight by positively affecting the skeletal and muscular system of exercise in individuals of growth age.

Considering the leg strength values of both football school athletes, it was seen that there was a difference between the mean of the first measurement (49.52 ± 11.65) and the mean of the last measurement (54.33 ± 9.83). In the same way, the baseline strength of Basaksehir football school athletes was found to be significant (p <0.01) between the first measurement (52.53 ± 12.61) and the last measurement (57.93 ± 12.38). There was no significant difference between the groups (p <0,05). Harbili et al. (2005), young handball players in their 6-week study at the end of the leg strength reported a significant increase (p <0.01). The findings of the study are in parallel with the literature. This increase is assumed to be an expected increase when the training program and the participants are in the developmental period. Ateş et al. (2007), examined the effect of pliometric training on the upper and lower extremity force parameters of male football players, sedentaries and footballers did not show a significant difference in the pre-test values of the leg force, p <0.01 at the end of the test showed a significant difference.

When the waist force values of the participants were evaluated within the group and between the groups, it was seen that there was a statistically significant difference (p <0.01) between the waist force pre-test (52.22 ± 15.67) and post-test (57.39 ± 16.75) mean values of Besiktas football school athletes. There was no significant difference (p <0,05) between waist force pre-test (56.37 ± 12.65) and post-test (58.93 ± 15.05) mean values of Basaksehir football school athletes. The difference between the pre-test post-test values of the two football school athletes was statistically significant (p <0.05). Harbili et al. (2005), in their study on the young handball players at the end of the 6-week study, reported a significant increase in leg strength (p <0.01). Again Ateş et al. (2007), pliometric training in the study on the effects of male football players, the pre-training sedentary and pre-training waist force of the pre-test there is no significant difference in the values, but the last test showed a significant difference in the p value of p <0.01 level.

While the average speed of the athletes of Beşiktaş football school before the planned training program was 50.95 ± 8.49 km / s, the average of these values increased to 57.78 ± 7.23 km / h after the implementation of the training program. The difference between the first measurement and the last measurement (-6.8261) was statistically significant (p <0.01) in favor of the last measurement. When the values of the same variable in Basaksehir football school athletes were examined, the average of shooting speeds measured before the planned training program was 55.99 ± 12.55 km / s, while the average of the smash rates after the training program was 51.03 ± 12.49 km / s. The difference between these two values (4.9533) was found to be significant in favor of the first measurement. Here, there is a serious decrease in the smash speeds of Başakşehir football school athletes who are not given top traction training. At this point, it was seen that there was a significant increase (p <0.01) when the leg strength values of the participants were examined. However, when the waist force values were examined, it was determined that there was an increase between pre-test and post-test values (-2.5667) but this increase was not significant (p <0.05). When the relationship between the leg force and the smash speed pre-test post-test values of the subjects were examined respectively, it was determined that there was a positive relationship between r = .507 and r = .460 respectively. Similarly, when the correlation between the waist force values and the smash velocity values were examined, it was found that the lumbar force had a positive relationship with both the smash speed pre-test (r = .594) and the smash speed final test values (r = .522). In spite of all these data, it is thought that the decrease in the average of smash speeds of Başakşehir football school athletes may be due to the inability to apply the technique correctly. Wrong applications such as leaving the back of the ball behind the ball when the technique is applied, not hitting the right point with the correct area can reduce the smash speed.

When the correlation between the age, body weight, height, leg and waist force values and the smash velocity was examined, it was found that the correlation coefficient between the age variable and the smash velocity pre-test values was 549. This means a positive significance in p <0.01 level. It was determined that the age variable did not show significant correlation (r = 300, p <0.068) with the last measurement. Although the smoothing rate of the age variable was positively correlated with the first measurement, it was thought that it was effective to have a high stroke training in the 12-week training program in order not to correlate

with the last measurement. It was seen that the correlation between the body weight and height variable and the smash velocity first measurement and final measurement values were not significant. Leg force values of the participants were found to be positively correlated with pre-test, r =, 507 (p <0.01) and r = 460 (p <0.01), respectively. Again it was revealed that the waist force had a positive correlation with the pre-test measured values of r =, 594 (p <0.01) and the final test with r =, 522 (p <0.01). The effect of the muscles on the force of the muscles like M. Biseps Femoris and M. Semitendinosus, especially Gluteus maximus and M. Sartorius and M. Tensor Fasia Late and extensively exerted by M. Sartorius and M. Tensor Fasia Late and flexing the hip joint, especially the hip joint. it is thought to be. The primary flexor of the hip is the iliopsoas muscle. 135 degrees flexion. Gluteus maximus and Hamstring muscles are hip extensors and have an extension of 30 degrees. Flexion, Hamstring muscle group and extension are restricted by the thickening of the capsule [15].

In the light of the data obtained in the study, it is possible to say that the height and body weight do not affect the smash speed, but the training given with the waist and leg force affects the smash speed in football players. Based on the same data, it can be said that the top impact training given by the factors affecting the smash speed is even more effective. In addition to the studies to increase the waist and leg strength in the training to be performed, the correct technique will increase the hit level with the smash speed.

One of the most important biomotor abilities that are needed in sports is the speed of moving or moving very quickly [16]. The top stroke is one of the effective and useful hits. As a football technique, all long-distance goals, passes, shots or ball shots can be done with a high kick. In addition to the off-shore defenses, the goal shots and goalkeeper races are also made with a high kick. When the ball is motionless, when rolling, the ground can be hit as soon as it gains height. The shorter the shorter the closer the ball, the greater the running steps in a straight direction. The support leg is placed one foot wide to balance the body behind the ball. The toe of the ball knees from the knees twisted back from the hips, the foot is stretched and locked, finger tips are shot in a way that shows the place. The full body weight is on the support leg with the support leg until it hits the ball, taking the speed of the leg kicking and relaxing after the shot. The ball kicking the ball continues its movement behind the ball. Significant increases in leg muscle strength did not result in little or no improvement in smash performance [17;18]. The first technique of the game in the first game in the ball to pass the ball in our hands and the game's aim is to pass the smash technique is the tactical sense of two important weapons [19].

A good football talent selection model to be applied in the process of identifying talented football players is the starting point of our sports schools, the success of school-family-club cooperation in this system is certainly very important. Most of the clubs in our country organize summer football schools during the summer. With this study, we hope to contribute to this structure and to shed light on similar studies.

This circuit, which includes the child's emin most ideal emin learning, perception comprehension and imitation period, should be well evaluated. All the coordinating skills that are difficult to learn in this age and the technique which is the most important factor determining success in football can easily be learned and perceived. It is very difficult to learn the delay and deficiency in technical matters at a later age and to compensate for this loss. Because in the first adolescence phase, mental-psychological balance is also negated due to prolongation of the skeletal system. Thus, the characteristics that make up the most ideal learning period change and the aim of the following periods can only be aimed at preserving the acquired technical skills [20].

Sportive success, conditional, psychological characteristics, theoretical accumulation and tactical applications are combined with the technique to achieve the desired result. The technique is of varying importance for every sport. But the technique; is the first basic element and prerequisite for success in sport.

The sportive technique is that a certain movement flow, which is generally made up of practice, is as much as possible and economical as possible [2]. According to Djackov, technical excellence; Under the most difficult competition conditions, it is possible to make the movement structures of sportive exercise economically and perfectly and to reach maximal efficiency [21].

Foot-kick; With the direction of the ball to the direction of the shaking of the foot to follow the same direction, with the large part of the foot hit and body weight and swing can be completely transferred to the ball is a technique that can be shot very hard. For this reason, the goal is to shoot the ball for long-distance shots.

For this reason, technical skills need to be developed and developed in a continuous development in order to reach the result and improve the ability to score in the football game [22]. The shot into the goal is

one of the technical skills required to score during the competition. It is about the beat technique and increases the likelihood of scoring and winning the match when performed properly [23]. Compared to the opposing team, the team has the ability to shoot more goals in the goal and the team is able to win more goals and win amatch [24].

The main purpose of football game; The goal is to shoot in the goal by either shooting or head kick. In order to be successful in football, the first thing that must be possessed is the technique of ball kick [7]. Soccer players, one of the types of strokes used in football and "top strokes" is defined as the upper part of the foot technique is often used by using the beat and from an early age they take this stroke training. The top shot technique is used mostly when smashing the goal. A low-level, often hard-to-beat style for the goal-strokes, is the central part of the ball. Apaydin (1999), in his study, according to the scores obtained from the top strokes by applying Duran Top Test, the fatigue protocol before, mid-and post-stroke performance, observed a statistically significant difference ($p < 0.05$). The decrease in the scores obtained can be considered as a decrease in fatigue formation and top impact performance. Biomechanics are used to define the characteristics of technical skills in sports branches, to determine the mechanical properties in the implementation of the movements and to determine the factors that constitute the basis for a successful performance [22].

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Physical and Anthropometric Characteristics of Youth Volleyball Players According to Playing Position and Gender

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Abstract

The purpose of this study was to investigate some physical and anthropometric characteristics of youth volleyball players according to the playing positions and gender. A total of 562 volleyball players [308 female and 254 male] at the age of 14 were examined according to their playing positions [setter, spiker and middle blocker] in the study. Body height and weight and anthropometric measurements of the players were measured in order to determine body fat percentage, fat-free mass, sum of seven site skinfolds and somatotype of the players. According to the results, the difference between the genders was significant in all analyzed variables [$p<0.05$]. In terms of body fat percentage and somatotype except from the components of endomorphy and ectomorphy, the difference between the playing positions was significant in other physical and anthropometric characteristics [$p<0.05$]. In conclusion, it was possible to state that some physical and anthropometric characteristics were efficient on positioning in female and male volleyball players at the age of 14, and some anthropometric characteristics specific to the position could be gained by the training. Furthermore, results of this study provided normative data for the 14-year-old male and female volleyball players playing in specific individual positions.

Keywords: Youth Volleyball, Anthropometry, Somatotype, Playing Positions

Introduction

Volleyball is an episodic sport branch with high-intensity activities and subsequent resting breaks. Considering that the average duration for the match is nearly 90 minutes, the players are expected to maintain these high-intense activities for a long time. For that reason, it has been reported in the literature that a high-level developed aerobic system and high-level trained anaerobic system are needed for the volleyball players [1, 2]. Besides, the presence of some physical parameters that the players should have for a good athletic performance has also been mentioned, and physiological requirements of the game as well as the physical requirements have been stated as the factors that are leading for the success [3, 4]. The physical properties with high genetic markers such as body height can be significant in some sport branches which the height to be reached is decisive [5-7]. Furthermore, excessive body fat is regarded as the counterproductive of the fast movements and jumps, as decreasing the level of performance, and increasing the energy needed while performing a specific action. In contrast, lean body mass is highly associated with speed, strength, power, and preventing from injuries [8-10]. Moreover, the somatotype means quantifying human body shape independent from the size of body. In terms of somatotype, the most common method is Heath-Carter system [11] classifying the body types as the mix of three components as endomorphy or relative fatness, mesomorphy or relative musculoskeletal robustness, and ectomorphy or relative linearity or slenderness [12].

There are several studies investigating the relationship between anthropometric characteristics and somatotype with performance. For example, it was determined in a study that optimal flexibility and mobility are closely related to anthropometric characteristics with particularly emphasis on body fat in volleyball [3]. In another study it was revealed that by combining somatotype, competition level and playing position linearly nearly 24% performance of the volleyball players in attack could be predicted [13]. It was found in another research that the players in different positions were significantly different in terms of body height and all three somatotype components; however, there were no significant differences in terms of body mass, body mass index and physical performance variables. The players with varying levels of performance differed significantly in terms of both anthropometric and physical performance variables. In general, middle blockers were taller, less mesomorphic, more ectomorphic and endomorphic, whereas the liberos were shorter, more mesomorphic, less ectomorphic and endomorphic than the players of other positions. In compared to less successful players, more successful players in any positions had lower body mass index, were less mesomorphic and endomorphic, and more ectomorphic. Moreover, more successful players have higher lower-body strength, speed, agility and upper-body strength [14]. In a study carried out with elite level volleyball players, it was determined that in terms of male players, there was a tendency towards

greater homogeneity in somatotype for the maximum performance level. Furthermore, somatotype varied according to the game role in volleyball players of both genders; for example, whereas the mesomorphic component is higher in setters, the ectomorphic component is maximum in central players [15].

Although the period between the ages of13 and 15 is characterized with the transition from the development of basic motor skills and primary tactical-technical volleyball skills to the development of position-specific abilities and skills [9], it has recently been known that positioning in volleyball starts at earlier ages, and youth matches are organized at an international level. The anthropometric variables can change during adolescence, and physical abilities can be improved with efficient trainings; however, what can create a difference in youth competition is starting from position-based levels [14]. That's why the coaches and trainers who work with adolescent players should provide training programs based on positional differences specific to age [16]. These data will be helpful for the coaches and sports scientists both in prepare specific training programs and in career planning and talent identification. Previous studies examined the anthropometric and performance characteristics of the elite-level volleyball players according to the positions [1, 3, 5, 13, 15, 17-21]. Although there are some researchers carried out with young volleyball players in the literature [22-24], there are limited number of studies [9, 25] with volleyball players at the age of 14. Therefore, the purpose of this study was to determine some physical and anthropometric characteristics of female and male volleyball players at the age of 14 according to their positions.

2.Method

2.1. Participants

Totally 562 players including 308 female and 254 male volleyball players at the age of 14 participated into this study. The participants were grouped according to the positions they played as setters [n=53 for females; n=49 for males], middle blockers [n=90 for females, n=53 for males], and spikers [n=165 for females; n=152 for males].

2.2. Research Design

All anthropometric measurements were performed between 9 and 11 a.m., from the right side of the body, and by the same persons. All necessary permissions for the tests were taken from the players and parents before collecting the data. Declaration of Helsinki guidelines for human experimentation was followed during the data collection process.

2.3. Anthropometric Measurements

The body height was measured with stadiometer [Holtain, England] in a way the head is on the frontal plane and overhead plane touches to the vertex point while the players were at an anatomical position during the inspiration stage. The body weight was measured on the bascule [Inbody230, Korea] without sportswear and shoes while the players were at an anatomical position. The skinfold thickness was measured with skinfold caliper [Holtain, England] from seven sites [biceps, triceps, subscapula, suprailiac, abdominal, thigh and calf] as suggested by Harison [26], and the girth [biceps, flex biceps, wrist and calf] and breadth [humerus and femur epicondyle] measurements were performed twice with Harpenden caliper [Holtain, England] by the same researchers from the right side of the body; and averages of the values were used for the calculations. After calculating body density from Durnin and Womersley formula [27], body fat percentage was determined according to Siri formula [28], and the somatotype was determined according to Heath-Carter method [11]. The sum of seven skinfolds was also used as an indicator of the body fat. The prediction of fat-free mass was calculated with the formula of [bodyweight- [bodyweight * body fat percentage]] [29].

2.4. Statistical Analyses

The average and standard deviation values related to all analyzed parameters were calculated, and the results were presented in a table. In analyzed variables, the difference between gender and positions after normality analyses was determined with 2x3 Two-Way Variance Analysis, and the difference between the playing positions was determined with Bonferroni Test. In these analyses, the age of training was used as the covariance variable. The significance level of all statistical procedures was accepted as 0.05.

3. Results

The findings obtained from the study were presented in Table 1. In all analyzed variables, the difference between the genders was significant [p<0.05]. In both genders, the variable of body height was different between the positions, and the middle blockers were taller than the players in other positions [F=38.597; p<0.05]. The body weight was significantly higher in middle blockers than the players of other positions, whereas body weights of setters and spikers were similar to each other [F=13.629; p<0.05]. The sum of seven sites skinfold was significantly higher in female volleyball players than the male volleyball players [p<0.05]. When the same variable was analyzed according to the positions, it was found that the sum of seven sites skinfold in middle blockers was significantly higher than the spikers, but similar with the setters [F=4.571; p<0.05]. The body fat percentage was higher in female volleyball players than the male volleyball players [p<0.05], and when the same variable was analyzed for the positions, all positions were noticed to have similar values [F=2.793; p>0.05]. While the male volleyball players had higher fat-free body mass than the females [p>0.05], the variable was noticed to be higher in middle blockers than setters and spikers when analyzed according to the positions [F=14.812; p<0.05]. In terms of somatotype characteristics, female volleyball players had higher values than the males, but all the players had similar values in terms of their positions [F=1.837; p>0.05]. While male volleyball players had higher muscularity levels than the females [p<0.05], setters had a more mesomorphic structure than the players in other positions [F=38.597; p<0.05]. Male volleyball players had higher ectomorphic component than the females [p<0.05], and the values of this component were determined to be similar in terms of the positions [F= 1.671; p>0.05]. In all analyzed variables, the gender and playing position interaction was not statistically significant [p<0.05].

Table 1. Physical and anthropometric characteristics of volleyball players [mean±SD]

	Gender	Setter	Middle Blocker	Spiker	Total
Body Heigth [cm]	Male	176.3±7.7	183.8±4.9*	178.6±5.9	179.1±6.5$^{\Psi}$
	Female	170.6±5.6	175.4±4.2*	172.3±4.3	173.0±4.8
Body Weigth [kg]	Male	62.8±8.5	68.8±8.4$^{\#}$	63.9±7.9	64.7±8.4$^{\Psi}$
	Female	58.7±6.6	61.9±7.6$^{\#}$	59.7±6.9	60.1±7.2
Sum of 7 Skinfolds [mm]	Male	72.0±25.6	78.7±29.7$^{\&}$	69.2±24.6	71.7±26.1
	Female	103.7±26.1	105.6±28.1$^{\&}$	99.4±23.1	101.9±25.2**
Body Fat [%]	Male	15.2±3.8	16.0±3.6	15.0±3.5	15.2±3.6
	Female	24.9±2.8	25.2±3.1	24.7±2.7	24.9±2.8**
Fat Free Mass [kg]	Male	53.1±6.0	57.5±5.1$^{\#}$	54.2±5.8	54.7±5.9$^{\Psi}$
	Female	44.0±4.0	46.1±4.4$^{\#}$	44.8±4.4	45.1±4.3
Endomorphy	Male	2.48±0.92	2.69±1.05	2.43±0.98	2.49±0.99
	Female	3.70±0.97	3.75±0.15	3.61±0.87	3.67±0.97**
Mezomorphy	Male	3.64±1.21$^{\wedge}$	3.38±1.16	3.43±1.33	3.46±1.26$^{\Psi}$
	Female	3.12±0.14$^{\wedge}$	2.63±1.09	2.74±0.95	2.77±1.03
Ectomorphy	Male	3.98±1.38	4.22±1.26	4.22±1.30	4.17±1.31$^{\Psi}$
	Female	3.62±1.20	3.95±1.12	3.78±1.07	3.80±1.11

$^{\Psi}$p<0.05, Male> Female, **p<0.05, Female>Male, *p<0.05, Middle blocker>Spiker>Setter, $^{\#}$p<0.05, Middle blocker> Setter and Spiker,$^{\&}$p<0.05, Middle blocker> Spiker,$^{\wedge}$p<0.05, Setter>Middle blocker and Spiker

4. Discussion

Similar to the literature, in this study the data showed that the male volleyball players at the age of 14 had more body height, bodyweight and fat-free body mass, less body fat percentage and the sum of seven sites skinfold, be more mesomorphic and ectomorphic and less endomorphic than the females. When these values were analyzed in terms of playing positions, the difference was significant in all analyzed variables except from body fat percentage, endomorphy, and ectomorphy. While the middle blockers had the highest

bodyweight and height, setters and spikers were noticed to have similar body height and weights. In a study carried out with female volleyball players at the age of 13 and 15 interval, the body height differed significantly between the positions, but the body weight was determined to be similar [14]. The studies carried out with adult volleyball players also show that the body height and weight differed according to positions, and this difference was arisen from the middle blockers. In these studies it was found that middle blockers had higher body height and weight values than the setters and spikers [1, 17, 20, 21, 30, 31].

Since excessive fatness had negative effect on the athletic performance the previous studies carried out on body composition mostly focused on body fat percentage [3, 29, 32-34]. Although the gender specific differences in body fat percentage are clearly evident in the athletic population, the lower values in the body fatness range indicate that in sports which translocation of body mass is required, athletes are at or close the theoretic minimal body weight estimated at approximately 5% and 12% body fat percentage for male and female subjects, respectively [35]. In a study analyzing the change of body fat percentage between the playing positions in elite female volleyball players, it was stated that body fat percentage of middle blockers [28.9%] was significantly higher than the setters [24.3%] [31]. Some degree of error is inherent in the measurement of body dimensions and body composition. Error associated with the measurements per se and with prediction equations should be noted. The standard error of estimate associated with available equations to predict body density generally ranges between 2% and 5%. For a discussion of error associated with anthropometry and the accuracy of body composition prediction equations [29]. For that reason, there were studies using the sum of skinfold value instead of a formula for determining the body composition. In the present study, higher sum of seven skinfolds value was determined in female volleyball players [101.9±52.2 mm] than the male players [71.7±26.1 mm]. In a study carried out with elite, semi-elite and novice level volleyball players [36], it was reported that male volleyball players had lower sum of skinfolds values than the female volleyball players, and lower sum of skinfolds values were obtained as the level of competing increased.

There were also studies on body fat percentage according to the playing positions with different results. For example, in a study carried out with national level players with 15.5 age average, it was found that body fat percentage, height, body weight and somatotype were similar in all playing positions [22]. However, in a study carried out with female volleyball players at 13-15 age interval, middle blockers were determined to be taller, more ectomorphic, less mesomorphic and endomorphic; and furthermore, more successful players playing in any positions were found to have lower body mass index, be less mesomorphic and endomorphic, and more ectomorphic than the less successful players [14]. In another study carried out with elite female volleyball players, the results proved that liberos and setters had less body height than the other position players and lower body weight than the opposites, centers and hitters. While the centers were taller than setters, hitters and liberos, the opposites had more body weight than the setters and liberos. In terms of somatotype, it was found that liberos had higher mesomorphy than setters and centers. Furthermore, the liberos were noticed to have lower ectomorphy than the centers, setters and hitters [5].

In this study, when somatotype was examined categorically in terms of genders, it was found that the males [2.49-3.46-4.17] were ecto-mesomorph and the females [3.67-2.77-3.80] were endo-ectomorph. The categories of somatotype according to the positions had similar distribution, and mesomorph component of the setters was observed to be significantly higher than the other positions. In a study carried out with male volleyball players at 17 age group, while the setters were determined to be endomorphic ectomorphs and hitters and opposites tend to be balanced ectomorphs, the centers tended to be ectomorphic mesomorphs [22]. In the study with male volleyball players [4], lower endomorphism in youth team and lower ectomorphism in adult team were determined. Whereas the youth team was classified as ectomesomorphic, the adult team was possible to be classified as mesomorph ectomorphic. In another study [5], high level female players [in teams with high team performance ranking] were determined to be taller, have higher skeletal muscle mass and ectomorphy and lower adiposity markers level when compared with lower level of players. The players selected for playing for respective national teams were found to be taller, have more body weight, higher muscle mass and lower endomorphy than the non-selected ones. In a study carried out with elite level male volleyball players, the results indicated that Division A1 players were taller, more muscular and less endomorphic and had more body weight when compared to the ones in Division A2. It was reported that somatotype differed in terms of playing positions as centers and opposites to be endomorph-ectomorph and as hitters to be central [13].

Different results in the literature related to body fat percentage could be interpreted as the varying of genetic structure and efficiency of training program. It is known that frequency, duration and intensity of the

trainings were efficient on the decreasing the body fat percentage [32]. In a study emphasizing the importance of maturity status even comparing the same age groups, [33], the volleyball players jumping to the highest level were found to be matured later than the others. Young adult values of fat-free mass are reached earlier in females, about 15 to 16 years, compared with 19 to 20 years in males. In late adolescence and young adulthood, males have, on average, an fat-free mass that is about 1.5 times larger than that of females. After 14 years of age, males have more fat-free mass for the same height as females [29]. In the study carried out with female volleyball players [37], fat-free mass was noticed to be lower in players under the age of 14 [41.57±6.06 kg] compared to the players at 14-18 age interval [50.24±6.96 kg] and the players above 18 [52.03±3.39 kg]. Besides, it was reported that the relative peak power measured in the Wingate Anaerobic Test was the highest in the group with participants above 18 [9.72±0.65 W.kg], lower in the group with 14-18 age interval [8.95±0.7], and the lowest in the group under the age of 14 [8.32±0.78 W.kg]. It was also stated in a study that [16] positional differences were observed in adolescents in terms of body mass and fat-free mass. It was reported that the differences in body mass, fat-free mass and counter movement jump according to the playing positions of female volleyball players depended on age. The findings in another study indicated that [38] the anthropometric characteristics of volleyball players were consistent with the movements and requirements of their playing positions and competitive needs.

5. Conclusion

On the basis of the previous findings in the literature and our results it is recommended that training programs based on age-specific positional differences should be developed by coaches and physical trainers who work with youth and adolescent players.

6. References

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Can Self-controlled Stationary Bicycle Moderate Intensity Training Increase Claudication Distance in Patients with FontainsStage IIa without the Effects of Expansion on Infrarenal Abdominal Aortic Aneurysm (IAAA) Diameter without Iliac Artery Dilatations (IAD) and Iliac Artery Aneurysms (IAA)?

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Abstract

Background: Non-surgically treated small infrarenal abdominal aortic aneurism diameter (IAAA) without iliac artery dilatations and aneurisms and symptoms of claudication on big distances (ankle brachial index ABI 0,9-0,8) is mainly treated with the recommendation of lifestyle modification, acetylsalicylic acid (ASA) statins, ACE inhibitors which as an alternative combine with walking on a treadmill or by using stationary bicycle.

Materials and methods: This study was conducted from the beginning of May 2015 until the end of May 2016 on Clinic for vascular surgery of Clinical Center of University in Sarajevo, Faculty of Sport and Physical Education of University in Sarajevo and East Sarajevo. 100 patients of the age between 40-55 years of age with peripheral artery disease (Ankle Brachial Index-ABI 0,8-0,9 and BMI 25-34.9kg/m²) participated in the study, namely 5 patients without the disease on a standard program of the training and 50 patients on stadium IIa of peripheral artery disease with symptoms of a slight claudication. For the testing of the differences between examined groups we used T-test for the level of significance ($p<0,05$). The increase of claudication distance after a one-year study was researched in all testedpatients.

Results: Result analysis showed that no statistically significant differences were obtained between claudication distance between the group with stationary bicycle and group with treadmill ($p> 0,05$).

Conclusion: Stationary intervention with stationary bicycle can be alternative vascular therapy and has its benefits, but it cannot completely replace treadmill therapy in patients with peripheral artery disease and values BMI of 25to 34,9kg/m²). Vascular rehabilitation therapy using treadmill still remains the main strategy for therapeutical effect on the improvement of claudication distance (Fontaine phase II) of peripheral artery disease.

Keywords: Infrarenal Abdominal Aortic Aneurysm (IAAA),Stationary Bike, TreadmillTherapy, Peripheral Artery Disease, Claudication Distance.

Introduction

Infrarenal abdominal aortic aneurysm (IAAA) is a pathological state which aneurismaticaly can infect iliac segment, and in any moment has life-threatening effects on patients' lives with increase of measure diameter growth (Table 1) and with progressive degeneration of media (collagen degradation) the risk of rapture itself increases [1-3]. Infrarenal abdominal aortic aneurysm is characterised by physiologically abnormal, localised widening of lower parts of aorta directly under renal arteries. IAAA is also connected with the risk of death as well as some other cardiovascular diseases which are attributed to IAAA [3-5]. Considering that smoking is frequent as a behaviour pattern, the real number of cases of death in Bosnia and Herzegovina can be bigger than currently assessed and with a great empirical certainty it actually is. Ruptured infrarenal abdominal aortic aneurysm is a fatal state with death outcome in 38-50% cases, and in some situations with even greater percentage, even though it is surgically treated [6,7]. Usually, diameter of asymptomatic or symptomaticinfrarenal abdominal aortic aneurysm is 50-55mm and more. Such diameter of

aneurism in most cases is indication for standard operative treatment, by open aortic repair (OAR) or endovascular aortic repair (EVAR). Nevertheless, the research which has been done lately shows that EVAR is equally efficient as OAR is, even though it has its characteristic deficiencies [8-11]. The patients with OAR represent high-risk group depending on individual general state of the patient. Peripheralartery disease is intertwines with aneurismatic degenerative disease which is common, contemporary and insufficiently treated. It is usually followed with numerous comorbid states, and it appears mostly in long-time intensive smokers, with 50 years of age, with or without symptomatology claudication difficulties. In peripheralartery disease we are talking about progressive constriction of lumen artery, especially because of arterotrombotic lesions which results in movement function reduction (intermittent claudication), pain during stillness and tissue loss (critical ischemia), and heightened cardiovascular mortality [12,13].

Peripheral artery disease is very common, but only a small number of patients require relative surgical intervention. Usually these are the patients with deterioration of arteryhemodynamic (over 70%) and symptoms of intermittent claudication under 100m walking distance. It appears in patients who have problems with certain walking distance and are motivated to change their conception of diet and changes to physical activities levels. Infrarenal aneurism diameter of 30-40mm generally requires frequent controls by ultrasound and/or CTA report of aneurism diameter, quitting smoking, lifestyle change, and moderate aerobic physical activity. Identical requirements are asked of the patients with moderate and light claudication difficulties, but without strong oscillations of the pressure, and motivation increase for lifestyle changes which are connected to risk factors of diseases with big consequences [14].Prevalence of atherosclerotic disease, which creditable for the appearance of claudatic difficulties is often hard, but not impossible to determine, because atherosclerosis is predominantly asymptomatic disease, which often intertwines with other diseases of similar symptomatology [15-17]. Correct and precise data on frequency of artheriosklerosis can hardly be evaluated, and even harder determined. All epidemiological data refer to clinical manifestations of atherosclerosis, i.e. its most important consequences (coronary heart disease, cerebrovascular diseases and peripheral blood vessels obstruction which causes symptomatology of claudication difficulties). Atherosclerosis is a complex disease with numerous predisposing factors which are called risk factors. In 95% cases of infrarenal aneurism disease cases cigarette consumption is frequent as the strongest risk factors of degenerative disease [18].Also, in anamnesis of the patients included in the research, alongside cigarette consummation, overweight has been recorded and frequent deficit of sports activities, especially aerobic exercises with uncontrolled meat consumption and traditional fast food which contains a lot of simple carbo-hydrates, starches, animal fats, with low nutritive values of vitamins, minerals and fibres. Consuming of cigarettes also can result in 6-7 times heightened risk of occlusive diseases of peripheral arteries, degenerative aneurism arteries appearance [19]. Roughly calculated, intermittent claudication appears in 5% cases in people older than 60. In most of the patients with occlusive disease a high level of LDL has been recorded, as well as low level of HDL in blood, mostly because of bad diet habits, cigarette consumption and low level of physical activities. Everything points to the fact that using of Atorvastatin indirectly helps and improves the distance which patient with claudication difficulties feels no pain. Heart Protection study has confirmed that the treatment with Statins reduces the risk of mortality in patients with coronary and non-coronary atherosclerosis including patients with peripheral artery disease with no previous cardiovascular event [20]. ACE inhibitors are the right choice in the treatment of elevated artery pressure and are frequently recommended to patients under 55 years of age, and also can be useful for patients who have diabetes mellitus, kidney disease as well as infrarenal abdominal aortic aneurysm. Lifestyle modification, lipid level in blood, values of blood pressure with the usage of Statin and ACE inhibitors in combination with trainings of walking is highly recommended to patients with peripheral artery disease, and with that to patients with IAAA: By reducing of cardiovascular events, increase of walking distance and lipid level reduction certain surgical or non-surgical interventions can be slowed-down and eventually reduced [21-24].

Table 1 Infrarenal segment abdominal aortic aneurism which is not in indicative operative area [25]

The risk assessment of abdominal aneurysm rupture correlates with the diameters	
Diameters in cm	**Risk of rupture %**
< 4cm	0
4-5cm	0,5-5%
5-6cm	3-15%

6-7cm	10-20%
7-8cm	20-40%
>8 cm	30-50%

Aim Of Study

The primary goal of this study is to try to prove and indicate that claudication difficulties can improve only by controlled and good quality aerobic sports activity (bicycle) with modification of dietary habits and with no fear of rapid increase of aneurism diameter. We think that these activities will have the same and even better effects in comparison to treadmill walking programme and therefore bring back and improve patient's life quality. The aim of the study is the evaluation of abdominal aortic aneurism diameter increase (24-40 mm) in patients with lower or medium claudicationsymptoms, (ABI), ankle-brachial index during stillness 0.9 –0.8 (phase IIaaccording toFontane) by increasing the length of the distance during the day, and using aerobic exercises, interval trainings of low intensity walking in the treatment for the elevated blood pressure with lifestyle modification and overall lifestyle. It is important to note that all patients included in the study, in their therapy regularly consummated ACE inhibitors Atorvastatin 10-20mg, and that the state of previous hypertension and current therapy corrosion was convenient for the conduction of individual physical therapy concept (stationed bicycle or treadmill).

Ethical Authorization

Having in mind that this is postoperative monitoring of the patients without modifications of ethical indicative medical treatment no ethical principles of this study was violated nor additionally disturbed.

Materials And Methods

The study is planned as a perspective double blind study which lasted for a year, from May 2015 until May 2016.

Complete one-year program of therapy exercises was led by vascular surgeon and sports—medical team. The distance was approximately 400m (circle on athletic stadium) was taken as an indicator in order to determine lower or medium claudication pain. All patients were observed and clinically assessed by team of doctors, sports-medical team, leading experts in the field of recreation and other areas of sport on Faculty for Sport and Physical Education of University in Sarajevo and East Sarajevo led by vascular surgeon of Clinical Centre of University of Sarajevo.

The patients were given a possibility to choose between interval training with walking (treadmill) or stationery bicycle riding. Pilot study was conducted on the Clinic for vascular surgery of University clinical centre in Sarajevo and under the observation of the professors of Faculty for Sport and Physical Education in Sarajevo and Faculty for Sport and Physical Education in East Sarajevo. 100 patients were included in the study, male and female, with the age of 45-55, with abdominal aortic aneurism with or without claudication difficulties without acute ischemies of extremities, and whi meet the criteria for participating in the study.

Interval program training implied combination of isolated treadmill walking or cyclic interval programmes lasting from 30-60min, more than three times a week with a higher number of repetitions and resting periods after 3,5,10 or more minutes depending on mental readiness, willingness to exercise, competency and patients' successfulness. During every repetition what was followed and controlled was heart frequency (90-135 beats/min) maximum intensity, by using subjective 50-70% heart power. All patients initially passed load test and they were convenient for conducting of physical concept. Training programs were planned to last for a year.

50 patients were included in the first group (experimental), with infrarenal abdominal aortic aneurism (IAAA) with 24-40mm diameter, slight or medium expressed by claudication difficulties with prevalence of (ABI) ankle-brachial index during stillness 0,9-0,8 (average 0,84 and BMI27.8kg/m^2). This group used stationed bicycle therapy treatment.

The other (control) group included 50 patients, with infrarenal abdominal aortic aneurism with diameter of 30-40mm with slight or medium expressed claudication difficulties with prevalence (ABI) ankle-brachial index during stillness 0,9-0,8 (average 0,86 and BMI=29.5kg/m^2) who have to increase covered distance and improve claudication distance in the period of one year. This group used aerobic interval trainings on treadmill, lower intensity, up to and over 400m.

Before the beginning of trainings by walking or riding bicycle, after every month all patients were observed and clinically assessed by team of doctors, sport- medical team, led by vascular surgeon and also

were invited for an assessment every 7-14 days to check motivation, as well as general mental state. Aneurism diameter was especially assessed with ultrasound (by surgeons and radiologist). Also, every patient (individual concept) was given detailed instructions on their lifestyles (restriction of fat from animal sources in diet, lowering of nutritively low-quality diet, sugar consumption reduction. They were given detailed instructions on how and how much to exercise and everything was done with strict observation by medical team. The patients were excluded from the study if they had the following states in one year period: myocardial infarction, peripheral vascular surgical intervention or pecutal intervention, unstable angina, stroke or transitory ischemic attack, deep venous thrombosis, acute or chronic liver disease.

It is important to note that during one-year research of the patients with IAAA aortic diameter of 30-40mm there were not cancer appearances, diabetes mellitus of type II, unstable angina pectoris, brain stroke or heart attack and if we are talking about highly risky group. Also, there were no appearances of neuropathies of lower extremities of feet during the research. All patients successfully went through the study and were motivated by all members of sports medical team during the one-year period.

Table 1. Average of years in groups Cycle and Treadmil groups in IAAA patients with claudication distance over and under 400m before study

Average of years	Claudication distance before study	GROUPS		Total
		Female (N=50)	Male (N=50)	
45-55 years	Over 400m	30 (60%)	38 (76%)	68 (66,4%)
	Under 400m	20 (40%)	12 (24%)	32 (32%)

Table 2.Diametar of IAAA patients with claudication distance over and under 400 meters before study

Diametar of IAAA before study	GROUPS		Total
	Cycle Exercise (N=50)	Treadmill Walking (N=50)	
40mm ±0,4mm	4 (8%)	4 (8%)	8 (8%)
38-40mm	12 (24%)	9 (18%)	21 (21%)
35-38mm	15 (30%)	13 (26%)	28 (28%)
33-35mm	16 (32%)	14 (28%)	30 (30%)
30-33mm	3 (6%)	10 (20%)	13 (13%)

Table 3. Arterial part of Stenosis 30-70% patients with claudication distance over and under 400 meters with IAAAbefore study

	Location of stenosis	GROUPS		total
		Bicycle exercise	Treadmill Walking	
Arterial part of Stenosis 30-70% Anclebrahial index (0,9-0,8)	(The Parts of External Iliac artery) (The parts of common femoral artery)	**2±3 (4±6)**	**7±1 (14±2)**	9±4 (4,5±8)
	Superfitial femoral artery (The parts of common femoral artery)	**15±2 (30±4%)**	**10 (20%)**	25±2 (21±2%)
	Superfitial femoral artery Common femoral artery	**15 (30%)**	**13 (26%)**	28 (28%)
	Common femoral artery (The Parts of popliteal artery)	**14±1** (28,0±2%)	**10 (20%)**	14±1 (30±2)

	Superfitial femoral artery Popliteal Artery	**4 (8%)**	**10**±1 (20%)	14±1 (13%)

Table 4. Decreasing diametar of aneurysm under 10mm or over 10mm in IAAA paitents with claudication distance over and under 400 meters after 12 months of research

Diametar of aneurysm paitents with claudication distance over and under 400 metars	**GROUPS**		**Total**
	Bicycle exercise (N=50)	**Treadmill walking (N=50)**	
Diametar of aneurysm under 10mm after 12 months	42 (86%)	31 (62,6%)	73 (67,4%)
Diametar of aneurysm over 10mm after 12 months	8 (14%)	29 (48,4)	37 (33%)

Table 5. Claudication distance in paitents (IAAA) with claudication distance over and under 2000 meters (five olimpic laps) after one year of reserch

Claudication distance after one year of reserch	**GROUPS**		**total**
	Bicycle exercise (N=50)	**Treadmill walking (N=50)**	
Claudication distance over 2000 m	36 (62%)	48 (92%)	69 (79%)
Claudication distance under 2000m	14 (28%)	2 (8%)	31±1 (18)

Table 6. Impact of exercise on Body Mass Index (BMI /kg/m2) in Patients with IAAA and claudication symptoms on Stationary Bike Interval Training and standard TreadmillTherapy after one year of study.

Body Mass Index after one year of study	**GROUPS**		Total
	Bicycle exercise (N=50)	**Treadmill walking (N=50)**	
BMI (kg/m2) under 25	30±1 (60,0±2 %)	34±2 (68,8±4%)	64±3 (63,4±6%)
BMI (kg/m2) over 25	20 (40%)	16±2 (32,2±4%)	36±2 (36,1±4%)

Limitation Of Study

Significance of stenosis levels combination analysisof 30-70% stenosis in different part of arterysis confirmed by the group on stationed bicycle with minimal deviations on ColourDoppler($p<0,05$). Considering the fact that colourDoppler was used in detection and following of IAAA diameter and not CTA, radiological millimetre deviations were observed and possible mistakes were reduced to a minimum.

Results

The results of the study after a detailed analysis in terms of some minimal deviations show that all patients with additional efforts of motivation successfully ended initiated study with various concept of training process and different chemodinamicssymptomatology. In analysis between the programmes of the two groups, with stationary bicycle (average ABI ankle-brachial index during stillness 0,86 and BMI=29,5kg/m²) was not significantly statisticaly-analiticaly different ($p>0,05$). In 68 patients or (66,4%), over 400m of claudication distance of free walking were statistically significant differences were recorded in total in both observed groups for the level ($p<0,05$), while under 400m of claudication distance there were 32 (32%) patients, also with significant difference between both groups (Table 1). In 69 (79,0%) overall patients from the two groups there has been an increase of claudication distance over 200m where treadmill group statistically dominated with 48 patients (92%) (Table 5). Before the beginning of the study, aneurysm diameters (33-35mm) were recorded in most of the patients, 16 (32,0%) i.e. in the therapy group on stationary bicycle, while only in 3 patients (6,0%) the least aneurism diameters were recorded (30-33mm). In the same

group what was also recorded were differences with significant differences betweengroups(p<0,05).Critically crossover aneurysm diameters (IAAA)40mm ±0,4mm before the study were recorded in examinees in both groups in total.Interestingsignificant statistical data (Table 4) was obtained in 8 (14%) patients who were on stationery bicycle where it has led to diameter increase of IAAA over 10mm for 12 months of the study, in comparison to the treadmill group where the number of the patients was 29 (48,4%)(p<0,05).By inspection of Table 6we can conclude that the patients in both groups, in total 64±3 (30±1 patients from the group with stationery bicycle and 34±2 patient from treadmill group) fell to an BMI under 25kg/m2. (p>0,05).Observed generally, the study confirmed that 73 patients (67,4%) felt benefits from stationary and treadmill program without widening of aneuriym diameter (IAAA) over 10mm (p<0,05) after one year (Table 4). Out of this number 42 patients (86,0%) had a safe choice of widening of aneurysm diameter in individual concept of stationery bicycle of the load 50-70% in comparison to 31 patients (62,6%) on the treadmill (p<0,05).
Dilatations and aneurysms on the level of iliac segment on both sides andunilaterally were not recorded.

Disscusion

Guidelines of therapy medicament concept of treatment for a more quality performance of improving of hemodynamic quality with encouraging non angiogenesis were mostly established in the form of treadmill walking program. However, individual treatment is even more demanding if it is about the patients who have two very related diseases, degenerative disease of media wall of abdominal aorta and stenoticly-oculsiveartery disease.
Damages to hemodynamic with untreated medicament and therapy concept can lead to deterioration of the overall health state, permanent disability and fatal ending in later phase.
Bicycle therapy is always in the shadows of treadmill as an alternative solution depending on comorbidity, and is recommended as an alternative solution in obese patients or as combined therapy. Weight lifting (anaerobic straining exercises) increases blood pressure, which momentarily effects degenerative wall of aorta, making it a predictor for haemorrhageintrabdominal or retroperitoneal leak. Therefore it is not convenient for therapy treatment of combination of aneurism and atherosclerosis disease, especially with a diameter of aorta of over 30mm. Maximum and sub maximum strain should also be avoided with a diameter of 30-40mm IAAA and over and only minimum weight should be used (maximum 50% strain 8-15 repetitions) with no significant momentary elevation of artery pressure, in order to give a positive effect of training, especially in patients for who the process went over the limit 30-40 cm of infrarenal segment aneurism. Further studies are needed in which safety level of individual load could be determined in dependence of blood pressure, frequency, and comorbidity (with the accent of elevation of blood pressure to critical level). Because of the deficit of conducted research, empirical knowledge suggests to potential danger of dissection of aneurism wall in weight lifting. Also, detection of AAA infrarenalsegment was detected in 2% of male population over 55 years of age, with male-female ratio 8:1[5,9,12].

The main concept of the strategy of patients with diameter AAA 30-40mm who express claudication difficulties is a change and life quality improvement with modifications of lifestyle habits as one of the main factors, even though the risk of rapture is minimal, there is a tendency of degenerative widening of diameter with physical and hemodynamic load.

Such patients are physically negligent, in their anamnestic background they have a lot of comorbidies which are limited by quality conducted physical therapy. Therefore, they do not show habits and motivation which are key to conducting of self-regulated concept of physical (aerobic or anaerobic) activity. The patients with stronger forms of symptoms and weaker overall state require special attention and individual observation and doctor's motivation in conduction of physical activities concept. The structure of the training concept in patients with peripheral artery disease is two to three times per week and lasting 30-45 minutes, according to some studies, it gives good results in terms of elevating of claudication distance with prevalence (ABI) ankle-brachial index during stillness 0,9-0,8 [16]. Acetil-salycillic acid is the backbone of benefits of primary therapy (100-325mg daily and therapy does not nearly give the benefits of therapy of individual continuous concept of exercising.

Efficient treatments with ecetil-sallycilic acid were recorded with 75mg 2 times per day on every 12 hours with appropriate concept of physical activity [26]. Some authors state that ecetil-salycilic acid (ASK) is a powerful primary weapon in treatment of claudication difficulties. From our aspect it is a marginal and unhelpful weapon, in comparison to lifestyle modification, quality and rational dietary concept, as well as continuous physical activity concept. In synergy acetil-salycilic acid and atorvastatines represent an ideal

potential of therapy effects on obstructed state of hemodynamic with improvement of overall quality of the state and increase of claudication distance in generalised artheriosklerosis with minimum diameter AAA(5,17,18).

There is a deficit of studies with the subject of longevity, persistence, efficiency of vascular rehabilitation of claudication difficulties and expansion of AAA diameter, and improvement of life habits in population under threat, as well as pointers to adequate diameter of AAA for the conduction of physical activities, version of interval training of stationary bicycle. The deficit of physical activities impacts improvement of comorbidity (high-sensitivity C-reactive protein (hs-CPR)), interleukin-6 (IL-6) and obesity (BMI 25-34.9) as well as pro-inflammatorycytokinesis [1, 8, 17, 24]. However, it has been scientifically proven that treadmill training is a powerful mean for secondary prevention. Clinically and scientifically its impact has been proven in terms of prolongation of primary surgical or endovascular intervention and it is a powerful regulator of hemodynamic system in chronically diseases of arteries in conservative treatment. However, individual dosage in terms of primary treatment of degenerative aneurism and atherosclerosis diseases is still a scientific mystery which successfully primary can be solved with the help of adequate medicaments (conservatively-by surgical and/or endovascular therapy.

Many authors from all sub disciplinary medical fields, sports fields and nutritionists agree that the lifestyle changes of the patients, diet remodelling and appropriate concept of physical activity will have an impact on claudication distance and improvement of cardiovascular system, without deterioration and endangering of already set overall state of health. The biggest benefit from secondary prevention of aretoskerotic symptomatic disease in terms of claudication difficulties and aneurism disease would have the patients in the beginning phase of the disease development, and lower number of comorbities. Only those patients would benefit from some general pointers of vascular rehabilitation, while the patients with a greater number of comorbities would be limited by performance of secondary prevention and he ones with formed clinical picture of peripheral artery disease and widening of AAA diameter would go in the direction of surgical treatment (EVAR/OAR)[2, 12, 13]..

Limited data suggest that with the possibility of exercise continuity inflammatory reaction of the organism decreases and immune system rises and thus system markers of inflammation connected to AAA and atherosclerosis disease decrease. The treadmill therapy patients and stationary bicycle therapy patients will also profit for a longer period and the benefit expectancy and life quality for those patients will get longer [21,22].

The advantage of interval training of high intensity over training of medium and low intensity is more significant and in a big advantage in patients with coronary disease of hemodynamic significant stenosis from 30 to 70% (lasting for 30min with breaks of 4 min). The advantage of this training is better benefits of coronary and collateral circulation in patients with no coronary incidents (myocardial infarction and unstable angina pectoris). However, on the other hand, training of medium difficulty in significant stenosis of 40 to 70% carries smaller risk of potential possibility of mobilisation of detritus from aneurysm bag and embolization towards distal extremities as well as the loas under 100w, which minimises acute embolization of acute cardiovascular incident. In this way it ensures satisfactory therapy benefits in fixing of circulatory colaterisation without claudication symptomatology itself and transfer into asymptomatic phase, as well as expansion of aneurism diameter [25-28].Stationary bicycle and treadmill cannot give protective guaranty and influence on the stopping of the expansion of degenerative wall of aneurism over 40mm and possibility of rapture 0,5-5% of future increase of the diameter itself, and further studies are needed in order to point to and improve the pointers of individual treatment [29].Also, the impact of Body Mass Index (BMI) in our research has drastically improved, and the subjects lost weight which motivated the tested population greatly. Further studies on direct or indirect connection of BMI with expedite growth of infrarenal aneurism of abdominal segment are needed. The question is if the choice of aorta vascular (OAR or EVAR) reparation is primary in smaller AAA diameter or even the choice of priority of conservative treatment of suppression of obesity as a predictor for further aneurysm expansion.

By detailed research of this study (Table 4) significant expansion of aneurism widening ofinfrarenal abdominal aortic segment has been recorded in heightened BMI of tested groups on treadmill therapy in 29 patients (48,4%; $p<0,05$). This result is slightly unexpected because some previous studies which analysed similarities of the subject could not find any connection. Maybe the coincidence is in this study, and according to our opinion bigger samples of data and tested population are needed in order to confirm such claim with certainty [30-35].Even though it was not the subject of the research, it has been proven that physical activity has a significant impact on improving the condition of cardiopulmatoryethology in patients

with deficit Alpha 1-Antitrypsin. Wecannot exactly determine adequate general modus of the level of load of physical activity in starting diameter of abdominal aortic aneursm formation which could stop elasticises which is almost irreversible process. The question that stays, and is not scientifically determined, is if there is a connection between aneurysm of abdominal aorta and Alfa 1- antitrypsin [36]. There is evidence that the level of Alfa 1- antitrypsin can be genetically low and that there are more than 70 genetic variations of samples of Alfa 1- antitrypsin deficit which makes conditions for elasticises. Therefore scientific research with deficits of Alfa 1- antitrypsin in formation of abdominal aortic aneurysm and its starting diameter of 30 mm [37-40] are still in focus. What can be concluded with certainty is that physical activity of interval training (bicycle or treadmill) has potential influence of prevention of inflammatory reaction in the process of atherosclerosis and atheromatosis and that it gives potential cardiovascular benefits with compatible diet plan and reduction of risk factors [41, 42].

Conclusion

The results of the study show that training with stationed bicycle in combination with remodelled diet, medicament (antithrombotic, antilipid-atrovastin and antihypertensive therapy ACE inhibitors) highly and relatively sure choice for treatment and suppression of peripheral artery disease with no danger of expansion of AAA diameters (30-40mm) of infrarenal segment. The results also showed that aerobic load with training bicycle (50-70%) of the overall subjective intensity does not extremely disrupt the integrity of already degenerative wall of medium and represents partially non-invasive, safe and adequately applicable vascular rehabilitation treatment, especially under medicine surveillance, which is one of the main options besides treadmill in the conduction of the therapy itself. The study confirmed that 73 patients (67,4%) had benefits from stationed and treadmill program without widening of aneurysm diameter over 10mm ($p<0,05$) after a year (Table 4). 42 patients (86,0%) had safe choice of widening of aneurysm diameter in individual concept of stationed bicycle load 50-70% in comparison to 31 patients (62,6%) on treadmill ($p<0,05$).

Conflict Of Interest

The authors declare no conflict of interest

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Energy Diagnostics and Forecasting the Hokkey Match of Russia and Germany Team at Xxiii Olympic Games in Pyeongchang

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Abstract

Purpose: analysis and justification of energy forms, content and forecasting the performance of hockey teams of Russia and Germany at the Olympic Games in Pyeongchang. Research methods: The quantum method is a contact or remote impact on the power system of hockey players, used for teams to diagnose, assess the restoration of the functional state during and after the game training and competitive load. Results: Analyzed and substantiated the energy law of productive game activity in the final game of the teams of Russia and Germany at the Olympic Games of the hockey match (02/25/2018). During the hockey match, the teams of Russia and Germany revealed a red, bright red, green-red, red-green energy in the form of a vertical, information square. The results of the study showed that the energy status of hockey players changes during the first, second and third periods in color form, content and this must be taken into account and efficiently manage not only the energy state, but also the functional state, sports result during the hockey match at the Olympic Games. Taking into account the energy status of the hockey team will contribute to high sporting achievements and prediction of the hockey match.

Conclusion: The content and change of the color energy system of the hockey team indicates a high functional performance, athletic form and performs a high predictive function of the readiness of teams at the Olympic Games. The color energy information state of the hockey teams is the basis for predicting successful competitive activity.

Keywords: energy and functional performance, the hockey team of Russia and Germany, the Olympic Games.

Introduction

In modern sports, operational diagnostics of the functional and energy state of hockey players is necessary. This is a promising direction in ensuring an effective, efficient, cost-effective competitive activity of highly qualified athletes [3, 25]. Comprehensive diagnostics in sports does not allow to quickly have information about the functional status of the team and the opposing team and, accordingly, to predict the effectiveness of the game result [13, 20, 23, 24]. Traditional complex diagnostics requires considerable time and financial costs, which are not always an operational action and this is a disadvantage during a hockey match, alternative can be quantum (energy) method. The quantum (energy) method allows for a short time to quickly determine the functional status of one and the other hockey teams without special physiological, psychological, biomedical methods according to the color state of the team's energy system [19]. At the same time, having mastered the color state, we also own the energy state of the opposing team and our team. This makes possible to assess the functional state of the team and build effective, rational tactical actions during the game. Energy diagnostics allows you to quickly assess and see the special physical fitness, functional status and have information about the opponent. The quantum (energy) method contributes to the operative diagnostic, prognostic function in color content, the color energy changes, and the functional state of teams and players changes.

The hockey team of Russia and Germany at the Olympic Games in Pyeongchang has a high level of the energy system, contributing to an optimal prediction of high achievements. The hockey team of Russia and Germany at the time of the hockey match had a high level of color energy system in form and content, and accordingly, they showed a high result of the hockey match. The energy prediction of the hockey match of Russia-Germany team at the Olympic Games in Pyeongchang by quantum method allows determining the functional performance, recovery process and energy intensity of the hockey team and carry out the correction of the energy state of the team at suitable time, which depends not only on the content, but also on the shape of the color energy system [18].

From the point of view of personality development, hockey players should take into account all factors affecting athletes [1, 5]. From the psychophysiological position, the different colors of the energy systems on specific athletes have different effects [10, 16, 17]. In connection with the above, it should be emphasized that red, yellow, green colors are perceived differently by athletes and this depends on the length of those waves that are reflected or absorbed from the environment [15]. The strongest and longest waves of the power system are observed in red, orange, yellow colors and their shades [9, 14]. These energy waves activate emotional resources, the recovery process and increase the functional performance of a person [6, 11]. Energy waves also contribute to the sustainability of the cardiovascular and respiratory systems [2, 4]. The presence of the green color of the power system creates favorable conditions for the functioning of the functional system during the competitive load, since the short wave does not cause tension in the work of the organs and systems, it acts harmoniously, rationally and dynamically. The most rational colors of the power system that increase functional performance in competitive activity are red colors (light red, bright red, red) they are associated with the manifestation of courage, perseverance, decisiveness [7, 12].

The hypothesis of the study

High sports achievements of the hockey team at the Olympics Games are determined by many factors, but one of the leading factors is the team's high or highest level of energy system, which has (light red, bright red, red colors) in the form of an ellipsoidal circle or vertical square. If create a high level of the energy system of the hockey team, it will contribute to a high athletic shape, functional performance, predictive function, operational recovery processes in the implementation of technical and tactical actions of hockey players.

The purpose of the research

analysis and justification of energy forms, content and prediction of the effectiveness of hockey teams of Russia and Germany at the Olympic Games in Pyeongchang.

Material and methods of research

ascertaining experiment, analysis and synthesis of information, the method of mathematical statistics for the accuracy of Student's t-test, the method of quantum evaluation of the energy and functional state of hockey players of the national teams of Russia and Germany at the Olympic Games in Pyeongchang. The quantum method is a contact or remote impact on the energy system of hockey players, used to diagnose, assess the restoration of a functional state during and after a game, during the training and competitive load. It does not matter the distance between the quantum method of a hockey player or a hockey team in the process of recovery of the color power system and functional state [8, 21, 22]. Static analysis involved calculating the validity of Student's t-test, where the differences between the comparative results of the ascertaining experiment were determined. Statistical processing of the results of the hockey team of Russia and Germany was carried out according to the Student's t-criterion between the sample averages at the 5% significance level ($P<0.05$), which is considered to be quite a reliable criterion for pedagogical research. The color power system of teams was determined in points from 1 to 10.

Of the information energy forms of the energy system among hockey players, the hockey team determined four levels by the quantum method: low - horizontal square with green-red energy; the middle one is a vertical square with yellow-red energy; high - vertical square with red content; light red, green-red, red-green color energy; and the highest is an ellipsoidal circle with the contents of red, light red, green-red, red-green color energy. In the hockey teams of Russia and Germany, the highest energy system was not revealed in the final, but only a high level of the energy system was revealed.

Study participants

The study involved hockey national teams of Russia and Germany in the final at the Olympic Games in Pyeongchang.

Organization of the study

The study was conducted at the Olympic Games in Pyeongchang during the hockey final match of the hockey match of Russia and Germany. Quantum method was used to determine the color energy system of the teams of Russia and Germany.

The results of the study

A static analysis of the study shows that the red ,green background color of energy system of the hockey team is an indicator of the predictive function in the game of the Russia and Germany hockey team . The red and green color of the power system characterizes the functional state of the team in the manifestation of fitness and the realization of the special physical qualities of hockey players at the beginning and at the end of the match, which is connected, in our opinion, not only with an insufficient level of special physical fitness, but also with a deterioration of the energy and responsibly, the functional state of the team.

In the hockey team of Russia, we note the positive dynamics of the color energy system in comparison with the hockey team of Germany in the red and green color. The Russian hockey team has statistically significantly improved the results of red energy - from 8.5 to 8.8 at the end of the match (P 0.001). In the German hockey team, the results of the red energy at the end of the match were statistically unreliable from 8, 1 to 7, 7 (P> 0.05) for both red and green color energy — from 1, 9 to 2, 7 (P > 0.05). The increase in green color energy among hockey players in Germany is associated with the onset of fatigue, and as the higher the score, as the stronger the fatigue of the team, accordingly, as the lower the score of colored green energy, as the higher the functional performance of the team during a hockey match.

The tabular results of the mathematical statistics of the hockey teams at the Olympic Games show that the Russian hockey team has statistically significantly improved the indicators of the red and green color energy systems, which characterize a higher level of special physical fitness compared to the initial results, which cannot be said about German hockey team (see Table .).

Table – Energy System of the hockey team of Russia and Germany in the final of the Pyeongchang Olympic Games (in points)

Content of the color energy system of the hockey team	Period of game	X ± m		t P
		Russia n=29	Germany n= 30	
Red color	Begining	8,5 ± 0,2	8,1 ± 0,3	1, 33 > 0,05
Red color	Final	8,8 ± 0,4	7,3 ± 0,5	3, 66 < 0,001
Green Color	Begining	1, 5 ± 0,3	1, 9 ± 0,4	0,80 > 0,05
Green Color	Final	1, 2 ± 0,4	2,7 ±0,2	3, 75 < 0,001

The novelty of the study lies in the fact that the bioenergy law of effective game activity on the color system presented to the rationale the diagnosis and forecasting of the finals of the hockey team of Russia and Germany at the Olympic Games (February 25, 2018).

Hockey players of the teams of Russia and Germany at the beginning of the game show red, bright red, green-red, red-green energy in the form of a vertical, information square (see table). If the hockey team develops the highest energy system, it will always contribute only to the highest results in the absence of "tough" competition from rivals in competitive activities.

Leading the hockey teams to a high level of special physical fitness and game performance contributes to the highest and highest level of the energy system, i.e. light red, dark red, red, dark red color of the energy, declaring high functional sports opportunities. The color of energy information state of the hockey teams is the basis for predicting successful competitive activity. Imagine the color energy state and the result of gaming activity, depending on the energy system, the functional state in the gold Olympic final of the hockey teams of Russia and Germany at the Olympic Games.

Before the match starts, the hockey team must take into account the color and shape of the energy system. For productive gaming activity, hockey players need to develop red energy in the form of a vertical information square, and preferably a form of a red ellipsoidal circle, contributing to the highest level of the power grid, effective recovery during and after games. It is the high and highest level of operation of the energy centers of the energy system of the vertebral canal that have red color energies (red, light red or red-green colors) in the form of an information circle and an information vertical square.

The German hockey team showed a productive game at the Olympics Games. This indicated a lack of fatigue in the functional system of the German hockey team, which contributed to the silver medal. The Russian hockey team did not reveal significant energy differences in form and content compared to the German hockey team. The Russian hockey team won the Olympic gold.

The results of the game activity study showed that the hockey teams of Russia and Germany revealed high identical color energy levels and forms of the energy system in the work of the energy centers of the energy system of the spinal canal, neuromuscular and functional systems.

At the final period, the energy system of the Russian and German hockey teams at the Olympics Games was similar in its high color energy state and in its functional, specialized fitness. Before the start of the hockey match, the energy system of the Russian team consisted of 8, 5 - red energy and 1, 5 points - green energy in the form of a small circle, a vertical wall of the information square, contributing to the achievement of high results. At the same time, not only the color of the energy determines the success of the hockey match, but also the form containing the power grid of various levels of the information square.

The German hockey team before the start of the match shows a high-level power system containing 8, 0 red and 2, 0 green color energy in the form of a small circle, a horizontal wall. The power system of the hockey team of Russia and Germany is in the form of a vertical information square. For the ice hockey teams under consideration, this color energy system is "energy-efficient" in form, but not the highest "energy-capacity". The energy prediction of the Russia-Germany hockey match at the Olympic Games in Pyeongchang using the quantum method allows determining the functional performance of the hockey team, which depends not only on the content, but also on the shape of the color energy system.

Discussion

Indicators of special physical training and a developed energy system of athletes are important criteria that determine the level of athlete's readiness at various stages of competitive activity in various sports. The results of the study showed that a high level of the energy system contributes to high sporting achievement and a high level of special physical fitness; only light red, red, the color of energy, testifying to the high functional sports capabilities of the team. The color energy state of hockey teams is the basis for predicting successful competitive activity. Gubanova, L.S., as well as the authors of the works, consider that the power system affects the functional performance of athletes in competitive activities. It has not only a diagnostic, but also a prognostic basis [7, 20, 24, 25].

Static analysis of the study shows that the red, green background color of energy systems of athletes is an indicator of prognostic function. This is evidenced by the work of Belousova N.A. with co-authors that the red and green color of the power system characterizes the functional state and high performance of hockey players in the formation of motor actions of young hockey players [2, 26].

Guba V.P. believes that an insufficient level of special physical fitness reduces the energy and functional state of a sports team [2]. Brooks, G. defined the relationship between the indicators of the power systems and the special physical qualities of athletes [1]. Volkov, N.I. established positive correlation relationships between developed and undeveloped energy systems of athletes in competitive activities [21, 22, 23].

The results of the studies of the above works complement our research [17, 18, 19] on the competitive feasibility and effectiveness of accounting for the color energy system of athletes, contributing to successful competitive activity through diagnostic, prognostic and operational justification of the functionality of the functional system. The study is attributed to the fact that the lack of accounting for the energy system of athletes will not contribute to a rational, scientifically based competitive activity [12–15].

Thus, the scientific and methodical work in this direction allows the point-to-point diagnosis and prediction of the game result in the color system of the hockey team. The study improves the efficiency of diagnostic and prognostic functions in the competitive activity of not only hockey players, but also athletes in individual sports [1–11, 16].

Conclusion

1. The research results of the Russia-Germany hockey teams at the Olympic Games showed that the team will take high playing positions only with bright red, red, green-red, red-green energy potential in the form of a circle or vertical information square.

2. Analysis of the hockey match showed that there is a perfect background color of the energy system - red, bright red, green-red, red-green, contributing to high gaming results. In the Russian and German hockey teams, the red color of energy in the form of an information energy vertical square confirms the high, but not functional, highest capabilities of the teams that did not have a game advantage in the final, but created additional game pressure at the end of the Olympic tournament.

3. The hockey team, which has only a red color energy background in the form of an ellipsoid circle, will show the highest functionalities at the Olympic Games, but such teams have not been identified in competitive activities. The red color of the energy ellipsoidal circle, the hockey team is a high sports form and functional performance, and the team's game result in technical and tactical actions of hockey players is also accurately predicted.

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Irrational Abuse of Anabolic Steroids Stacking with Aromatase Inhibitors Increase Carotid Intima-Media Thickness (CIMT) and Lowering High Density Lipoprotein (HDL) levels Causing High Risk Factors for Cardiovascular Disease and Potential Steatohepatitis in Young Recreational Bodybuilders Age 17-30. (pilot study)

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Abstract

Aim: Carotid intima-media thickness (CIMT) is an efficient predictor of cardiovascular risk and potential cardiovascular disease. The magical ability of abusing Aromatase Inhibitors (Tamoxifen Citrate and Anastrozole) in bodybuilding purposes is highly popular with the young recreational anabolic steroids abusers and especially those who will imbalance some primary side effects of anabolic steroids like water retention and enlarged breasts in men (gynecomastia). Potential cardiovascular and hepatic effects risk of the effects of 17 alpha-alkylated groups activated by anabolic steroids with Aromatase Inhibitor switch still remains hidden and investigated in our country and in most parts of the world.

Material and methods: This short study was conducted from the beginning of August 2018 until the beginning march of 2019 at the Special Hospital dr. Solaković, Cardiovascular Surgery Clinic, Clinical Centre of University of Sarajevo, Sport Facultys of University of Sarajevo and East Sarajevo with internationally incorporated medical and sports scientists. Study included 120 male subjects of the age 17-30 (68 subjects who have aromatase inhibitors in their anabolic steroids cycles and impellers group consisting of 52 subjects who do not abuse aromatase inhibitors in their anabolic steroids cycles). Potential cardiovascular side effects of anabolic steroids in stacking with aromatase inhibitors are investigated. Non-parameter and parameter tests were used for the testing of statistical significance of differences between the examined groups. The difference at a level of $p<0,001$ was statistically significant.

Results: Potential damage increase of cardiovascular and hepatic parameters after 8 months of study was confirmed in tested subjects sample (experimental group). Analysis shows no statistically significant influence of cardiovascular demographic damage in aromatase inhibitors group ($p<0,001$), compared to non-aromatase inhibitors abuser group ($p<0,001$).

Conclusion: Anabolic steroid stacking has generally destructive cardiovascular and hepatic side effects. Young bodybuilding subjects who are involved in their steroid cycles of aromatase inhibitors increase the risk of cardiovascular disease and potential risk of liver disease.

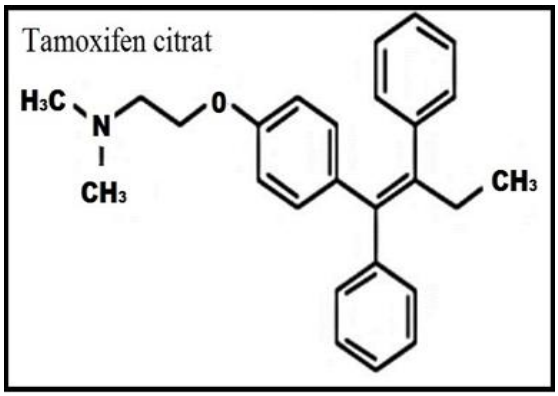
Keywords: Anabolic Steroids, Stacking, Aromatase Inhibitors, Recreational Bodybuilders

Introduction

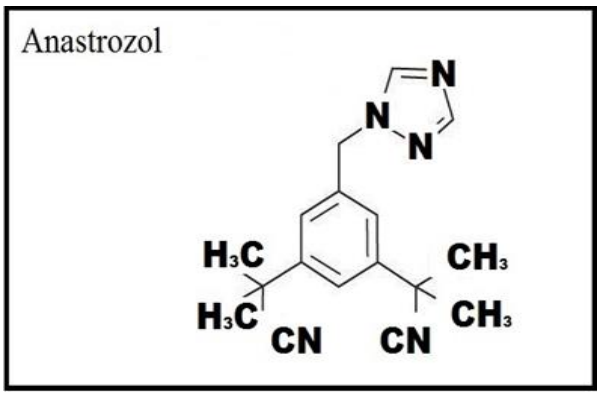
Anabolic steroids are not a taboo topic anymore; they are in fact commercially pervasive and epidemiologically inconspicuous regular supplementation of modern conceptual training trend of young recreational bodybuilding population. By using of anabolic steroids more and more recreational subjects want a better quality and faster acquiring of better athletic performances from the aspect (definition, strength, muscle mass or fat tissue loss while preserving muscle mass)[1,3]. The popularity of fast, basic and efficient base of recreational training process has led to steroid stacking, unfortunately (simultaneous using

of several types of anabolic medication, which speeds up the healing process) which additional increases the risk of cardiovascular incidents and connection to liver diseases [1-7]. Subjectively we are faced with frequent irrational overdoses of stacking of various anabolic supplements, commercialisation of black market for dealing with suppression of side effects of different anabolic supplements. The solution was found in application of aromatase inhibitors because of anabolic steroids, especially the ones which have 17-alkyl group as a side effect of excessive conversion modification of synthetic testosterone (black market supplement). That chemical juncture has a similar physiological conversion simulation in estrogenic through aromatase enzyme function which results with the production of aldosterone hormone. Aldosterone has water retention as a consequence and potential gynecomastia as unwanted clusters of sub-acute fat tissue which masks muscle symmetry and definition with threatening cardiovascular incidents, heightened liver enzymes and liver intoxication it self. [8,9]

Tamoxifen citrate (picture 1) as Anastrozole (picture 2) which increases the production of follitropin (PSH-follicle stimulating hormone FSH) depends on the adenohypophysis, which depends on the hypothalamus (GnRH) in men. Follitropin (FSH) increases the production of androgenise connecting protein in Sertoli cells in testicles and is necessary for the spermatogenesis and shows a high potential in bodybuilding as a miraculous supplement. As oestrogen antagonist (weak oestrogen which stops the connection of stronger oestrogen with adequate receptor) became a supplement which is inevitable in the steroid stacking cycles of young recreational bodybuilders. Even though oestrogen is a by-product in bodybuilding, it has a significant role in preventative role in anti-aging of the skin as well as tendons, metabolism, physiological and morphological ligament function, so it is an important and irreplaceable facto in maintenance of normal body functions as well as maintenance of libido and muscle mass in heightened testosterone level in serum (ST). However, alongside cardiovascular symptomatology and acute incidents the inhibitors of aromatase carry threatening potential cardiovascular danger. [6-9]



Picture 1. Molekular stucture of Tamoxifen citrate



Picture 2. Molekular structure of Anastrozol

Advanced increase of atherosclerosis was detected in users of anabolic steroids, regardless of age, limitation of following samples data, as well as various combinations of anabolic medication application (steroid stacking) and inability of quality control of the tested subjects themselves (cleaning period) [10-13]

Ultrasound tracking alongside laboratory research and clinical symptomatology showed to be reliable in advanced phase of cardiovascular and cerebral system damage. Carotid Intima-Media Thickness-CIMT as a protocol non-invasive parameter became a predictor for the evaluation of atherosclerosis on carotid artery segment in patients who were under the doubt of having carotid illness as an evaluation of generalised atherosclerosis process. A an established non-invasive method found fast and relatively reliable non-invasive method of detection, visual atherosclerosis progress control on carotid segment, not including the carotid fattening of carotid intima-media thickness encompasses hemodynamic speed control of artery extra-cerebral circulation flow, therefore it is a good predictor of evaluation for the corresponding conservative or operative therapy treatment. In bodybuilders and power-lifters anabolic steroids, alongside with liver damage, it is proven that they cause a whole set of cardiovascular and cerebrovascular damages. In younger generations a sudden cardiorespiratory arrest appears with no subjective pain in anamnestic data, as well as in objective clinical picture of myocardial hypertrophy mitral valve damage, and in increased ischemia of pectoral angina.

Out of potential predilection places, during applications of overdoses of anabolic steroids, the

damages are especially localised on coronary arteries in the shape of endothelial dysfunction of intimal wall and artery elasticity as well as accelerated deposit of fat (atheromatosis). However, there is a lack of studies on decade consequential damages of various stacking on magisterial peripheral circulation of lower extremities. Consequently, it would be of great use to explore this field, with the purpose of introduction of preventive measures and suppression of pathological atherosclerosis progression in younger users. [13-26]

Primary aim of the study was to draw attention to the process of progression of atherosclerosis pathology based on data acquired throughout an 8-month study, as well as the potential damaging of cardiovascular system from the medicine aspect. We indicated the seriousness of consequences of anabolic steroids in combination with inhibitor aromatase Tamoxifen Citrate as Anastrozole application on cardiovascular system.

Secondary aim of the study was to draw attention to cardiovascular negative influence of general stacking of combined anabolic steroids, in contraindicative medicine inhibitor aromatase application in younger generation of bodybuilders. Moreover, relevant information for the doctors who are not introduced to threatening cardiovascular incidents as causes of abuse of medical drugs which are easily reachable on the black market will be given, as well as risk factors of their use.

Potential health risks of (ab) using and potential possibility of avoiding of prohibited pharmacological recovery medicine were presented to all included participants of the study, who use anabolic supplements from the black market on self-initiative.

Material And Methods

Retrospective-prospective multicentre study was encompassed by research concept in the period of 8 month of observing.This short study was conducted from the beginning of August 2018 until the beginning march of 2019on Special Hospital dr. Solaković, Cardiovascular Surgery Clinic University of Sarajevo, Clinic's Vascular and Endovascular Surgery department, Sport Faculty of University ofSarajevo andSport Faculty of University of East Sarajevo.with help from other international country'smedical and sport specialist.A total of 120 male participants was included in the study between the ages 17-30, divided into two groups: Experimental (Group 1) with 68 participants of the age 23,4 who currently abuse aromatase inhibitors (Tamoxifen Citrate 10-20mg and Anastrozole 0,5-1mg) in their steroid cycles and control group (Group 2) with 52 participants of the age of 24,8 who currently do not abouse aromatase inhibitors (Tamoxifen Citrate 10-20mg and Anastrozole 0,5-1mg) in their steroid cycles.

All participants were incorporated in long-term recreational anaerobic fitness programme (powerlifting and/or use of machines for individual or systematic muscle groups with maximum and/or sub-maximum load (between 3-10) repetitions in 4-6 series lasting from 80 to 160 minutes, weekly, with no competition plans and with the basic concept of gaining subjective muscle mass and muscle power as well as with periodical cycles of catabolic diets between the cycles. Because of the limitation and difficult access to the subjects, the needed sample of 120 examinees was collected in short time studies lasting 8 months. It is important to emphasize that in all participants no oncologic illnesses were evident, as well as coagulopathies, haemophilia, nor any other cardiovascular illnesses, angina pectoris/arrhythmia in the background. With all participants a concept of free diet plan was conducted, which includes occasional traditional Bosnian cuisine and the freedom of using nutritive supplements of their own choice in the form of daily, weekly or monthly implementation of eating style with periodical observation of calorie intake and food restriction. Aerobic training concept during the study (bicycle/treadmill/elliptical cross trainer/stepper) was not detected in neither experimental nor control group. In Bosnia and Herzegovinausing and abusingof anabolic steroids are strict illegal underground black market supplement,so they are forbidden for usually pharmacologic health-care medical prescription.Multiply irrational stacking and general stackingdoes not have medical individual application inusuallymedical prescriptionand for medical treatment are no recommended.

Results

Lipid status parameters of all 120 participants before the start of the study were optimized through diet modification by supplements (unsaturated fatty acids) and shown in Table 1. The results of Group 1 (experimental) which used an 8-month stacking with aromatase inhibitors (Tamoxifen or Anastrozole) are shown in Table 2, while in Table 3 the results of Group 2 are shown (control group) which during the 8-month study did not use stacking with aromatase inhibitors. During the 8-month cycle in Group 1 (experimental) a decreased percentage of HDL was recorded as a consequence of the use of aromatase

inhibitors, which was especially visible after 5 months of using in comparison to Group 2 where aromatase inhibitors were not used. Also, a bigger value of Steatosishepatis is more visible in Group 1 in comparison to Group 2 (Tables 2,3). Intake of the mentioned aromatase inhibitors is manifested in the form of decrease of HDL, alongside threatening appearance of liver steatosis and possible potential of further liver damage, which is visible in recorded results of analysed groups.

Table 1. The characteristic in groups **with and without** stacked Aromatase Inhibitors*

***Aromatase Inhibitors** : Tamoxifen Citrate 10-20mg on second day, or Anastrozol 0,5-1mg every day oral application	**Group 1, N=68** Characteristics in groups **with** stacked Aromatase Inhibitors	**Group 2, N=52** Characteristics in groups **without** stacked Aromatase Inhibitors
The measured parameters in groups	**Mean**	**Mean**
Average Age	23.4	24.8
Average ACC Carotid Intima-Media Thickness CIMT (mm)	0,70±0,02	0,62±0,02
Average Triglycerids 0,46-2,28 mmol/l	2,25±0,02	2,25±0,02
Average LDL low-density lipoprotein 1,55-4,53mmol/l	2,67±0,12	2,67±0,12
Average HDL high-density lipoprotein 1.03-1.55mmol/l	1,11±0,03	1,41±0,03
Average Sistolic blood pressure in groups (mmHg)	127,7	123,3
Average Diastolic blood pressure in groups (mmHg)	82,7	85,2
Average body mass index BMI (kg/m²)	26,4	23,4
Acne steroidicae	1	5±2
Presence of Ginecomastia (Aromatization)	0	0
Average years of stacking anabolic steroids before study	2,72 ±0,21	1,72±0,12
Cleaning period in years under 6 months in year (subjects)	23	23
Cleaning period in years over 6 months in year (subjects)	3±2	3
Cleaning period in years under 3 months in year (subjects)	30±3	3±1
(Trenbolone Acetate) 50-100mg/ml intramuscular application	3+1	3+1
(Methandrostenolone) 25-50mg oral application	34±2	30
(Oxandrolone) 30-50mg oral application	8±2	28
(Stanozolol) intramuscular application	28±2	22
(Stanozolol) 35-75 mg / oral application	32±2	29 ±2
(NandroloneDecanoate) DecaDurabolin intramuscular application	23±2	23
(Testosterone Cypionate) intramuscular application	27	27
(Sustanon) 250-300 intramuscular application	29±2	29±2
(Tamoxifen Citrate) (Nolvadex) 10-20mg oral application)	12±2	12±2
(Anastrozol) (Arimidex) 0,5-1mg every day oral application)	2±1	2±1

Table 2. Carotid Intima-Media Thickness (CIMT) and HDL levels in anabolic steroid groups **with** stacked Aromatase Inhibitors after 8 months of study

Group 1: The characteristics in groups with stacked Aromatase Inhibitors (Tamoxifen Citrate 10-20mg on second day or Anastrozol 0,5-1mg every day (oral aplication); N=68	
Average Common Carotid Intima-Media Thickness (CIMTmm)and Average HDL levels (%)(p<0,001)**	
Average Carotid Intima-Media Thickness CIMT (mm) after 1 month	0,71 (±0.02)
Average HDL high-density lipoprotein after 1 month (mmol/l)	1,11 (± 0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 2 months	0,85 (±0.02)

Average HDL high-density lipoprotein after 2 months (mmol/l)	1,11 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 3 months	0,67 (±0.02)
Average HDL high-density lipoprotein after 3 months (mmol/l)	1,00 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 4 months	0,69 (±0.02)
Average HDL high-density lipoprotein after 4 months (mmol/l)	1,17 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 5 months	0,86 (±0.04)
Average HDL high-density lipoprotein after 5 months (mmol/l)	1,05 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 6 months	0,90 (±0.01)
Average HDL high-density lipoprotein after 6 months (mmol/l)	1,08 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 7 months	0,84 (±0,02)
Average HDL high-density lipoprotein after 7 months (mmol/l)	0,98 (±0,03)
Average Carotid Intima-Media Thickness CIMT (mm) after 8 months	0,93 (±0,04)
Average HDL high-density lipoprotein after 5 months (mmol/l)	0,92 (±0,03)
Steosis Hepatis after 8 months	9 (±1)

Table 3. Carotid Intima-Media Thickness (CIMT) and HDL levels in anabolic steroid groups **without** stacked Aromatase Inhibitors after 8 months of study.

Group 2: The characteristics in groups without stacked Aromatase Inhibitors (Tamoxifen Citrate 10 - 20mg on second day or Anastrozol 0,5-1mg every day (oral aplication); N=52	
Average Common Carotid Intima-Media Thickness (CIMTmm) and Average HDL levels (%)(p<0,001)**	
Average Carotid Intima-Media Thickness CIMT(mm) after 1 month	0,69 (±0.02)
Average HDL high-density lipoprotein after 1 month (mmol/l)	1,01 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 2 months	0,75 (±0.02)
Average HDL high-density lipoprotein after 2 months (mmol/l)	1,11(±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 3 months	0,78 (±0.02)
Average HDL high-density lipoprotein after 3 months (mmol/l)	0,99 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 4 months	1,09 (±0.02)
Average HDL high-density lipoprotein after 4 months (mmol/l)	1,07 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 5 months	0,96 (±0.04)
Average HDL high-density lipoprotein after 5 months (mmol/l)	1,08 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 6 months	0,94 (±0.06)
Average HDL high-density lipoprotein after 6 months (mmol/l)	1,11 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 7 months	1,02 (±0,03)
Average HDL high-density lipoprotein after 7 months (mmol/l)	1,01 (±0,03)
Average Carotid Intima-Media Thickness CIMT(mm) after 8 months	0,83 (±0,04)
Average HDL high-density lipoprotein after 5 months (mmol/l)	1,02 (±0,03)
Steosis Hepatis after 8 months	6 (±1)

Discussion

The race for better esthetical and anthropological results ends in damaged cardiovascular picture in recreational bodybuilding. Anabolic steroids lost their dignity of application in sport but not in efficiency and commercial effects of black market. The race for obtaining perfection and structural transformation of ester synthetic testosterone and prohibited improvement of manipulation by fast physical performances is constant in young recreational bodybuilders. Unfortunately, small inconspicuous damages to cardiovascular system and a quiet epidemic persist in silence and are gaining a symptomatology of cardiovascular illnesses only after decades of abuse. Moreover, anabolic steroids of new generations overcome futuristic level of detection and masking, in which case the performance and result play the most important role in its users of any level (recreational, amateur or professional) and any place of residence, while ignoring health [2,3,27-30]. In comparison to the tempting application of anabolic steroids manipulation, with recreational bodybuilders, there are no scientifically confirmed enormous proportions in the doses themselves when we are talking about applications of potentially devastating deviant psychophysical status of the users themselves. Anabolic medicine are sometimes prescribed with a significant benefit of post-menopause treatment in

women with breast cancer whose ovaries were removed, for the reason of opposite androgenous-oestrogenous effect of proliferation and spreading of tumour tissue hormonally caused by oestrogen [25, 26].

Primary treatment of conservative choice was testosterone propionate which pointed to regression of tumour tissue (anti-tumour effect) in 21,5% of the observed 521 patients previously treated with chemotherapy with significant patient survival analysis. Moreover, the application of synthetic testosterone derivate in breast cancer as a secondary hormonal therapy showed significant benefits in the beginning stages, while no opposite benefit was recorded in the later studies [31,32,33]. Tamoxifen is used as a conservative justified medicine with female breast cancer patients because the growth of cancer cells is prolonged by the influence on the oestrogen in which case the oestrogen is supressed in order to obtain stagnation of the development of tumour cells. Moreover, Tamoxifen positively and alternatively impacts as one of non-surgical options with patients with prostate cancer patients who have chest pain symptoms, gynecomastia caused by non-steroid anti-androgens, by suppression of subjective pain intensity in patients treated with Tamoxifen 10mg or 20mg daily and according to the delicate opinion the user gains superiority over radiotherapy treatment [14-20].

Anastrozole belongs to the third generation of medicaments with prospective of treating women in post-menopause with breast cancer. For the sake of comparison, data shows that Anastrozole in comparison to Tamoxifen after 68 months of observation of patients shows similar incidents of mortality from cardiovascular incidents (Myocardial infarction), even though Anastrozole is significantly connected to a lower incident number of cerebrovascular incidents. [20]

However, studies conducted on ethical use with medicinal purposes limit data of irrational abuse of the medicament in sports purposes, thus damaging dignity and ethics of the sport itself by individual consumers [3,4]. We are mainly limited by studies on prevention measures and side effects of benign a symptomatology of water retention in young recreational sportsmen. In the beginning they decide to use aromatase inhibitors as a preventive measure of implementation of testosterone propionate as one of the most misused medicament among this population.

It is recorded that bodybuilders and athletes who abuse anabolic steroids during persisting and recurring water retentions and breast swelling signs simultaneously use aromatase inhibitors in order to prevent the side effects of oestrogen excess. Young recreational bodybuilders who have a positive anamnesis of heightened fat tissue in their bodies and heightened values of BMI, heightened doses of synthetic testosterone with stacking of over 1000p/mol in serum and of even less values are especially exposed. Such people tend to suffer from gynecomastia and breast swelling with water retention along the whole body.

Recreational bodybuilders with low percentage of fats who are on short steroid cycles rarely use this combination (anabolic steroids and aromatase inhibitors) and surely do not need them. Even though we have not seen these cases often in practice we can add that they are insufficiently investigated. Long-term consummation of anabolic steroids is directly connected to cardiovascular incidents. However, studies conducted with patients of andopause syndrome in men point to benefits of treatment with TRT, which had low values of testosterone in serum <350ng/dl. The results of the research confirmed the benefits of the therapy with synthetic testosterone products, decrease of LDL and total cholesterol without degradation of HDL level, which directly points to positive effects with metabolic syndrome and improvement of insulin sensitiveness [21-24].

Young recreational bodybuilding population with enormous and irrational doses of anabolic medication stacking shows opposite benefits with high potential of cardiovascular damages [3,4]. By increasing of the liver enzymes, alongside additional damage by various steroids, liver damages caused by Anastrozole, which is according to some research cerebrovascular protective [20], goes in favour of toxicities and/or imunoalergion of the liver metabolism itself and cytochrome P450 system and its strong inhibitor CYP 2A as well as CYP 2C19in comparison to Tamoxifen which has other chemical structure [20,34-38]. Asymptomatic steatosis of liver is the most common and relatively non-damaging liver disease, and in cases of strong symptomatology and ignoring the right treatment it can lead to liver cirrhosis and overall health disturbance. The pathology of high calorie intake (fat, protein and carbohydrates) with the goal of muscle mass gain leads to potential pathological deposits of fat in liver cells, even though some study experiments on animals showed the opposite, i.e. that anabolic steroids do not cause fatty liver by pointing to significant benefits of liver disease affected patients.

Clinical studies show improvements of medical doses application of anabolic steroids with patients who have liver cirrhosis, while current therapy considers it to be medically and scientifically out-dated and inadequate insignificant effects of synthetic testosterone products on the ill population [39-43]. Even though

asymptomatic fatty liver does not require primary therapy and recommends diet modification and increased physical activity, as a key factor of metabolism activation, measures of restriction of animal fats intake (limiting of calorie intake) and prohibition of anabolic steroids application should be incorporated as a part of therapy treatment. However, young recreational bodybuilders often avoid for the sake of Addison complex and give false information on personal abstinence or just on the cleaning period, as the applications of combination effects themselves and anabolic steroid interaction are the subject of controversial scientific data. Scientific research limit data on cardiovascular incidents and illnesses caused by anabolic steroid abuse, generally for the reason of conducted cycles, stacking and individual abuse doses. Dyslipidaemia and artery hypertension are clear indicators of potential cardiovascular illness threatening anabolic steroid consumers, where HDL and LDL as a total cholesterol are always out of referential values limits, which is confirmed by some authors' research [4,5,44]. We have to realise that calorie intake during cleaning cycle is minimal and followed by enormous fat restrictions. As a consequence of such state of the organism the decrease of HDL is recorded alongside LDL increase. In connection to that additional preventive measures are needed in terms of cardio-protection in this risky population group as well as studies with a greater number of participants where scientific significance could be recorded [2-5]. The role of oestrogen in cardio-protection of men in comparison to its role in cardio-protection of women during the menopause is reflected in different statements and opinions of relevant scientist. There is also a significant correlation in the group of anabolic steroids users which used aromatase inhibitors, which is confirmed by this research. The effects of oestrogen in cardio-protection of men who use anabolic steroids are not very clear. Young bodybuilders who additionally supress their oestrogens as side effect of the overuse of medications of synthetic testosterone aromatase inhibitors, additionally in combination with anabolic steroids of high hepatoxic or cardiovascular devastating effects, thus double cardiovascular risk with added increase of triglyceride values and serum levels of LDL. In that way they put themselves through strong toxic effects on the lover via oral anabolic, especially the ones which 17-alky group. However, there is a contradictory opinion drawn from some studies, which states that supplements of oestrogen in 65-year olds are connected to lowering of homocistein, fibrinogen and plasminogen inhibitors activators, by correcting lipid status of HDL/LDL and total cholesterol with a better benefit than during the application of the testosterone itself [45-48]. The results gained on experimental samples of animals give opposing results, so the effects of some studies are questionable in terms of cardiovascular risk and oestrogen.

Even though subjective opinion of weak side effects and benefits quality of Tamoxifen and Anastrozole is represented, some cases of young recreational of the current study, who use Tamoxifen report blurry eyesight, but state that they are not frequent with Tamoxifen side effects, because it does not belong to 17-alkyl group. However, all participants had phases of lowered mood and loss of dynamics during the 8-month conducted study, which does not include the influence of anabolic steroids. We cannot with certainty state that this is a state of depression, even though the suppression of oestrogen is not recommended, except in cases of pre-competition phases of fat tissue loss, and optimum definition of muscle structures. In those cases positive anabolic effect of oestrogen is supressed by maintaining misbalance (testosterone-oestrogen scale), which negatively impacts the formation of peptide hormone IGF-1 (somatomedin C), the primary mediator of hormones which has one of the most dominant roles in the growth process. Its long-term medicametosa suppression by Tamoxifen and Anastrozole on the organism itself in young individuals is not completely known. Therefore, further studies are needed in order to examine potential damages of, according to our opinion, irrational contra-productive abuse of anabolic steroids in combinations with abusing Tamoxifen and Anastrozole.

Conculsion

Besides, Tamoxifen and Anastrozole are extraordinary medicaments in usually medical prescription with promising potential healing results,their medical propertiesand purpose in medical treatment of healing patientsare not questionable.Suspicious of cardiovascular and liver damage in ethical medical treatment of Tamoxifen and Anastrozole are no doubt. Achilles' tendon concept of abuse starts after of various hard corecycles application and calorie intake with the aim of subjective satisfaction with body mass and potential of muscle development, as well as anabolic steroids dose combinations (stacking) of various medicine with questionable quality from the black market with abusing aromatase inhibitors, by irrational application ofyoung recreational bodybuildersby their own-initiative.In combination with anabolic steroids, Tamoxifen citrate and Anastrozole can leave a strong destructive cardiovascular potential. That especially relates to young recreational bodybuilding population with accent on objectivity from the scientific point of

view by leaving a strong progression of atherosclerosis in the form of elevation of Carotid Intima-Media Thickness (CIMT), as well as lipids in the serum. That is manifested in the increase of HDL with threatening development of liver steatosis and potential for further liver damage which can partially be improved by diet regimen and diet modification, but only with abstinence from anabolic steroids, which is confirmed by the current research.

Further Research

The occurrence of cardiovascular epidemiology destruction in younger generations, consummation of new generations as well as various stacking combinations of anabolic steroids from the black market is not usually available to the doctors due to ethical codes of medical treatment (abusing). That happens due to the secrecy surrounding consuming of medication from the black market of pharmacologically suspicious origin and questionable quality in Bosnia and Herzegovina. There is a significant need for further studies with the aim of protection of young bodybuilding population which can contribute to the decrease of the application of pharmacologically forbidden substances with anabolic effects, also to inform physicians about this young modern cardiovascular risk group. Moreover, preventive measures concerning application in initial training phases (build-up) can be brought up with younger generations, and even in pre-adolescent recreational bodybuilding population.

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Conflict Of Interest

The authors declare no conflict of interest.

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The Theoretical Improvement of the Motor Units' Recruitment Model D. Costill Et Al., 1980

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Abstract

It is considered that the study of sportsmen's neuromuscular junction, in particular, connected with its motor unit, does open the new perspectives in sportsmen training improvement. The experimental facts received in several tests among healthy people and animals yet cannot explain the wide range of questions regarding the controlling function of the motor units in the formation of the force and speed of muscle contraction. For this reason, the existing theoretic models of motor units' recruiting that were created on this basis, provide incorrect recommendations in sportsmen training planning. In the current article there is represented a possibility of hypothetico-deductive model application in order to clarify the world-recognized models of motor units' recruiting based on the laws of the oscillation theory. The results of the research represent the high efficiency of the new method's application in exploration and explication of some processes that are intended to improve the human's functional abilities.

Keywords: physical exercise, the recruiting model of motor units' muscle fibers of different type and kind.

Introduction

In the last decades the specifics of sportsmen's neuro-muscular junction have been discussed commonly, in particular, those connected with the motor unit (MU). A huge number of specialists consider this direction to open new perspectives in sportsmen training improvement. According to V.N. Platonov, "the effective work intended to the improvement of muscles' functional abilities that is being dictated by the training and competitive activities' demands in different sports, can be exerted only basing on the clear understanding of the neuro regulation mechanisms" [1, p. 159]. In particular, F.P. Suslov notes that the problem of physical training in cyclic kinds of sport may be resolved only in case the action inside the muscle, caused by an application of physical exercise, is discovered [2].

The researches done by specialists [3, 4, 5, 6, etc] represent that the role of motor units in the formation of the speed and force of muscle contraction, their fatigue resistance does vary, whereas the successful work execution of different relative power and duration is dependent on the muscle fiber composition of the skeleton muscles.

The analysis of scientific publications on the muscle activity physiology represents a number of experimental patterns demonstrating the specifics of this process. It is discovered that there are three mechanisms of muscle stress being realized:

1) *the regulation of the number of active MUs (motor neurons) of the current muscle*. This matter was studied fully by Henneman et al [7], who showed that "with a facile change of activating ions, the motor neurons activate and deactivate in a constant, stereotypical order, relevant to the size of motor neuron" [8, p. 78];
2) *the regulation of the MUs activity mode (motor neuron pulse frequencies).* It is determined that with a nonspecific increase of muscle contraction force, the MU potential amplitude grows. This phenomenon can be explained by "the increasing contraction of the growing number of muscle fibers of the current MU caused by the rise of the muscle contraction force for the incoming impulse" [3, p.11]. This way, the higher (in definite limits) the frequency of motor neuron impulse is, the greater tension the MU exerts and thus the greater impact it has on the muscle's total tension.
3) *the regulation of the temporal connection of the MUs (motor neurons).* The muscle tension to some degree is dependent on the connection between different motor neurons' impulses of the given muscle in time [3].

The mechanisms mentioned above represent the phenomena of muscle tension regulation observed by the scientists. However, "despite the long ago justified role of the impulse frequency and the new MU recruitment in the muscle contraction force formation, this question does remain a matter of discussions" [3; p.22]. The question of the relative role of the frequency and modulation recruiting in muscle force control is being discussed often. For example, according to E. Henneman [7], the recruiting is the primary mechanism

in contraction force gradation. V.S. Gurphinkel, U.S. Levik state that the "recruitment of the new MUs is unavoidably followed by an increase in impulse frequency of the working MUs and these two parameters are not independent, thus this question is not so principled" [8, p.79].

This way, the experimental facts collected in various tests among healthy people and animals yet cannot explain the wide variety of questions regarding the controlling function of the MUs in the force and speed formation of muscle contraction.

The theoretic models of the MU recruiting mechanism formed on the experimental data are represented in the literature resources, in particular, the D. Costill, R. Sharp, J. Troup [9] and the following modifications that the Russian specialists refer to (U.V. Verkhoshanskiy, 1988; L.M. Kulikov, 1995; V.N. Seluyanov, 1995, V.N. Platonov [1]) while basing the methodological recommendations for the sportsmen training process. Ergo it is possible to conclude that the current models obtain significant flaws and thus cause the incorrect practical recommendations to be given.

The analysis of the mentioned model shall be provided further in the article, and at this instant it is necessary to defy the major reasons of the current situation. First, these are the problems of the traditional research method itself when the most concrete conclusions about the muscle contraction mechanisms are exerted according to the simplified conditions of artificial elimination and stabilization of the external factors except for the one being tested. Second, these are the technical problems. While studying the impulse activity of the MUs scientists do face the interference phenomenon which creates limits for the potentials identification that are possessed by different MUs.

The solution to this situation I.V. Desherevskiy, for example, does see in "knowing the muscle structure and suggesting a certain functioning mechanism of this construction, that ultimately can make it is possible to logically defy the muscle properties (contractive and thermal) for the stated mechanism and after clarify them by experiment" [10, p. 13]. Then, according to the author, it is possible to predict the muscle action at the non-researched conditions, as well.

The current research obtained a goal to develop a theoretic approach which does allow to solve problematic questions, in particular the models (processes) of MUs recruitment that are connected with the limiting factors (natural, technical, etc) of the experimental researches.

The Main Concepts, Patterns And Thesises

During many years of studies by Russian [11, 12, 13, 14] and foreign [15, 16] specialists there has been defined the following.

1. The organization of a nonspecific move is a summation of processes in the central nervous system, preceding and implementing the execution of the required move.
2. The muscles and motor neurons that innervate them are the components of the neuro-muscle junction, of which the general part is the motor unit.
3. From the morphologic point of view, the MUs differ from each other by the size, volume of the motor neuron's body, the thickness of its axon and the number of muscle fibers in the MU.

4.From the functional point of view, the MUs are divided into two main types: the slow MUs, or type I, and the fast MUs, or type II. Among the fast MU there are two kinds defined: II-A and II-B.

The slow MU is consistent of a motor neuron and type-I muscle fibers (slow), whereas the fast MU is formed by a motor neuron and type-II (fast) fibers.

The differences in physiological properties of the fast and slow myocytes are defined by their morphologic and biochemical characteristics [17, 18, 19].

Basing on the impulsation frequency, the muscle fibers may work in two regimes: single and tetanic contraction. It is justified experimentally that in natural conditions of muscle activity, the motor neurons send not one but a series of impulses.

In the process of nerve-to-muscle impulse transition the specialists suggest three parts (E–C–E): the electric (the nerve impulse), chemical (with the formation of ACh–receptor complex) and again the electric (the myocyte potential).

The properties of the impulse transition process are significantly connected with the specifics of impulse passaging ability of synapses [16, 20]. The cycle of synapse's excitability change is relative to the cycle of electric potential's change and is characterized by the duration of the consistent phases: absolute refractivity, relative refractivity, supernormal or exaltational, and subnormal.

The Research Method

In the current article the research algorithm suggested by I.V. Desherevsky has been used [10]. This way, the problem is solvable in case the process of research is based on the assumptions and results of our work [21, 22].

1. The morphologic and functional differentiation of MUs is executed not only for the types and kinds, but also appears within a particular type and kind.
2. The growing physical exercise is executed by the central neuro system's controlling influence on the MUs' motor neurons and then the fibers with the management of the impact potential's frequency and amplitude of the perturbation.
3. The MU recruiting with the growing physical exercise intensity is exerted as a process of cyclic-wave system development.

The main points and conclusions of the analysis methodology for the cyclic-wave development processes are the following. [21]. The most common for all objects of different nature is the property of changing in time. The general essence of such processes is described by the oscillations theory. The massive empirical material of scientific research in various fields of science shows that its basic laws are equally applicable for the light, sound, atom, mechanical systems, organism, etc.

In the works of N. Wiener (1958) and W. Ashby (1966) the theoretical foundations of the homeostatic systems' functioning were formulated. By the definition given by these scientists, the main property of stable systems, which include the human body, is the desire to restore its original level after the termination of the perturbing factor. The dynamics of the process of individual systems' functions restoring and the organism as a whole is reflected in Weigart's law of supercompensation (Fig. 1).

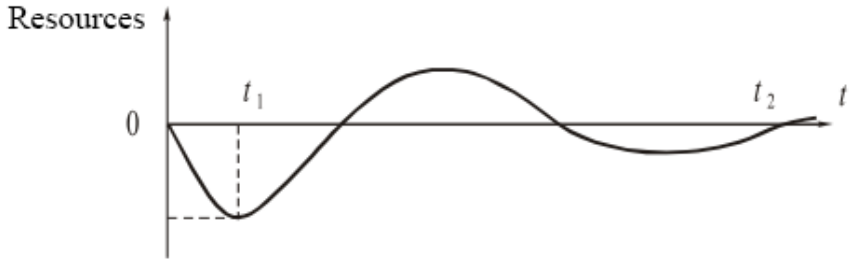


Fig. 1. The dynamics of the recovery process in the human body

From the theory of oscillation point of view, the law of supercompensation can be considered as a successive alternation of two processes (phases) (see Fig. 1).

First, the driving force acts on the system in [t_0, t_1] time interval and removes it from the equilibrium state.

Secondly, after the end of the driving force's action in the [t_0, t_1] time interval, the system makes a free damped oscillation. Beginning at the end of the free damped oscillation, the system comes to its original state.

In real life, in particular in the process of sports training, the frequency of the physical exercise repetition is commensurate with the duration of the free damped oscillation phase of the system. In this case, in the superposition of oscillations interval, the system will be in the mode of forced oscillation, and under certain conditions this process may become periodic with a certain frequency and amplitude of oscillations, forming a rhythm.

Based on the laws of damped oscillation and using the graphoanalytical method, we exerted a theoretical analysis of the three main types of the oscillatory system state dynamics (the dynamics of a supercompensation phenomenon).

1. The forcing effect takes place during the non-recovery phase.
2. The impact occurs during the ascending and descending wave of the supercompensation phenomenon with a constant frequency of repetition of this effect.
3. The impact occurs on the ascending and descending wave of the supercompensation phenomenon with an increase in the frequency of repetition of this effect.

As a result of theoretical analysis [21], the following conclusions were obtained.

The system does develop in case:

a) if

$$A_{\min} \le A_{\text{forced syst.}} = A_0 + \sum_{i=1}^{n} \Delta A_i \le A_{\text{crit.}},$$

where $A_{forced\ syst.}$ – the amplitude of forced oscillations of the system; $A_{\min} \neq 0$, thus any impact should cause a developmental process; $A_{crit.}$ - the maximum deviation of the system parameters, beyond which it does collapse;

b) if the moment of application of the driving force F(t) of a constant oscillation frequency, i.e.

$$T_{F(t)} = \frac{2\pi}{\omega_{F(t)}} = \text{const},$$

occurs during the interval of the supercompensation phase's ascending wave

$$\left(\frac{1}{4}\right) T_{damped\ syst.} \le T_{F(t)} \le \left(\frac{1}{2}\right) T_{damped\ syst.},$$

then the process of the system development asymptotically increases until the moment of the driving force application coincides with the half-period of the free damped oscillation of the system, i.e.

$$T_{F(t)i} \le \left(\frac{1}{2}\right) T_{damped\ syst.(i-1)},$$

c) if the supercompensation phase's descending wave in the interval

$$\left(\frac{1}{2}\right) T_{damped\ syst.} \le T_{F(t)} \le \left(\frac{3}{4}\right) T_{damped\ syst.},$$

does face the superimposed driving force F (t) of the variable oscillation frequency, i.e.

$$T_{F(t)} = \frac{2\pi}{\omega_{F(t)}} = \text{var},$$

herewith, $\Delta\omega > 0$ and the moment of application coincides with the half-period of damped oscillation of the system

$$T_{F(t)i} = \left(\frac{1}{2}\right) T_{damped\ syst.(i-1)},$$

then the development process has the maximum growth rate of the system parameters and is limited only by the capabilities of the system itself;

d) in general, the conditions for the optimal development of the oscillatory system will be expressed in the following:

$$A_{forced\ syst.} = A_0 + \sum_{i=1}^{n} \Delta A_i = A_{max},$$

$$T_{F(t)i} = \left(\frac{1}{2}\right) T_{damped\ syst.(i-1)},$$

4. The system is in a state of relative equilibrium and this state will be maintained by the system for an unlimited time, if the moment of application of the driving force occurs during the interval

$$\left(\frac{1}{2}\right) T_{damped\ syst.} \le T_{F(t)} \le \left(\frac{3}{4}\right) T_{damped\ syst.},$$

and the value and frequency of the current force is constant in time, i.e.

$$T_{F(t)} = \frac{2\pi}{\omega_{F(t)}} = \text{const}.$$

5. The system faces regressive change in case:

a) if $A_{\text{forced syst.}} > A_{\text{crit.}}$, the system faces destruction;

b) if $0 < A_{\text{forced syst.}} < A_{\text{crit.}}$, and the moment of the driving force F (t) application falls on the ascending wave of the damping process (the phase of non-recovery), where the requirement is completed

$$T_{F(t)} < \left(\frac{1}{4}\right) T_{damped\ syst.};$$

The theoretical criteria obtained above, which determine the three basic rhythms of the system's dynamics, provide objective grounds for applying the theoretical results received above to understand of the regularities of the MU recruitment.

The model of the action potential and frequency of motor neuron discharge development with the increasing speed of running.

According to the modern concepts, the alpha motor neuron receives nervous connection from several subsystems - the spinal level and the higher regions of the central nervous system. This controlling excitation launches their activity through the dendrites, which serve as the inputs of the motor neurons. The output of the motor neuron is an axon, through which electrical impulses are transmitted from the motor neuron, exciting the muscle fibers.

In fig. 2. there is represented the process of the motor neuron potential formation and the phases that are implemented in this process [16, 20].

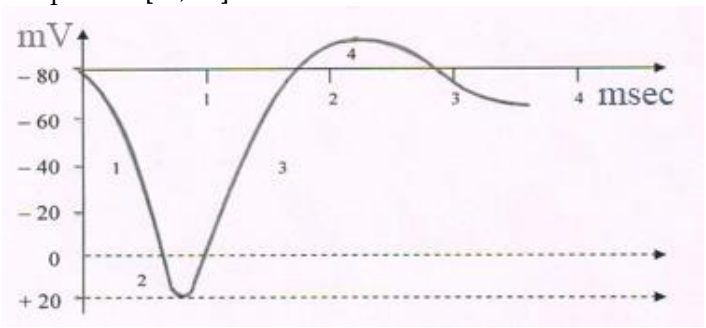


Fig.2. The phases of action potential:
1 - depolarization, 2 - inversion (overshoot), 3 - repolarization,
4 - trace hyperpolarization

The process of developing an action potential and its phase is absolutely equivalent to the form and content of the phases of the law of supercompensation (see Fig. 1).

The regular change in the excitability of the motor neuron, which is essentially the law of supercompensation, and the periodically stimulating action of the central neuro system's motor centers on the motor neuron were utilized as the basis for the impulses generated by the motor neuron to muscle fibers formation process analysis from the cyclic-wave theory of system development point of view.

It is necessary to consider the process of the motor neuron stimulated activity, based on the following initial conditions.

1.In a state of relative equilibrium ($V_{running} = 0$), the motor neuron is located in the $[0 < t < t_1]$ interval in the background excitation phase, i.e., the total amplitude of the action potential of the central nervous system's motor centers does not exceed the minimum excitation threshold of the motor neuron.

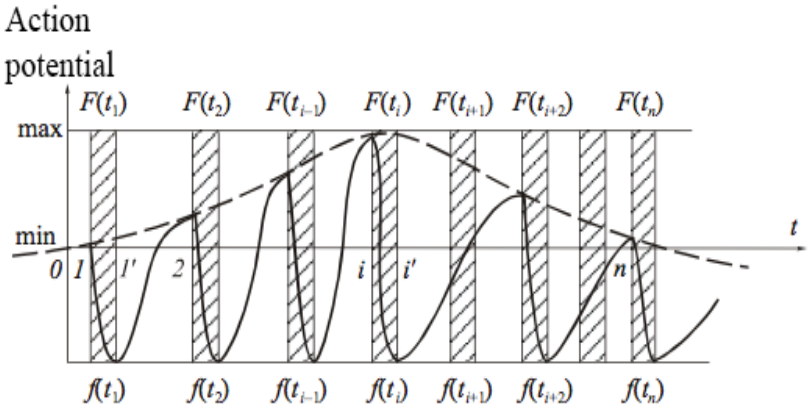


Fig. 3. The development of action potential and frequency of discharge of the motor neuron with an increasing speed of running:
F(t) – the periodic driving force of the motor centers, f(t) – the forced frequency of discharges and the amplitude of the motor neuron action potential

2.The precondition to the displacement (running) is the arrival of the impulse from the motor centers of the central nervous system at the time $t = t_1$, which activates the motor neuron.

3.The motivation of the running speed growth causes an increase in the amplitude and frequency of

the stimulation potential of the motor neuron by the motor centers.
For the conditions listed above, the process of stimulated activity of the motor neuron proceeds in the following sequence.

1. Being activated ($t = t_1$), the motor neuron generates an action potential in the interval [$t_1 < t < t_1'$], which is transmitted to the muscle fibers and causes their contractile response.

2. From the moment of time $t = t_1'$ in the interval [$t_1' < t < t_2$] the regenerative processes take place in the excitable structures (motor neuron, synapses).

3. In the cyclic contraction mode, in particular for the case of an increasing running speed, each subsequent excitation of motor neuron does occur in the interval from T/4 to 3/4 T of the damping process (supercompensation phase) with an increasing excitation frequency.

Such interaction of the motor neuron stimulus and the rate of recovery processes of excitable structures in the [$t_1 < t < t_i$] interval ensures the consistent development of the system (see criteria for the optimal development of the oscillatory system).

A specific property of this development process is an increase in the frequency of impulses and the action potential amplitude of the impulses generated by the motor neuron. This phenomenon was discovered by A.A. Ukhtomsky and was called ***the assimilation of irritations rhythms***.

The progressive development of the system stops when the critical frequency of motor neuron stimulation is reached. A further increase in the frequency of stimulation by the motor centers leads to a regressive change in the functional properties of the motor neuron (interval [$t > t_i$]).

The motor neurons, whose task is to directly activate the slow contractile mechanism, are equipped with a number of preventing devices. Experts identify several well-known facts that determine this phenomenon: first, the lability of the motor neuron and synapses — the rate of flow of elementary reactions (electrical, ionic, etc.) that are the basis of excitation [8, 20, etc.], secondly, the presence in the of special inhibitory neurons in the central neuro system (for example, Renshaw cells) [8].

If in the first case, the irritation from the motor centers comes to the motor neuron in the phase of relative refractoriness (non-recovery), then there are two types of interruption in the transmission of impulse. Specialists defy the presynaptic block, partial and full postsynaptic blocks [8]. For the reason of interruptions in the transition of excitation, the impulses acting on the motor neuron become rare (rhythm transformation) and ergo the frequency of discharges generated by them and the amplitudes of the action potential decrease. In the case of a complete blockade, the impulse does not reach the motor neuron.

In the second case, the motor neuron can retard itself through the Renshaw cells. The more excitatory impulses the motor neuron sends to the periphery (and, therefore, to the inhibitory cell), the stronger the recurrent postsynaptic inhibition is. Such a closed system acts as a mechanism of neuron self-regulation, limiting the degree of its excitation and protecting it from excessive activity.

The material mentioned before suggests that the change in the motor-neuron-generated frequency of discharges and the amplitude of the action potential with increasing frequency of stimulation by the motor centers of the central nervous system is characterized by two stages. The first is an increase in these indicators ([$t_1 < t < t_i$]). At the second stage, the dynamics of changes in these indicators is regressive ([$t_i < t < t_n$]).

The recruitment of a separate motor unit's muscle fibers.

It was discovered experimentally that the impulses generated by a motor neuron are transmitted along an axon through neuromuscular synapses to the muscle fibers innervated by a given nerve cell.

Therefore, the process of cyclic contraction of the muscle fibers of the motor neuron, providing accelerated movement of the athlete, will influence a number of factors. On the one hand, this process is governed by the nature of the impact coming from the motor neuron. On the other hand, it is additionally regulated (limiting conditions are imposed) by the lability of excitable structures at the axon – muscle fiber excitation transfer region, and the morphofunctional properties of the muscle fibers themselves. The specialists, in particular, C. Begshaw [16], among the reasons causing interruptions in the transition of excitation from motor neuron to muscle fibers, determines three parts: 1) presynaptic neuromuscular block; 2) postsynaptic neuromuscular block; 3) membrane-myofibrillary connection - a set of phenomena that determine the relationship between excitation (action potential) and contraction of muscle fibers.

In the field of physiology of muscular activity, there exists a point of view that the motor units are activated according to the "all or nothing" law. Thus, if an impulse is sent from the body's spine cord through the nerve pathways, all muscle fibers of the motor unit shall react to it, or none.

These conditions should predetermine the process of the muscle fibers contraction of a given MU in the phases of the "contraction-relaxation" cycle in the following sequence.

The reduction phase

1) when the amplitude of the action potential of a motor neuron reaches a value corresponding to the excitation threshold, a contractile reaction of all the muscle fibers of the MU occurs;

2) the repeated impulses with higher rates of frequency and amplitude of the action potential cause an additional contractile response of the MU muscle fibers (the effect of time summation), which provides an increase in the speed of running;

3) the summation of contractile waves with an increase in the frequency of stimulations causes an increase in tension of the muscle fibers, but only to a known limit, called by N.E. Vvedensky "the optimum". A further increase in irritation reduces the degree of tension (pessimum).

The graphic interpretation of the muscle fibers tension process is presented in Fig. 4.

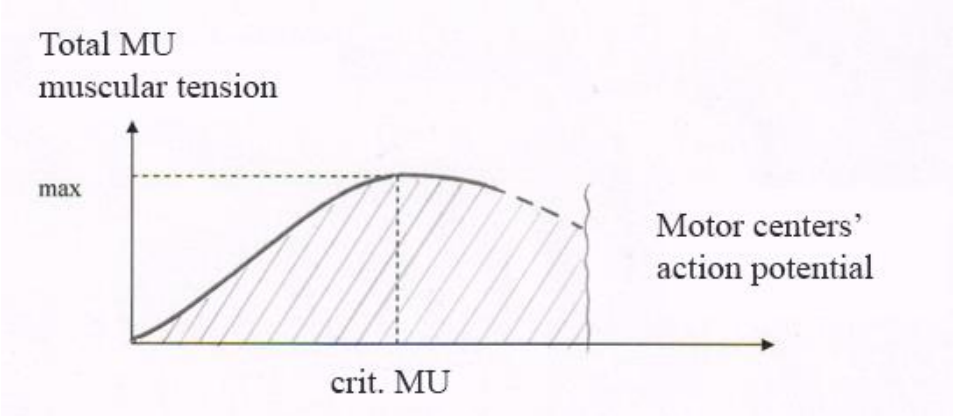


Fig. 4. The total muscle tension developed by a separate MU

In the relaxation phase, the recovery process in the MU system is limited in the following areas: axon – muscle fiber excitation transition, functional properties of muscle fibers, and is implemented in accordance with the law of supercompensation. In this regard, depending on the magnitude of the athlete's acceleration movement, the excitatory impulses of the motor neuron can arrive at different phases of the recovery process (non-recovery, supercompensation), which in the next cycle of contraction will determine the way of its contractile dynamics.

The recruitment of motor units of one type

According to the experimental data [3, 6], the morphological and functional differences are insignificant within the boundaries of one MU type. These conditions predetermine the process of recruitment of a single MU type as the running speed is increased in the sequence similar to the forced activity process of the motor neuron.

1. When the amplitude of the action potential of the motor neuron reaches the value corresponding to the excitation threshold of the muscle fibers, their contractile reaction occurs.

2. The increase in the degree of impact of the central neuro system's motor centers on MUs leads to the fact that low-threshold motor neurons and the muscle fibers innervated by them become involved in the stimulated activity first, then all the existing MUs of this type are consistently applied (the rule of size). Thus, the recruitment of MUs and, therefore, the development of total muscle tension, both within a single MU and their combination, is carried out.

For the MU of a separate type, as well as for a separate MU, there is a critical region of excitation frequencies of motor neurons and muscle fibers, the excess of which leads to the removal of the muscle tension value.

The minor morphofunctional differences within the MU of one type provide, on the one hand, a relative synchronization - simultaneous contractions of muscle fibers, contributing to an increase in total

muscular tension, on the other – a relative asynchrony, on which the degree of total muscle tension fluctuation is dependent, i.e., the movement is performed more smoothly, or the posture is held.

The interaction of MUs of a different type and kind in the process of their recruitment.

There have been experimentally established significant morphological and functional differences between the types of MU and their kinds [3, 7, 12, 18].

We shall review the model of the MUs' recruitment process when the speed of running changes from a state of relative rest to a random failure (Fig. 5).

Initially, the accelerated movement of a person is provided by the consistent development of total muscle tension that occurs when the slow MUs are involved in the stimulated activity. At this stage, the total muscle tension of the slow MUs will provide, on the one hand, the movement of a person. On the other hand, it will compensate the inferior counteraction of the muscle fibers of kind II-A and II-B (compression, extension), because according to the "rule of size" they will not be in a state of active contraction. Upon reaching the zone of critical excitation frequencies for the slow MUs, the process of consistent reduction of muscular tension begins (Fig. 5, a).

At the same time, the further increment of the running speed is realized by recruiting the fast MUs of II-A kind, whose muscular tension, on the one hand, provides an increase in running speed, on the other hand, compensates the reduction in tension of some of the slow MUs and the inferior counteraction of the II-B kind MUs (Fig. 5 b).

Upon reaching the critical zone for the fast MUs of II-A kind, the further speed increase is developed by recruiting the fast II-B kind MUs, whose muscular tension, on the one hand, provides an increase in running speed, on the other hand, compensates the reduction in tension of some of the slow MUs and the inferior counteraction of the II-A kind MUs (Fig. 5, b).

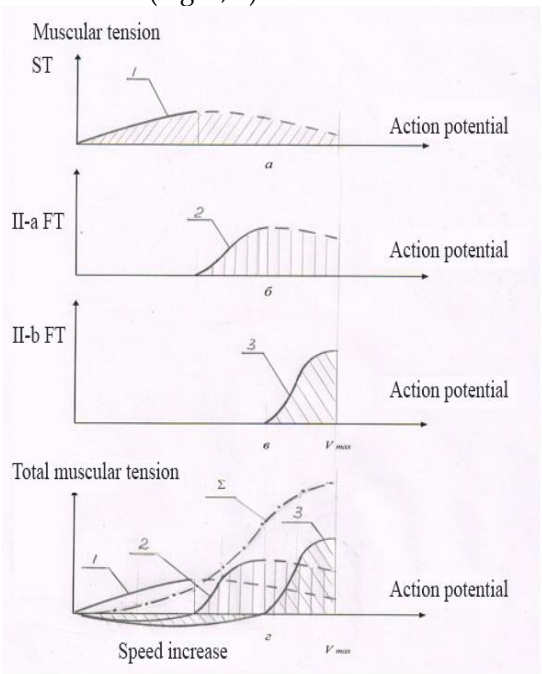


Fig. 5. The principal model of the muscle fibers recruitment of different types and kinds in the transition mode of executing physical activity from the state of relative rest to the individual maximum (1 – the contribution to the muscular tension of the slow MUs; 2 – the contribution of the fast MUs II-A; 3 - the contribution of the fast MUs II-B; ∑ - the total contribution of the MUs of various types and types)

The increase in the degree of motor centers' impact on the motor neurons above the critical values for the fast II-B kind MUs should lead to the following result. In one, the most probable option, the tension of the fast II-B MUs consistently reduces, the speed of running decreases, and the mode of cyclic contraction of the MUs maintains. In another, also probable option, the mode of cyclic contraction is transformed into the varieties of tetanic contraction of the MUs (for example, the convulsive effects).

In fig. 5, d, a superpositional model is constructed for the spatial and temporal summation of MUs' muscular tensions of various types and kinds in a transition mode of executing physical exercise from the state of relative rest to an individual maximum.

This model of the MU recruitment process can serve both as a physiological basis for a classification of physical exercises creation from the point of view of selective impact exerted on different types and kinds of MUs [20], and for solving other problems of athletes training, in particular, the practicability of training process intensification.

The Discussion Of The Research Results

In order to demonstrate the correctness of the recruitment process model for the MUs of a different type and kind (see Fig. 5, d), on the other hand - presented in the scientific and methodological literature (Fig. 6) [23; P. 21], we shall evaluate their compliance with the validity criteria of the scientific research results [25].

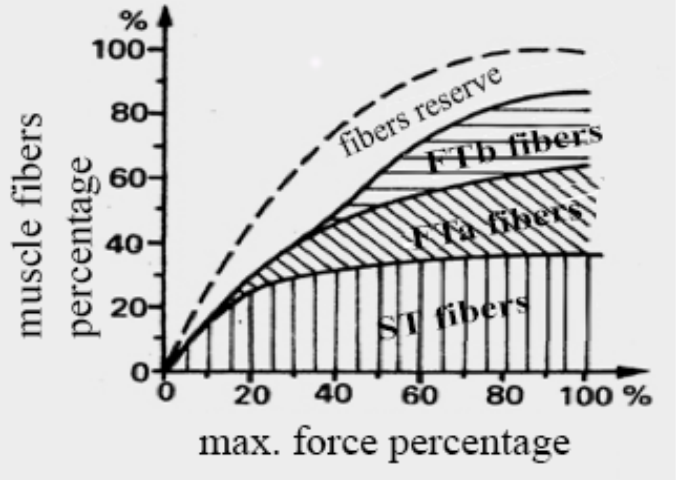


Fig.6. The inclusion of various types of muscle fibers in the movement with increasing resistances (transformed according to Kostil)

The first criterion (empirical substantiation) requires the model to explain the observed facts, which is the truth test. We shall evaluate the correctness of the compared models by several established experimental facts.

From the model presented in fig. 6 the following can be stated.

1. When the intensity and magnitude of the resistance is less than 10%, only slow-twitch muscles (ST) are involved in work (slow MUs and, correspondingly, slow muscle fibers).
2. At the maximum value of resistance and intensity, all three types of muscle fibers are involved in work.
3. With the magnitude of resistance of approximately 40%, the ST muscles'contribution to the total muscle tension reaches maximum and remains almost constant.

The information analysis is represented in Fig. 7 [1; P.160]. From the use of glycogen while cycling with different intensity function graph, the following can be stated.

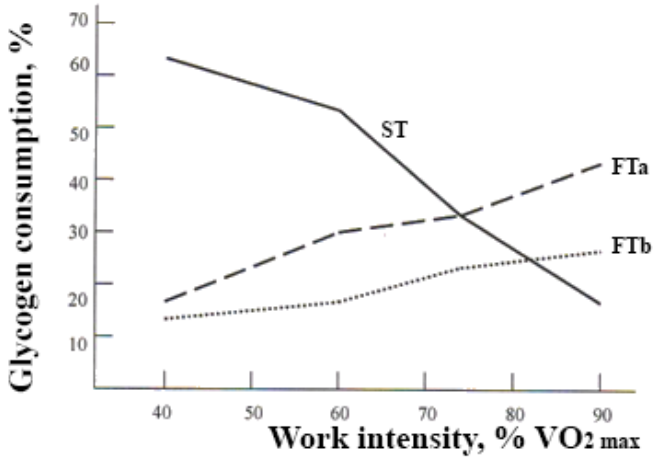


Fig.7. The use of glycogen by the slow-twitch (ST) -, fast-twitch (II-a kind, FTa) - and fast-twitch (II-b kind, FTb) - fibers of the M.vastus lateralis muscle while cycling with different intensity for 60 minutes (Wilmore, Costill, 2004)

1. When the intensity of work is at the level of 40%, glycogen is used by three types of muscle fibers. This fact contradicts the recruitment model in fig. 6, where only ST and FTa muscles are involved, but the FTb are not, thus, the use of glycogen should not be there.
2. At the maximum intensity value, it can be seen in fig. 7 that the level of glycogen consumption in ST fibers is significantly lower than with a small amount of work performed. This fact also contradicts the recruitment model (see Fig. 6), according to which glycogen consumption in the ST fibers should increase, and from 40% of the load it should remain almost constant.

The objectivity of our principal model is reflected by the following arguments.

1. According to this model, when the body performs external work due to the contraction of slow muscle fibers (low resistance, low intensity), the intermediate and fast fibers work in the mode of inferior counteraction (compression-extension). Accordingly, in this mode of operation, the consumption of glycogen as an energy source will be present in the intermediate and fast fibers.
2. In the mode of maximum speed, a part of the slow muscle fibers will be in the mode of inferior counteraction, i.e. it will perform negative work in relation to the total muscle tension. Since in this mode the instant contribution of slow muscle fibers will be less than with their maximum involvement, the depletion of glycogen will be less than the maximum values.

Among the reasons that explain this phenomenon, it is possible to mention, the interruptions in the impulse transition from the motor neuron to muscle fibers [8, 20], which leads to a decrease in their tension. On the other hand, the muscle tension in the mode of maximum cyclic contractions develops in the following sequence: fast-intermediate-slow. This phenomenon is explained by a smaller amount of electrical resistance to the passage of an electromagnetic impulse to the corresponding MUs in the process of excitation transfer from a nerve to a muscle [8, 16].

In particular, "the time required for the maximum tension of the FT fibers does not usually exceed 0.3–0.5 s, while the ST fibers are able to develop the maximum tension only after 0.8–1.0 s (Mohan et al 2001)" [1; P. 153].

We shall consider how the dialectic of the recruitment process unfolds in the mode of maximum cyclic contraction. The contraction of the fast (FTb) fibers (0.3 - 0.5 s) is dominant in this process. The slow (ST) fibers in a period of up to 0.8 - 1.0 s will be in a mode of inferior counteraction, i.e., they are subtracted from the total contribution to the muscle tension, and only with the arrival of an electromagnetic impulse (with a delay of at least 0.3 relative to FTb), they will begin to contract.

It has been determined that "the ST fibers are able to transfer biounits at a very high speed (more than 1000° 1 s), but only under the condition of minor force application (Costill et al., 1980; De Vries, Housh, 1994)" [1; P.159]. Due to the fact that the ST fibers excitation moment is characterized by the conditions noted above, the ST contraction rate will be higher than the FTb contraction rate and after a short period of time the ST will "pick up" the titanic tension mode, i.e. there will be a process of imposing (adding) the tension of FTb, FTa and ST fibers.

The second experimental argument in favor of the greater objectivity of the model presented in Fig. 5, is the experimental data on the dynamics of interaction between the number of nerve impulses per second and the force of muscle contraction as a percentage of the maximum force can be attributed (Fig. 8) [23]. It can be argued that the shapes of this dynamics and the dynamics of total muscular tension (∑ Fig. 5, d) are equivalent, while the shape of the analogous dynamics in Fig. 6 is significantly different.

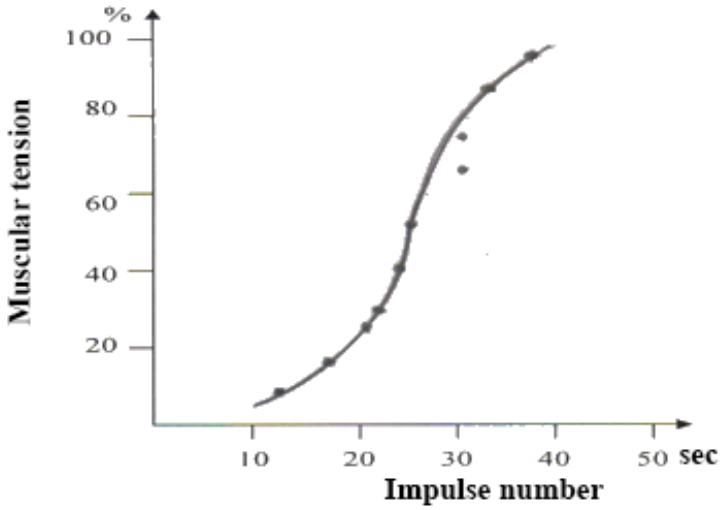


Fig.8. The ratio between the number of nerve impulses per second and the force of muscle contraction as a percentage of the maximum force; the average value of multiple motor units; the little finger abductor's output
(according to Bigland and Lippold)

The second level of knowledge validity criteria (meta-theoretical) reflects the internal perfection of the developed models, by which experts [24, 25, 26] understand, first of all, its logical (cause-and-effect) integrity and therefore basic experimental verifiability. According to the methodology of science, "no matter what errors the authors make in terms of logic ... while describing the sequence of research, it is always possible to prove that any mistake of this kind ultimately becomes equal to violating the requirements of a certain logical law" [24; p. 60]. If we apply this to the model of D. Costill, then, in particular, the presence of the so-called "reserve of fibers" in the process of various types of muscle fibers inclusion into motion with the increasing resistance does not have a natural explanation. From the point of view of our model, this is not a reserve, but an objective natural phenomenon, when part of the muscle fibers of the MU is in the mode of dialectical contradiction (inferior counteraction) due to their evolutionarily formed biological features.

Intertheoretical criteria distinguish the compatibility (interdisciplinary connection) of this theory (model) with others. In M. Bunge's works this criterion is said to be more important than the metatheoretic one. He states: "The worst possible of all is not a refutation of the theory by the experiment that it induced, but the absence of its connection with other theories" [26; p. 302].

As an example of the compatibility of our recruitment model with other theories, we shall present two arguments.

1. The dialectic of any development process assumes that in this case three laws are implemented.

1. The transition of quantity to quality.
2. The negation of negation.
3. The unity and struggle of opposites.

The experts recognize that the dominant in the development process is the unity and struggle of opposites.

The unity of opposites, in particular of the slow MU and fast II-b MUs, will consist in the fact that they are in the same "bundle" of muscle tissue of the muscle, are attached to the heads of the muscle and, through the tendons, collectively transfer efforts to the levers of the skeletal system. The opposites of these MUs are expressed in the evolutionarily established structural and functional characteristics of various types of MUs [1, 3].

We shall consider the process of interaction of opposites for the two exercise modes (see Fig. 6):

a) no more than 10% of the maximum intensity according to the recruitment model;

b) 100% maximum strength.

For the mode "a", the model shows the presence of only one opposing load in this mode – slow MUs. The opposing contradiction is not represented on the model, but it should be.

For the mode "b", the model shows the mutual imposition of the slow MUs and fast II-B MUs contribution – the addition of opposites, while they must be in a state of confrontation, i.e., the muscular tension of the slow MUs should be partially subtracted.

2. The concept of the "golden mean" has existed in the human community for many centuries. In the theory and practice of sports, the manifestation of the law of the golden mean is associated with the "law of average exercise" identified in the course of laboratory studies by the Soviet physiologists [27]. The thesis is: *the muscle makes the maximum mechanical work at average intensity and average rate of the movement*. If we observe the analysis of the total muscular tension growth rate (see Fig. 5, d), we shall see that in the area of small and maximum intensity, the growth rate is lower than in the middle part of the exercise load. This phenomenon is easily explained if we take into account that in the extremes, the inferior counteraction of the relative muscle fibers is more significant than at average intensity.

Conclusion

This way, the result of a theoretical study of the law of supercompensation based on the laws of of the damped oscillations theory provides an objective basis for its application in substantiation of the model of muscle fibers of different types and kinds recruiting in a transitional mode of physical exercise execution from relative rest to individual maximum.

A comparative analysis of the developed model for the recruitment of muscle fibers of various types and kinds of MU and of the adopted in the Russian theory of sports model (D. Costill et al., 1980) and its modifications in order to substantiate the methodical recommendations for the physical activity planning in the training of athletes, has shown that the first does meet the requirements imposed to the reliability of the results of scientific research, i.e., it is correct in relation to the level of the modern knowledge in the field of physiology of muscular activity.

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Non-traditional means of physical training in middle school physical education classes

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Abstract

The article investigates the influence of non-traditional means of physical education on indicators of physical development and physical preparedness of pupils of middle school age in rural schools. The timeliness of the research: preserving and improving moral, physical and mental health of pupils is one of the priorities according to the Concept of a new Ukrainian school. The participants of the research: fifty pupils aged 12–13 years old participated in the study. They were divided into two groups: experimental (n=25), where pupils practiced stretching, Crossfit and elements of hatha yoga during physical education classes and control (n=25), where pupils followed the traditional curriculum. The experimental group included 11 boys and 14 girls, 12 boys and 13 girls were in the control group. All of the pupils in both groups were in the main medical group and did not practice sports. The methods of the research: theoretical analysis and generalization of scientific and methodical literature, questionnaires, pedagogical observation, pedagogical experiment, testing, methods of mathematical statistics. At the end of the experiment, there was a significant increase in the studied parameters of the pupils of the EG ($p<0.05$), which indicates the high efficiency of the usage of non-traditional means of physical training in the physical education classes in the rural school. Conclusions. Comparing the obtained end-results of the experimental group with the state norms proposed by the resolution «On state tests and norms of assessment of physical preparedness of the population of Ukraine», which we used during the experiment, it should be noted that the level of physical preparedness of pupils increased in comparison to the initial data and meets the standards of normative requirements. The conducted experiment allowed to develop pupils' interest to the lessons of physical education and showed their desire to engage in non-traditional means of physical education in the next academic year.

Keywords: physical education, physical development, physical preparedness, pupils of middle school age

Introduction

According to the Concept of a new Ukrainian school, preserving and improving moral, physical and mental health of pupils is one of the school priorities. This value is of strategic importance for the sustainable development of society, and, therefore, it is one of the prior development goals of modern Ukraine. At various stages of society's development, attention has always been attributed to the study of health problems. It is no wonder that in the normative legal documents such as the Law of Ukraine «On Higher Education», the National Doctrine of the Development of Education in Ukraine, it is emphasized that the need for health is fundamental to the system of vital values of every person, without which it is not possible for the personality to self-actualize. Consequently, the successful development of each child, in general, depends on the state of his health [1, 2, 3, 4, 5]. Physical education plays a special role in the solution of this issue, which corresponds not only to the ability to manage vital motor activity in different conditions and to educate the need for systematic physical exercises throughout life, but also for the formation of a harmoniously developed personality [6, 7, 8]. It is the teachers of physical education who promote the development of a physically healthy personality of a pupil.

2. Literature Review

Analysis of literature sources [7, 8, 9] showed that today teachers of physical education are facing the task of not only preserving the health but increasing its level. The most effective ways of improving the health of children are motor activity, rational organization of day routine and rest regime, nutrition and psychological comfort, etc [1, 5, 10]. Motor activity is a necessary condition for the normal development of a young person, his health. Physical education is one of the components of a healthy lifestyle, health promotion and its improvement. Physical education class plays an important role in the development of the child [2, 6, 11, 12]. However, schools do not pay due attention to the health of children, the subject of physical education; as a result, pupils have reduced interest for physical education, in addition, there is no proper sports base for conducting physical education classes [2, 3, 7, 9, 13]. Therefore, the purpose of introducing non-traditional means of physical training in the physical education classes was to create a modern, interesting and developing class in a rural general-education school that would meet the desires, needs and interests of pupils.

The aim of study is to determine the influence of non-traditional means of physical education on indicators of physical development and physical preparedness of pupils of middle school age in rural schools.

3. Method

3.1. Participants

The study was attended by fifty pupils of the 7th grade aged 12–13 years, which were divided into two groups: experimental (n=25) and control (n=25). The experimental group included 11 boys and 14 girls, 12 boys and 13 girls were in the control group. All of the pupils in both groups were in the main medical group and did not practice sports. The study was conducted during 2017–2018 school year on the basis of the Yemilchin liberal arts school. The research related to human use has been complied with all the relevant national regulations and institutional policies and has followed the tenets of the World Medical Association (WMA) Declaration of Helsinki – ethical principles for medical research involving human subjects.

3.2. Materials

The study of indicators of general physical preparedness was carried out on the basis of test exercises: «running for 60 m» (speed), «flexing and extending arms while lying on the floor» (strength), «running for 1500 m» (endurance), «shuttle running 4x9 m» (agility), «tilting body forward while sitting» (flexibility), «jumping for length» (speed-power quality). Assessment of physical development of pupils was carried out using the method of anthropometry (height, body weight). Height was measured by a height gauge with an accuracy of 0.1 cm. Body weight was determined on special medical scales with an accuracy of 0.1 kg 3–4 hours after eating. To determine the functional parameters of the cardiovascular system, heart rate was measured at rest for 1 minute and after exercise (30 squats for 45 seconds) with heart rate monitor. For an objective assessment of the health of a child and assessment of cardio performance, the Ruffier test was carried out. Quantitative data was processed by statistical methods. To determine the probability of difference in the results of the study the Student's test was done. The significance for all statistical tests was set at $p<0.05$. All statistical analyses were performed with the SPSS software, version 21, adapted to medical

and biological researches.
Research methods: theoretical analysis and generalization of scientific and methodical literature, questionnaires, pedagogical observation, pedagogical experiment, testing, methods of mathematical statistics.

3.3. Procedure

Physical education classes were conducted three times a week for 45 minutes. Classes were conducted in accordance to the general structure of the lesson, which consisted of three parts: preparatory, main and final. Pupils of the experimental group followed the methodology we proposed, according to which 60–70 % of the exercises was designed for the implementation and in-depth study of non-traditional means of physical education. In the preparatory part of the lesson, warm-up activities were carried out. Towards the end the sets of exercises designed for stretching of muscles were included; they were aimed at increasing mobility in the joints and elasticity of the muscles and training of the locomotors apparatus for the main load (exercises in pairs, with balls, ropes, gymnastic sticks, which were executed with maximum strength from 10 to 20 seconds, including the relaxation). The main part – the Crossfit – exercises which were aimed at general physical training of pupils and increasing the functional capabilities of different systems of the body. In the main part of the lesson, the sequence of physical exercises was as follows: firstly, exercises for speed were performed, then for strength, and in the end – for endurance. Exercises were carried out with high intensity. In the final part of the lesson, stretching and methods of hatha yoga (asanas – poses for relaxation and development of physical qualities, pranayama – breathing exercises on the ground and in motion) were performed. The elements of hatha yoga in the final part of each lesson were designed for the body recovery after exercising. Every 2 weeks the type and the level of workload in the classes changed according to the individual characteristics of boys and girls. The variety of exercises depended on the creative potential of a certified teacher who previously underwent a special training in these kinds of sports. Girls from the experimental group performed exercises with less intensity, number of repetitions and approaches, compared to the boys of the EG. In addition, classes in the experimental group were conducted to the music. Pupils of the control group followed the general curriculum on physical education for grades 5–9 for general education institutions approved by the regulation of the Ministry of Education and Science from 07.06.2017 number 804.
In the beginning of the main pedagogical experiment, we conducted a questionnaire for the pupils of the experimental group to determine their attitude towards the introduction of non-traditional means of physical training in the classes of physical education. The initial level of indicators of physical development and overall physical preparedness in both groups were determined. The main tasks of our study were: to analyze literary sources on the topic of the research; to determine the attitude of pupils to non-traditional means of physical education and to introduce them in the classes of physical education in rural school; to study the dynamics of indicators of physical development and physical preparedness of pupils of secondary school age during the school year and compare them to the state norms.

4. Results

In the beginning of the main pedagogical experiment, we conducted a questionnaire for the pupils of the experimental group to determine their attitude to the introduction of non-traditional means of physical training in physical education classes and the choice of non-traditional physical education methods, which they preferred to implement in physical education lessons during the experiment. During the study, it was found that 92 % of the pupils surveyed expressed the desire to experiment and implement non-traditional physical training in physical education lessons (Table 1). Based on the results of the questionnaire on the choice of non-traditional means of physical education, it was determined that pupils mostly would like to practice respiratory exercises and recreational exercises of hatha yoga (25%), classic stretching (23%), and Crossfit (21%). The smallest percentages pupils attributed to such non-traditional types of exercises as aerobics (11%), classic yoga (8%), Pilates (7%). Taking into account preferences of the pupils, we decided to introduce such non-traditional means of physical education as classic stretching, hatha yoga, and Crossfit in the physical education classes for the experimental group.

Table 1. *Experimental group questionnaire results of the liberal arts school pupils.*

№	Questions and answers	Answers results (%)

1.	Do you want non-traditional means of physical training to be introduced in physical education classes? a). «Yes» b). «No»	 92 8
2.	What types of non-traditional means of physical training would you like to practice in physical education lessons? a). Aerobics	 11
	b). Classic stretching	23
	c). Pilates	7
	d). Hatha yoga (respiratory exercises and recreational exercises)	25
	e). Body flex	5
	f). Classic yoga	8
	g). Crossfit	21

Physical development of a child is also associated with the mode of motor activity, which is a biological need of the organism and can be satisfied in the process of physical education. Level assessment of the physical development of a child is an integral part of the control over the state of child's health. Therefore, the assessment of physical development was carried out on the principle of centimetographic tables and such anthropometric indicators as height and body weight. Indicators of the physical development of the pupils of both groups are presented in Table 2. It can be noted that the indicators of physical development of the students of both groups are average, corresponding to their age, and accordingly the students have normal level of physical development.

According to the data presented in Table 2, before the beginning of the experiment, the pupils of both groups were almost identical, with the absence of reliable differences ($p>0.05$). In general, it can be noted that the data obtained from the study indicate that the morphofunctional characteristics of the pupils in both groups have improved. However, pupils from the control group showed minor changes, and pupils who participated in non-traditional physical education classes during the school year had significant improvements in all indicators. Thus, according to physical development indicators, height in the experimental group was significantly changed by 6.1 cm for boys and by 5.41 cm for girls, compared to those who were in the control group, where the height for boys increased by 3.14 cm and by 3.42 cm for girls. Body weight for boys in the EG increased by 4.46 kg, for girls in the EG – by 3.21 kg, while the body weight for boys in the CG increased by 3.7 kg, and for girls in the CG – by 2.65 kg.

Thus, the indexes of functional parameters of the cardiovascular system in the state of rest did not differ significantly in the experimental and control groups of pupils at the beginning of the experiment, while the indexes of heart rate in the state of rest had a significant difference in the experimental group of pupils compared with the pupils of the control group at the end of the experiment. So, heart rate in the state of rest for the EG of pupils decreased by 7.12 beats per min. for boys and at 6.81 beats per min. for girls, respectively, heart rate in the state of rest for the CG of pupils decreased by 2.72 beats per min. for boys and by 0.54 beats per min. for girls. The heart rate after completing 30 squats in 45 seconds significantly decreased for the experimental group of pupils in the end of the experiment, compared to the heart rate indexes of the control group, indicating the adaptation of the cardiovascular system to regular physical activity. In addition, the positive effect of non-traditional means of physical education on the child's functional state of the cardiovascular system according to the Ruffier test should be noted. Thus, after the experiment, the Ruffier index for boys grew by 3.2 standard points, for girls in the EG by 2.0 points, whereas for boys in the CG this indicator also improved, but slightly – by 0.7 and 0.68 points respectively.

Table 2. *Morphofunctional changes of the experimental and control groups of pupils in the beginning and in the end of the experiment (X±m).*

Morphofunctional indicators	Experimental group (n=25)		Control group (n=25)	
	Bs. (n=11)	Grls. (n=14)	Bs. (n=12)	Grls. (n=13)
Before the experiment				
Height, cm	149.74±3.5	149.2±0.62	150.56±2.3	148.48±0.53
Body weight, kg	41.58±2.6	42.3±0.27	42.1±1.4	43.7±0.7
Heart rate in a state of rest, bts./min.	77.75±5.2	78.9±6.12	78.9±3.8	76.4±3.9

Heart rate after exercise (30 squats in 45 seconds) bts./min.	110.36±4.1	112.4±2.3	112.29±3.7	110.52±2.9
The Ruffier test, points	6.5±0.05	6.7±0.1	6.4±0.23	6.78±0.02
After the experiment				
Height, cm	155.84±2.2*	154.61±1.34*	153.7±3.2*	151.9±0.7*
Body weight, kg	46.04±3.4*	45.51±0.63*	45.8±2.28*	46.35±1.82*
Heart rate in a state of rest, bts./min.	70.63±3.7*	72.09±4.9*	76.18±6.3	75.86±2.81
Heart rate after exercise (30 squats in 45 seconds) bts./min.	104.12±3.5*	102.9±2.6*	112.09±3.1	109.58±4.1
The Ruffier test, points	3.3±1.02*	4.7±0.54*	5.7±1.04	6.1±0.25

Note * – the validity of the differences in Student's test at $p<0.05$ before and after the experiment

In order to determine the influence of non-traditional means of physical education on the dynamics of indicators of physical preparedness, complex testing was carried out. Quantitative analysis of the test results showed that during non-traditional means of physical education practices there were positive changes in all indicators of the development of physical qualities of the pupils under study (Table 3).

Non-traditional means of physical education had a positive influence on the development of high-speed abilities of pupils of the EG. According to the results of the test exercise «Running for 60 m», speed indicators for boys and girls of the CG are probably lower than that of the representatives of the EG, both in the beginning and in the end of the practice experiment. Indicators for running for 60 m for boys in the EG increased by 13.8 %, for girls in the EG – by 10.2 %. While, for the boys in the CG it increased by 4.2 %, and for girls in the CG – by 5.2 %, respectively. Significant changes were observed for the pupils of the experimental group when performing the test on «Flexing and extending arms while lying on the floor» as well. Consequently, for boys in the EG, the increase in results was 42.1 %, for girls in the EG – 20.2 %, which indicates that there have been positive changes in the development of strength endurance of hands. Minor changes occurred for the control group of pupils as well. Growth for boys in the CG was 26.5 %, for girls in the CG – 6.1 %. At the same time, quantitative changes are more significant in experimental groups and make up for 42.1 % against 26.5 % for boys and for 20.2 % against 6.1 % for girls. Consequently, there is an increase in the indicators for boys in the EG by 15.6 %, for girls in the EG – by 14.1 %, in comparison with an increase in the results of pupils in the CG. Quantitative characteristics of the increase in results between pupils of experimental and control groups have a probable difference ($p<0.05$).

Table 3. *Physical training indicators of experimental and control groups of pupils in the beginning and in the end of the experiment (X±m).*

Physical training indicators	Experimental group (n=25)		Control group (n=25)	
	Bs. (n=11)	Grls. (n=14)	Bs. (n=12)	Grls. (n=13)
Before the experiment				
Running for 60 m, sec.	10.8±0.8	11.7±0.6	10.6±0.55	11.5±0.4
Flexing and extending arms while lying on the floor, times	17.1±0.8	10.9±0.6	17.3±0.8	11.4±0.79
Shuttle running 4x9 m, sec.	11.6±1.2	12.0±1.24	11.5±1.06	12.3±1.5
Tilting body forward while sitting, cm	6.2±0.7	12.1±0.8	5.8±0.6	11.8±0.7
Jumping for length, cm	173.7±4.1	152.3±4.3	171.8±3.7	152.1±3.3
Running for 1500 m, min, sec.	7.91±1.02	9.81±1.52	7.75±1.76	9.92±1.48
After the experiment				
Running for 60 m, sec.	9.3±0.7*	10.5±0.69*	10.15±0.5*	10.9±0.4*
Flexing and extending arms while lying on the floor, times	24.3±091*	13.1±074*	21.9±0.54*	12.1±0.79
Shuttle running 4x9 m, sec.	10.7±2.01*	11.5±1.51*	11.0±1.3	12.1±1.03
Tilting body forward while sitting, cm	9.3±0.91*	15.9±0.68*	7.5±0.61*	12.2±0.75
Jumping for length, cm	180.3±4.5*	155.5±4.6*	175.4±3.8*	154.9±3.3

Running for 1500 m, min, sec.	6.80±0.84*	8.27±0.95*	7.52±1.06	9.15±0.92

Analysis of the results of the test «Shuttle running 4x9 m» showed that there were positive changes in the development of agility in the control and experimental groups for boys. Given that our experiment did not include exercises for the purposeful development of this quality, we did not expect a significant increase here. However, the experiment showed the opposite: despite a slight increase in absolute and relative indicators – the increase was 4.34 % for boys in the control group, in the experimental – 7.75 %. More significant quantitative increase in the results of the test «Shuttle running 4x9 m» was observed for girls: 1.62 % for the control group and 4.2 % for the experimental group. Significant differences are observed when doing the test exercise «Running for 1500 m». Consequently, for boys in the EG time for performing the test exercise decreased by 14 % at the end of the experiment, by 15.69 % for girls, whereas for pupils CG it reduced by 2.96 % for boys and by 7.76 % for girls. Statistically significant changes also occurred during the performance of the «Jumping for length» test, which characterizes the level of development of speed-strength abilities. Thus, for boys in the EG the increase was 3.8 %, while for girls in the EG – 2.1 %, respectively. At the same time, for boys in the CG growth was 2.1 %, and for girls 1.8 %, respectively. Consequently, the increase of the demonstrative force for boys in the EG exceeds the increase of the CG by 1.7 %, and for girls – by 0.3 %, respectively. During the practice experiment the magnitude of the increase is significant for boys and girls ($p<0.05$). This is reinforced by the fact that the age of 11–14 years is a period of rapid development of speed-power abilities. It is worth noting that the significant level of growth in the results was recorded for the test exercise on flexibility «Tilting body forward while sitting» for the girls of the experimental group, which is by 31.4 %, compared to the girls of CG, for whom this figure increased by 3.4 %. Significant differences were observed for boys in experimental and control groups. In this way, the results for boys in the EG increased by 50 %, while for boys in the CG – by 29.3 %. Consequently, for girls in the EG an increase exceeds 28 %, compared to the CG, for boys – 20.7 %.

Thus, such a significant increase in the results of these tests in experimental groups is related to the proposed and implemented non-traditional exercises in physical education classes, which in turn influenced the development of the physical qualities of the pupils. In addition, in the end of the experimental study, we conducted the questionnaire on whether pupils liked the classes of physical education with non-traditional means of physical training and whether they would like to continue with such classes, to which the children unanimously answered «yes» (100 %). It confirms pupils' positive attitude to the introduction of non-traditional means of physical education in the lessons of physical education.

5. Discussion and Conclusion

The results of many scientists' researches [1, 4, 8, 10, 14-17] testifies to the urgency of our work and the need to improve the traditional system of physical education in school. The analysis of the results of physical preparedness indicators of the pupils of both groups showed that the implementation of non-traditional means such as «hatha yoga», classic stretching, Crossfit in the lessons of physical education proved to be effective first of all for the development of flexibility. When performing the test exercise «Tilting body forward while sitting» the indicators increased by 28 % for girls in the experimental group and by 20.7 % – for boys, compared with the results of pupils in control groups. The analysis of the correlation between the indicators of the effect of non-traditional means of physical education and the development of physical qualities in the end of the experiment indicates that the second-best performance indicator was the indicator of strength qualities. Thus, when performing the test exercise «Flexing and extending arms while lying on the floor» the indicator of the increased result exceeded 15.6 % for the boys in the experimental group, and for girls – 14.1 %, as compared to the increase in the results of power qualities pupils of control groups. The test run time «Running for 1500 m» decreased by 11.04 % for boys in the experimental group and by 7.93 % for girls. At the same time, we can assure that the implementation of the experimental group of exercises with the Crossfit in the educational process significantly improved the physical form of pupils, developed power qualities, improved the work of the heart and trained the body to adapt quickly to the change of intense loads in a minimal time and, therefore, created much faster muscle stress state.

Analysis of the results of the study showed that among the indicators of general physical preparedness, after exercises on flexing and extending arms while lying on the floor, there is a slightly smaller increase in the results of the development of speed and agility after the performance of the test exercises «Running for 60 m» and «Shuttle running 4×9 m» respectively. The obtained data indicate a slight decrease in the time of realization of the corresponding distances. Thus, in experimental groups, the increase

in the speed results was 9.6 % for boys and 5 % for girls. But, unfortunately, the main ability in this case – agility – does not show significant dynamics. Difference in the increase of the agility results for pupils in the EG and CG is – 3.41 % for boys and 2.58 % for girls. The smallest percentage in the growth of the results can be traced when performing jumps for length, 1.7% is the best result of the increased force for the boys and 0.3 % – for the girls. The analysis of morphofunctional indicators and indicators of physical preparedness of pupils showed that for improving the health of pupils of secondary school age and increasing their level of physical training, the main focus should be put on the physical development of children and the development of their physical qualities; improvement of the educational process by introducing non-traditional means of physical education in the lessons of physical education.

Conclusions

1. As a result of the analysis of literary sources, low child health indicators, low level of physical education of schoolchildren, lack of pupils' interest to physical education lessons were revealed. It was determined that an integrated approach to the assessment of children's health and the introduction of non-traditional physical training in physical education lessons lead to improved pupils performance.

2. The conducted experiment allowed to develop pupils' interest to the lessons of physical education and showed their desire to engage in non-traditional means of physical education in the next academic year.

3. Significant differences in calculations of indicators of pupils' physical preparedness are revealed after all control test exercises for experimental group. Thus, the greatest increase in the results is observed during the test «Tilting body forward while sitting» (for boys by 50 %, for girls – 31.4 %) and «Flexing and extending arms while lying on the floor» (for boys for 42.1 %, for girls – 20.2 %), somewhat lower is observed in performing the test exercises «Running for 1500 m» (for boys by 14 %, for girls – 15.69 %), «Running for 60 m» (for boys by 13.8 %, for girls – 10.2 %) and «Shuttle running 4×9 m» (for boys by 7.75 %, for girls – 4.2 %). The smallest increment can be observed when performing the «Jumping for length» test (for boys by 3.8 %, for girls – 2.1 %). Indicators of the increase in the results after the test exercises for the control group of pupils were at a much lower level.

Comparing the obtained end-results of the experimental group with the state norms proposed by the resolution «On state tests and norms of assessment of physical preparedness of the population of Ukraine», which we used during the experiment, it should be noted that the level of physical mobility of pupils increased in comparison to the initial data and meets the standards of normative requirements.

Prospects for further research in this direction. It is planned to investigate the influence of non-traditional means of physical education on the indicators of physical health of middle school pupils.

Conflict of interest. The author declares that there is no conflict of interests.

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The Impact of Training Efforts of Various Focuses on the Development of the Function of the Visual Memory of Student-Athletes of 17-20 Years Old High Schools of Physical Culture

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Abstract

The article refers to the "Sports science" section of this magazine. Introduction: It is known that the function of visual memory is an active process in the activities of athletes, and therefore may suffer significant changes. There are also data indicating the fact of the specificity of the influence of training of various focuses on the psychophysiological functions of the organism of adolescent athletes. However, we did not find works that dealt with the problem of studying the impact of training efforts of various focuses on the dynamics of the formation and development of the function of the visual memory of athletes in adolescence. Objective: to investigate the impact of training efforts of various focuses on the development of the function of the visual memory of student-athletes 17–20 years old, specializing in various sports. Research methods: 110 athletes from the Brovarsky Higher School of Physical Culture (Kyiv region), 17- 20 years old, participated in the experiment, which were divided into two experimental groups:
group A (n = 56) - speed-strength sports (boxing, wrestling, athletics: sprint, hurdling, jumping, shot put and discus throwing) Group B (n = 54) - endurance sports (skiing, cycling, swimming 200, 400 and 1500 m) and one control group (n = 83) - peers of higher educational institutions who are involved in sports. The research of the individual characteristics of short-term visual memory was performed according to the method "memory for geometric shapes". When performing this test, the research subject was presented with forms with the image of geometric figures in the amount of 7 pieces. The research subject must remember their location for 30 seconds and then for 45 seconds to reproduce the figures on an empty registration form. The test task was performed twice using similar forms.
Statistics methods: the significance of differences between athletes of each group separately (in dynamics), between athletes of different groups (A and B) and between representatives of the experimental and control groups was determined using the Student's t-test. Results of the research: it was revealed that under the impact of physical efforts of speed-power nature, insignificant changes in the mean values of the function of short-term visual memory are observed, while under the impact of efforts on endurance there is a statistically significant improvement in the dynamics of this function.
Keywords: physical activity, visual memory function, research, athletes, adolescence.

1. Introduction

It is known that the state of the psychophysiological sphere of a person, which also includes mental functions (memory, attention, perception, thinking), directly affecting the effectiveness of sports activities [1, 2]. It is also proved that the function of short-term visual memory is an active process in human activity [3, 4, 5], and therefore may experience significant changes in the ontogenesis of both persons who engage in various sports and those who do not play sports or physical education.
Thus, it was revealed that athletes of different ages have higher indicators of the function of visual and auditory memory than non-athletes [6, 7, 8, 9]. There is also evidence of a positive, but uneven in nature, the impact of training efforts of various focuses on the development of this mental function in children and adolescents involved in sports [10, 11 et al.].

2. Literature review

Modern researches of M.V. Makarenko, V.S. Lizohub [10] establish that the function of short term visual memory is closely related to the state of properties of the basic nervous processes (strength and functional mobility), which, in turn, determine the nature of individual sports activity: the higher the level of development of functional mobility nerve processes, the more effective is the activity of an athlete in speed-strength sports; whereas a high level of development of the strength of nerve processes leads to successful sports activities in sports that primarily develop the quality of endurance. To the above, we'll add that high athletic result, for example, in representatives of sports of speed-strength nature, depends equally on the state of the actual muscle strength components and the properties of the main nervous processes of individuals [12, 13, 14, 15, 16, 17].

In our previous work [18], an analysis of changes in the function of short-term visual memory in young athletes aged 13–16 years was given, specializing in various sports. The main conclusion of such researches is the establishment of the fact of the specificity of the impact of training of various types on the psychophysiological functions of the organism of adolescent athletes. However, we did not find works that dealt with the problem of studying the impact of training efforts of various focuses on the dynamics of the formation and development of the function of the visual memory of athletes in adolescence. After all, it is known that the formation and development of mental functions take place non-equally at different age stages of human ontogenesis [10]. Therefore, the above-mentioned prompted us to conduct a series of researches on the study of this problem among student-athletes of 17–20 years of specialized sports institutions (high schools of physical culture, Olympic Reserve colleges, etc.).

3. Methods

The purpose of the research – to investigate the effect of training efforts of various focuses on the development of the function of the visual memory of student-athletes 17–20 years old who specialized in various sports. *Research methods*: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, testing, statistical methods.

3.1. Participants

The research involved young athletes (boys) 17–20 years old (n = 110) of the Brovary Higher School of Physical Culture (Kyiv region), who according to the classification of sports on A.G. Dembo [19] were divided into two groups: group A (n = 56) - speed-strength sports (boxing, wrestling, athletics: sprint, hurdling, jumping, shot put and discus throwing); Group B (n = 54) - endurance sports (skiing, cycling, swimming 200, 400 and 1500 m). The control group consisted of students aged 17–20 years (n = 83) of the Physical Education and Sports Faculty of the National Pedagogical Dragomanov University (n = 40) and the Faculty of Health, Physical Education and Sports of the Borys Hrinchenko Kyiv University (n = 43) who did not play sports.

3.2. Materials

The research of the individual natures of short-term visual memory was performed according to the method "memory for geometric shapes" [20]. When performing this test, the research subject was presented with forms with the image of geometric figures in the amount of 7 pieces. The research subject must remember their location for 30 seconds and then for 45 seconds to reproduce the figures on an empty registration form. The test task was performed twice using similar forms. They counted the number of correctly drawn and placed figures on the registration form (correct answers) and the number of mistakes (units) research subject for the entire period of work. According to the results of two tasks, the state of the visual memory of the individual was estimated in conditional points. When conducting a direct assessment of this function, we adhered to the following position: the more the research subject could correctly reproduce the geometric shapes in each of the two forms, which, as a result, automatically impacts the reduction in the number of mistakes made by him, the higher was his indicator of the function of visual memory. Evaluation of the test results was performed according to the scheme of the above-mentioned authors [20]:

Score, points	9	8	7	6	5	4	3	2	1
The correct answers, quantity	13	12	11	9–10	7–8	5–6	4	3	2

The evaluation of the research results was performed according to a comparative analysis of the first and second (in a year) research stages of the research subject according to the following scheme: separately for each sport, separately by groups of athletes according to the classification of sports by A.G. Dembo and the perform of comparative analysis of the experimental group) with a control group (peer-students of higher education institutions not involved in sports).

3.3. Procedure

Testing was conducted in the room of psychophysiological control in the first half of the day (from 9 to 12:00, no earlier than 2:00 after meals). One or two days before the conducted research, research subjects were asked to reduce physical exertion in terms of volume and intensity by 50%, not to drink tonic and soothing pharmacological preparations, and on the day of testing - strong tea or coffee. Each research subject voluntarily participated in the research. For the period of the survey, all individuals were healthy.

4. Results

The analysis of the function of the visual memory of speed-strength sports students (group A) in dynamics (according to the first and second stages of the research) indicates an insignificant change in the number of mistakes made in the process of conducting psychological testing ($p > 0.05$) (table 1). However, as you can see, there is a tendency to decrease the above-mentioned indicator among athletes of this group.
And, as a result of the above, there is no significant improvement in the function of short-term visual memory in boxers, wrestlers and athletes.

Table 1. *Indicators of the function of visual memory of student-athletes, sports of speed-strength nature (group A) according to the first (I) and second (II) stages of the research (n = 68), X ± m*

Indicators	I	II	t	p
		Boxers		
	(n=23)	(n=23)		
Number of mistakes, units	3,7 ± 0,48	3,4 ± 0,42	0,47	>0,05
Evaluation of the function, points	6,2 ± 0,44	6,4 ± 0,37	0,35	>0,05
		Wrestlers		
	(n=21)	(n=20)		
Number of mistakes, units	3,6 ± 0,45	3,3 ± 0,40	0,50	>0,05
Evaluation of the function, points	6,3 ± 0,39	6,5 ± 0,35	0,38	>0,05
		Track athlete		
	(n=24)	(n=22)		
Number of mistakes, units.	3,7 ± 0,51	3,4 ± 0,44	0,45	>0,05
Evaluation of the function, points	6,2 ± 0,48	6,4 ± 0,40	0,32	>0,05

The direct opposite character of changes in the indicator of the number of mistakes in dynamics is observed in athletes who mainly develop the quality of endurance (cyclists, skiers, swimmers) (table 2). Thus, in all of the above-mentioned athletes, an improvement in the function of visual memory was observed according to statistically reliable data ($p < 0.05$) on the decrease in the number of mistakes. The latter significantly affects the overall evaluation of the above function. As you can see, there is a statistically significant improvement in this function in all athletes of group B ($p < 0.01$).

Table 2. *Indicators of the function of the visual memory of student-athletes of endurance sports (group B) according to the first (I) and second (II) stages of the research (n = 59), X ± m*

Indicators	I	II	t	p
		Cyclists		
	(n=23)	(n=21)		
Number of mistakes, units	3,3 ± 0,42	2,2 ± 0,28	2,18	<0,05

Evaluation of the function, points	6,4 ± 0,39	8,0 ± 0,26	3,41	<0,01
		Skiers		
	(n=16)	(n=16)		
Number of mistakes, units	3,4 ± 0,44	2,1 ± 0,38	2,24	<0,05
Evaluation of the function, points	6,3 ± 0,41	7,9 ± 0,36	2,93	<0,01
		Swimmers		
	(n=20)	(n=20)		
Number of mistakes, units	3,3 ± 0,38	2,1 ± 0,34	2,35	<0,05
Evaluation of the function, points	6,4 ± 0,35	8,0 ± 0,29	3,52	<0,01

And finally, almost the same type with athletes who mainly develop speed-strength qualities (group A), the nature of changes in the indicators of short-term visual memory is recorded in their peers - non-athletes students (group K) (table 3). Representatives of this group also show only a tendency to improve the function of visual memory, while non-significant differences remain in the values of the error rate indicators and the function evaluation according to the data of the first (I) and second (II) research stages ($p < 0.05$ in all cases) .

Table 3. *Indicators of the function of the visual memory of students not involved in sports (group K), according to the first (I) and second (II) stages of the research (n = 83), X ± m*

Indicators	I	II	t	p
	Student - non-athletes (control group)			
	(n=83)	(n=76)		
Number of mistakes, units	3,7 ± 0,45	3,5 ± 0,38	0,34	>0,05
Evaluation of the function, points	6,2 ± 0,39	6,3 ± 0,37	0,19	>0,05

Table 4 shows the analysis of longitudinal changes in the indicators of the function of visual memory separately for student-athletes of sports of speed-strength nature (group A) and sports for endurance (group B).

As it should be expected, representatives of group A show insignificant differences in the values of the indicators of the number of mistakes and the overall evaluation of the mentioned mental function ($p > 0.05$), whereas athletes of group B show a statistically significant improvement in this function according to an increase in the number of correct answers or, respectively, a decrease in the number of mistakes and an increase in the value of the overall evaluation of the function of visual memory ($p < 0.01$ in both cases).

Table 4. *Indicators of the function of visual memory of student-athletes, sports of speed-strength nature (group A) and sports for endurance (group B) according to the first (I) and second (II) stages of the research(n = 127), X ± m*

Indicators	I	II	t	p
	Experimental group A			
	(n=68)	(n=65)		
Number of mistakes, units	3,7±0,44	3,4±0,35	0,53	>0,05
Evaluation of the function, points	6,2±0,38	6,4±0,34	0,39	>0,05
	Experimental group B			
	(n=59)	(n=57)		
Number of mistakes, units	3,3 ± 0,33	2,1 ± 0,26	2,86	<0,01
Evaluation of the function, points	6,4 ± 0,32	7,9 ± 0,30	3,42	<0,01

Interesting, in our opinion, can be the results of a comparative analysis of the indicators of the function of short-term visual memory of student-athletes of speed-strength sports (group A), endurance

sports (group B) and students not involved in sports, according to the first (I) and the second (II) stages of the research.

So, from the data of table 5 we find the following: at the first stage of the research, no statistically significant differences were found in the nature of changes of the indicator of the number of mistakes made by the three groups surveyed (p> 0.05), whereas according to the data of the second (one year) of the study, a statistically significant decrease in the number of mistakes was observed made by athletes of group B in comparison with their peers, some of whom represent the experimental group (group a), and others, respectively, the control group (group K) (p <0.01 in all cases). Note also that significant differences were found in the values of the number of mistakes between athletes of group A and students not involved in sports (p> 0.05).

Table 5. *Comparative analysis of changes in the indicator of the function of visual memory - the number of mistakes made by student-athletes of sports of speed-strength nature (group A), sports for endurance (group B) and students not involved in sports (group K), according to the first (I) and second (II) stages of the research (n = 210), units*

Stages	Group A [1]	Group B [2]	Group K [3]	t; [p1–p2]	t; [p1–p3]	t; [p2–p3]
I	(n=68) 3,7±0,44	(n=59) 3,3±0,33	(n=83) 3,7±0,45	0,73; >0,05	0,00; >0,05	0,72; >0,05
II	(n=65) 3,4±0,35	(n=57) 2,1±0,26	(n=76) 3,5±0,38	2,98; <0,01	0,19; >0,05	3,04; <0,01

One-type with the above-mentioned, the nature of changes in the average values of the function of visual memory (in points) is registered between students-athletes of speed-strength sports (group A), endurance sports (group B) and students not involved in sports (table 6).

The following is summarizing: a reliable improvement in the above-mentioned function (according to the data of the second stage of research) is observed in students of sports for endurance compared with their peers, some of whom are engaged in speed-speed sports (p <0.01), while others do not play sports (p <0.01); no significant differences were found in the nature of the changes in the mentioned function between the athletes of group A and the students of the control group (p> 0.05).

Table 6. *The average values of the function of visual memory and the reliability of the difference between student-athletes of sports of speed-strength nature (group A), sports for endurance (group B) and students not involved in sports, according to the first (I) and second (II) stages of the research (n = 210), points*

Stages	Group A [1]	Group B [2]	Group K [3]	t; [p1–p2]	t; [p1–p3]	t; [p2–p3]
I	(n=68) 6,2±0,38	(n=59) 6,4±0,32	(n=83) 6,2±0,39	0,40; >0,05	0,00; >0,05	0,40; >0,05
II	(n=65) 6,4±0,34	(n=57) 7,9±0,30	(n=76) 6,3±0,35	3,31; <0,01	0,20; >0,05	3,47; <0,01

5. Discussion and Conclusion

Analyzing the nature of the changes in the visual memory function of student-athletes, some of whom are engaged in speed-strength sports (group A) and other endurance sports (group B), we conclude that despite the fact that the function of visual memory is similar other mental functions (perception, attention, thinking) are characterized by expressed genetic heredity and are poorly corrected by means of physical education, we believe that the focus of the training process is specifically specializing features of the development of the above-mentioned functions. So, if athletes under the impact of training efforts of speed-strength nature did not reveal significant differences (p> 0.05) in the mistakes rate (although there is a tendency to decrease this indicator in the dynamics), whereas under the impact of endurance training, is registered a statistically significant a decrease in this indicator (p <0.05), which indicates a significant improvement (in average values) of the short-term visual memory function (p <0.01). In students who are not involved in sports, as it should be expected, there were no significant differences in the nature of changes in the indicators of this mental function (p> 0.05). The one-type of changes in the function of short-term visual memory was also revealed during a comparative analysis of two groups of athletes with different focuses of the training process. So, in athletes of group A, there is a statistically unreliable nature of changes in indicators of the function of visual memory (p> 0.05) according to the data of the first and second stages of research, whereas in athletes of group B, on the contrary, there is a significant (at p <0.01) improvement of this function. And finally, a comparative analysis of changes in indicators of short-term visual memory in three groups of research subjects indicates that athletes under the impact of training efforts, which are mainly aimed at developing the quality of endurance, recorded significantly better values of the above function compared to athletes who mainly develop speed-strength qualities, as well as with students who

are not involved in sports ($p < 0.01$ in both cases). Thus, the above-mentioned indicates the fact of the specific impact of training efforts of various focuses on the mental functions of the organism, one of which is short-term visual memory. The specificity of the training process, its focus is equally specifically specific features of the development of the function of the visual memory of student-athletes 17-20 years of specialized sports institutions (high schools of physical culture, Olympic Reserve colleges, etc.). So, if under the impact of physical efforts of a speed- strength nature, insignificant changes in the average values of the function of short-term visual memory are observed, while under the impact of efforts on endurance there is a statistically significant improvement in the dynamics of this mental function.

One-type, with student-athletes of speed-strength sports, the nature of changes in the function of visual memory are also students of higher education institutions who do not involve in sports.

Prospects for further research in this direction. It is expected to investigate the impact of training efforts of various focuses on the development of the attention function of student-athletes aged 17–20 years specializing in various sports.

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Methodical system of kettlebell lifting training of cadets during their physical education

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Abstract

Based on a developed methodical system of kettlebell lifting training the influence of kettlebell lifting classes on the physical fitness of cadets was analyzed. The timeliness of the research is defined conditioned by the need to increase the level of physical preparedness of future officers of the Armed Forces of Ukraine to professional activity. The participants of the research: the study included cadets from S. P. Koroliov Zhytomyr Military Institute aged 18–24 years, who entered a higher military educational institution in 2013 (n=119). The duration of the experiment was 5 years. Three groups were formed: EG1 included cadets who were involved in kettlebell lifting section at the institute during their studies (n=29), EG2 included cadets who were involved in the kettlebell lifting section at faculty (n=33), and CG included cadets who were engaged in the current system of physical training (n=57). The study groups were formed from cadets with statistically equivalent levels of preparedness. The number of hours of physical training in all groups was the same and equaled to 12 hours per week. The research was conducted according to the following tests: 100 m - running, pulling up on a cross-beam, 3 km - running, lifting with a coup on a cross-beam, bending the arms on the bars, complex power exercise (dip ups during a minute and sit-ups during a minute), inclination of trunk in sitting position, holding the body in a horizontal position, 5 km - running. The methods of the research are a theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics. Upon completion of the experiment, the cadets in EG1 and EG2 had a significantly better level of physical fitness ($p<0.05–0.001$) than the CG, according to endurance, strength, static endurance of the muscles of the body and flexibility indicators, which showed the effectiveness of kettlebell lifting classes according to the developed methodical system. Conclusions. The model of the methodical system focuses on the personality of future officers who should have a high level of physical and methodical preparedness and health, has fitness competencies for the implementation of physical education and sports in the field of professional activity, and who can

effectively perform the tasks of professional activity. The high level of physical qualities in graduate cadets will ensure the effective execution of assignments in the conditions of their future military-professional (combat) activity.
Keywords: methodical system, kettlebell lifting, physical fitness, cadets

1. Introduction

The modern system of physical education in Ukraine does not meet the biological need of young people in physical activity, does not provide it with the necessary level of health, physical preparedness and working capacity, which negatively affects the quality of protection of the state from external invasion [1, 2, 3]. The main reasons for this are the insignificant amount of physical activity and the lack of effective organization of the process of physical education in educational institutions. Therefore, it is necessary to find effective methods for optimizing the regime of physical training of future officers of the Armed Forces of Ukraine by such means as to ensure the health promotion and the necessary level of physical and professional training of the cadets.

One of the directions of improving the effectiveness of the training of cadets from higher military educational institutions (HMEI) is the implementation of fundamentally new learning technologies that would have a comprehensive impact on physical activity, which should form the knowledge, skills and habits of maintaining health and improving the effectiveness of professional (combat) activity of military servicemen [4, 5, 6, 7].

2. Literature Review

Analysis of literature sources [8, 9, 10, 11, 12, 13] showed that an effective mean of psychophysical training of cadets for future military-professional (combat) activity may be kettlebell lifting, which has such advantages as: lack of significant material costs; inventory compactness; possibility of training in limited space as well as in the open area; possibility of conducting both self-training and simultaneous classes with a large group of people; a wide range of simple and accessible exercises eliminates the possibility of adaptation to the same type of load; opportunity to conduct classes simultaneously with servicemen who have different levels of physical fitness, high efficiency in the development of physical and psychological qualities; prevention of injury.

Theoretical analysis of literature about the problems of physical education of cadets [1, 2, 4, 5, 6, 7] shows that, despite the rather close attention of researchers to this problem, it remains insufficiently studied, especially those aspects which related to the improvement of theoretical and methodical principles of kettlebell lifting training of cadets from HMEI.

The aim of study is to investigate the influence of kettlebell lifting classes, based on the developed methodical system of kettlebell lifting training of cadets, on the level of their physical fitness during their study.

3. Method

3.1. Participants

The study was attended by cadets from S. P. Koroliov Zhytomyr Military Institute aged 18–24 years (n=119). The duration of the experiment is 5 years. To test the effectiveness of the methodical system two experimental (EG1, n=29, EG2, n=33) and control (CG, n=57) groups were formed. EG1 included cadets who during studying process were involved in the kettlebell lifting section of institute (n=29), EG2 included cadets who were involved in the kettlebell lifting section of faculty (n=33), CG included cadets who were engaged in the current system of physical training (n=57). The study groups were formed from cadets (year of admission – 2013) with statistically equivalent levels of preparedness.

The research related to human use has been complied with all the relevant national regulations and institutional policies and has followed the tenets of the World Medical Association (WMA) Declaration of Helsinki – ethical principles for medical research involving human subjects.

3.2. Materials

The research was conducted according to the following tests: 100 m - running, pulling up on a cross-beam, 3 km - running, lifting with a coup on a cross-beam, bending the arms on the bars, complex power exercise (dip ups during a minute and sit-ups during a minute), inclination of trunk in sitting position (flexibility of the back), holding the body in a horizontal position (static endurance of body muscles), 5 km - running.

Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics.
During the researches, the authenticity of the difference between the indices of cadets by means of Student's criterion was determined. The significance for all statistical tests was set at $p<0.05$. All statistical analyses were performed with the SPSS software, version 21, adapted to medical and biological researches.

3.3. Procedure

In this study it was supposed to investigate the influence of kettlebell lifting exercises by the various types of organization of training with cadets on the level of their physical fitness. For this purpose, three groups were formed. The number of hours of physical training in all groups was the same and equaled to 12 hours per week. Distribution of time for physical training: in CG (according to the schedule of the day at the military institute): 4 hours – training sessions, 3 hours – morning physical exercise, 5 hours – sports-mass work (SMW). In EG2 – the same as in CG, but during the hours of SMW cadets were engaged not in the current program, but in kettlebell training in the section of the faculty. In EG1: 3 hours – morning exercise, 9 hours – kettlebell training (4 hours of training sessions and 5 hours of SMW). The main difference between EG1 and EG2 was the goals and tasks that were solved during kettlebell training, and, accordingly, the applied means, methods and loads. The ultimate goal of the classes in EG1 was the preparation of high-level sportsmen (kettlebell lifting was considered as the main means of physical education), in EG2 – the preparation of sportsmen of mass grades (kettlebell lifting was an additional means of physical training of cadets).

4. Results

Taking into account the work of many scientists [1, 2, 3, 4, 6, 12, 15, 16] and the results of our own researches [10, 13, 14], the methodical system of kettlebell lifting training of cadets from HMEI in the process of physical education, which includes target, content, organizational-technological, control-diagnostic components and which is focused on the personality of a future specialist – an officer of the Armed Forces of Ukraine – who has a high level of physical and methodical preparedness, health, and fitness competencies for the implementation of physical education and sports in the field of professional activity, and who can effectively perform official duties, was theoretically substantiated.

The model of the methodical system, which was built on the basis of the concept of the methodical system and on the idea of the integrating all components of the integral system of training the cadet to future activities, was grounded on the methodological, theoretical and practical levels. On the methodological level, the relationships and interaction of scientific approaches to the study of the problem (humanistic, systemic-activity, personality-activity, cultural-system, systemic, person-oriented, competence, innovation, technological) were reflected. On the theoretical level, the system of initial parameters, definitions, and evaluations, which was based on the understanding of the essence, content and structure of the methodical system of kettlebell lifting training of cadets in the process of physical education, was determined. On the practical level, the development of four author's techniques was foreseen: training in the technique of exercises in kettlebell lifting; development of physical qualities; formation of moral-volitional qualities and prevention of traumatism, which together with other components form a methodical system; checking the efficiency of the functioning of the methodical system, which will contribute to the formation of physical culture and recreational competencies.

The main tasks of the methodical system are: to increase the level of physical preparedness of the cadets with emphasis on the development of strength qualities and endurance that are most effective in their future military-professional (combat) activity; to improve the health level and level of morphofunctional development in future officers; to increase the level of components of physical, functional and technical training of cadets meaningfully important for the training of kettlebell lifting; to increase the level of methodological preparedness of future officers in the field of physical education and special physical training (the theoretical knowledge, skills and abilities of the organization and conducting sports and sport mass work and recreational activities in future activities); to increase the mental working capacity, emotional state and professional psychological qualities of cadets and, consequently, to improve the educational success; to improve the knowledge, skills and abilities regarding the use of physical education and sports for the prevention of injuries in the process of future professional activities, as well as in physical training and sport lessons; to form the need for future officers and the positive attitude towards systematic physical exercise and sports.

The main functions of the methodical system are: educational, organizational, recreational, training,

preventive, and restorative. The implementation of the methodical system was carried out in 2013–2018 during three stages: I stage – studying of cadets ion the 1st course; II stage – the period of studying of cadets in the 2nd course; III stage – studying of cadets in the 3–5th courses. The content of each stage of the methodical system varied depending on the main pedagogical tasks and was determined by the ratio of means, methods, magnitude and direction of physical load, types of training.

According to the methodical system three main groups of methods were used: methods aimed at mastering of knowledge; methods aimed at mastering of motor skills and abilities; methods aimed primarily at the development of physical qualities. In the process of constructing the methodical system, the task was to minimize the separation of cadets from the educational process in HMEI, therefore, kettlebell classes were conducted within the limits of the existing forms of physical education: training sessions and SMW. Among the methods of organizing the cadets in classes according to the methodical system: group, frontal, current, circular methods. Kettlebell lifting classes, based on the developed methodical system of kettlebell lifting training of cadets, include general preparation, auxiliary, special-preparatory and classical exercises with kettlebells. Dosage and load regulation at the stages of the methodical system were by change in the volumes and intensity of facilities, individual classes, cycles, magnitude and directional of loads, taking into account the individual capabilities of each cadet, level of its preparedness, weight category and determined by the peculiarities of the application and order of the combination of such components as: the type, the duration and nature of individual exercises, the number of approaches and occupations, the intensity of work during their execution (rate of movements, speed of their execution, time) etc.

The level of physical fitness is determined by the main criteria of readiness of graduate cadets from physical education for future military-professional activity.

The analysis of results in 100 m - running showed that the level of development of speed qualities of the cadets in all three groups in the 1–3rd years of study did not credibly differ from each other ($p>0.05$). In the 4th year of study the results of CG cadets were significantly better than in EG1 cadets for 0.29 sec, and in the 5th year of study the level of development of speed qualities in CG cadets (13,73 sec) was found to be significantly better than in EG1 (14.08 sec) and in EG2 (13.97 sec) for 0.35 sec and 0.24 sec ($p<0.01$; $p<0.05$). Instead, the results in 100 m - running in the 4th and 5th years of study in EG1 and EG2 do not significantly differ ($p>0.05$) (Table 1). Analysis of the dynamics of the results in 100 m - running during the pedagogical experiment showed that in all three groups of cadets the level of speed qualities improved: in EG1 – for 0.48 sec ($p<0.01$), in EG2 – for 0.67 sec ($p<0.01$), in CG – for 0.86 sec ($p<0.001$). But, in EG1 and EG2 the level of speed qualities in the all years of study is rated as a «good» grade, then in CG in the senior academic years – as an «excellent» grade (Table 1).

Table 1. *Dynamics of physical fitness indices (100 m - running, pulling up on a cross-beam, 3 km - running) among cadets of EG1, EG2 and CG during the pedagogical experiment (X±m).*

Stages of experiment	EG1 (n=29)	EG2 (n=33)	CG (n=14)	Statistical significance		
				p1–p2	p2–p3	p1–p3
100 m - running, sec						
1st year	14.56±0.13	14.64±0.12	14.59±0.09	>0.05	>0,05	>0,05
2nd year	14.39±0.12	14.42±0.11	14.25±0.09	>0.05	>0,05	>0,05
3rd year	14.21±0.11	14.17±0.11	14.02±0.08	>0.05	>0,05	>0,05
4th year	14.13±0.10	14.05±0.10	13.84±0.07	>0.05	>0,05	<0,05
5th year	14.08±0.09	13.97±0.09	13.73±0.07	>0.05	<0,05	<0,01
p (1–5)	<0.01	<0.001	<0.001			
Pulling up on a cross-beam, times						
1st year	12.1±0.71	12.5±0.67	12.3±0.52	>0.05	>0,05	>0,05
2nd year	16.9±0.68	15.2±0.64	14.6±0.51	>0.05	>0,05	<0,05
3rd year	18.8±0.64	17.6±0.62	16.3±0.49	>0.05	>0,05	<0,01
4th year	21.5±0.61	19.9±0.59	17.2±0.45	>0.05	<0,01	<0,001
5th year	22.7±0.59	21.3±0.57	18.1±0.47	>0.05	<0,001	<0,001
p (1–5)	<0.001	<0.001	<0.001			
3 km - running, sec						
1st year	792.4±8.96	800.9±8.47	797.8±6.78	>0.05	>0,05	>0,05
2nd year	733.8±8.15	749.2±8.02	754.9±6.43	>0.05	>0,05	<0,05

3rd year	703.3±7.56	729.8±7.32	734.1±6.31	<0.05	>0,05	<0,01
4th year	686.6±6.37	707.9±6.51	719.8±6.18	<0.05	>0,05	<0,01
5th year	673.9±6.03	691.7±6.24	714.2±5.94	<0.05	<0,05	<0,001
p (1–5)	<0.001	<0.001	<0.001			

The examination of results in pulling up on a cross-beam shows that only in the 1st year of study the difference between the indices of the studied groups was not detected (p> 0.05). In the 2nd and 3rd years of study the results of cadets of the EG1 were significantly better than in the CG for 2.3 times (p<0.05) and 2.5 times (p<0.01). And at the 4th and 5th years of study the indexes of cadets both of experimental groups (EG1 and EG2) were significantly better than in the CG (p <0.01, 0.001), which indicates the effectiveness of the training by the methodical system for development of strength qualities in cadets. Instead, the results of EG1 and EG2 during the whole experiment do not significantly differ (p>0.05) (Table 1). The analysis of the dynamics of results in pulling up during the experiment indicates that all groups have significantly improved the results (p<0.001), but in the CG the difference between cadets at the end and at the beginning of the study is 5.8 times, in EG1 – 8.8 times, and in EG2 – 10.6 times, which testifies to the superiority of occupations according to the experimental system than in the current one.

The greatest efficiency of the methodical system of kettlebell lifting training of cadets was revealed during the research of results of 3 km - running. In the 1st year of study the results of cadets of the EG1, EG2 and CG were substantially the same (p>0.05). In the 2nd year of study in the EG1 a significantly better level of endurance development than in the CG was found (21.1 sec, p<0.05). In the 3rd and 4th years of study the difference between the results of EG1 and CG increased to 30.8 sec and 33.2 sec (p<0.01), besides in these years of study a significant difference was found between the indicators of EG1 and EG2 (p<0.05; 0.01). In the 5th year of study the best result was recorded in EG1 (11 min 14 sec) which for 17.8 sec is significantly better than in EG2 (11 min 32 sec) (p<0.05) and for 40.3 sec than in CG (11 min 54 sec) (p<0.001). The difference between EG2 and CG at the end of the experiment is also significant and is 22.5 sec (p<0.05) (Table 1). The positive influence of occupations by the methodological system on the level of development of endurance is also confirmed by the increasing the results of 3 km – running during the period of the pedagogical experiment – the largest difference between the initial and final data of the study was found in the EG1, it is 1 min 58 sec (p<0.001). In the EG2 the level of endurance improved for 1 min 49 sec (p<0.001), and in the CG – for 1 min 24 sec (p<0.001). It indicates a more pronounced positive effect of methodical system of kettlebell lifting training of cadets compared with the current program of physical education.

The analysis of the results of cadets in the lifting with a coup on a cross-beam showed that from the 2nd year of study the results of cadets of the EG1 and EG2 are significantly better than the results of cadets of the CG (p<0.01; 0.001) (Table 2). At the 5th year of study the difference between the results of the EG1, EG2 and CG was the greatest (6.7 times and 5.5 times (p<0.001). During the experiment the results in this exercise significantly increased in all groups of cadets (p<0.001), but if in the CG the difference between the initial and final data of the experiment is 3.5 times, then in EG2 – 8.8 times and in EG1 – 10.3 times.

Table 2. *Dynamics of physical fitness indices (lifting with a coup on a cross-beam, bending the arms on the bars, complex power exercise) among cadets of EG1, EG2 and CG during the pedagogical experiment (X±m).*

Stages of experiment	EG1 (n=29)	EG2 (n=33)	CG (n=14)	Statistical significance		
				p1-p2	p2-p3	p1-p3
Lifting with a coup on a cross-beam, times						
1st year	4.8±0.70	5.1±0.65	4.9±0.49	>0.05	>0,05	>0,05
2nd year	9.1±0.69	8.5±0.62	6.2±0.47	>0.05	<0,01	<0,01
3rd year	11.7±0.68	10.9±0.66	7.1±0.54	>0.05	<0,001	<0,001
4th year	13.2±0.68	12.2±0.64	7.6±0.52	>0.05	<0,001	<0,001
5th year	15.1±0.66	13.9±0.63	8.4±0.55	>0.05	<0,001	<0,001
p (1–5)	<0.001	<0.001	<0.001			
Bending the arms on the bars, times						
1st year	14.5±1.06	14.8±0.98	15.1±0.81	>0.05	>0,05	>0,05
2nd year	23.2±1.12	19.7±1.04	16.9±0.85	>0.05	<0,05	<0,01
3rd year	29.4±1.33	26.6±1.15	19.3±0.90	>0.05	<0,001	<0,001
4th year	34.6±1.23	31.7±1.19	22.1±0.96	>0.05	<0,001	<0,001

5th year	38.1±1.31	35.4±1.23	25.2±1.02	>0.05	<0,001	<0,001
p (1–5)	<0.001	<0.001	<0.001			
Complex power exercise, times						
1st year	47.8±1.34	46.4±1.27	47.2±1.04	>0.05	>0,05	>0,05
2nd year	60.2±1.43	58.5±1.34	55.3±1.32	>0.05	>0,05	<0,51
3rd year	68.9±1.52	67.1±1.42	60.1±1.49	>0.05	<0,01	<0,001
4th year	77.5±1.61	74.8±1.48	61.9±1.53	>0.05	<0,001	<0,001
5th year	81.4±1.69	79.9±1.53	63.8±1.61	>0.05	<0,001	<0,001
p (1–5)	<0.001	<0.001	<0.001			

The analysis of the dynamics of the results of cadets in the bending the arms on the bars and complex power exercise showed a similar trend to the lifting with a coup on a cross-beam in the period of the experiment – the absence of a significant difference between the results of cadets of the studied groups in the 1st year ($p>0.05$) and a significant prevalence of strength indicators for cadets EG1 and EG2 in 2nd – 5th years of study ($p<0.001$) (Table 2). The highest results in these exercises were recorded in the EG1 in the 5th year of study (38.1 times in bending the arms on bars and 81.4 times in complex power exercise), but they are not significantly different from the results of cadets EG2 (34.4 times and 79.9 times) ($p>0.05$). During the study the level of strength qualities in the cadets of all groups has improved: in the bending the arms on the bars in the CG – for 10.1 times, in EG2 – for 20.6 times, in EG1 – for 23.6 times ($p<0.001$); in complex power exercise in CG – for 16.6 times, in EG2 – for 33.5 times, in EG1 – for 33.6 times ($p<0.001$).

The study of the level of development of flexibility in cadets shows a low level of development of this quality in the majority of cadets of the three groups at the beginning of the experiment – the average results in the inclination of trunk in sitting position in the 1st year of study do not differ significantly ($p>0.05$). The positive effect of the methodical system of kettlebell lifting training is already observed on the 2nd year of study: the indicators of the EG1 and EG2 are significantly better than in the CG for 4.8 sm ($p<0.001$) and 2.7 sm ($p<0.01$) (Table. 3). At the senior courses the difference between the results of the experimental and control groups only increases and at the end of the experiment is 8.4 sm ($p<0.001$) and 6.6 sm ($p<0.001$). Starting from the 2nd year of study, there is a significant difference between the flexibility indicators of the EG1 and EG2 – the results of EG1 are similar to those in EG2 for 1.8–2.8 sm ($p <0.05–0.001$). During the pedagogical experiment the level of flexibility in all groups has significantly improved ($p<0,001$) – the difference between the indicators at the beginning and at the end of the study in CG is 5.3 sm, in EG2 – 11.5 sm, in EG1 – 13.5 sm. This study has shown a significant advantage of kettlebell lifting training by the methodical system in comparison with the current program of physical education.

Table 3. *Dynamics of physical fitness indices (inclination of trunk in sitting position, holding the body in a horizontal position, 5 km - running) among cadets of EG1, EG2 and CG during the pedagogical experiment (X±m).*

Stages of experiment	EG1 (n=29)	EG2 (n=33)	CG (n=14)	Statistical significance		
				p1-p2	p2-p3	p1-p3
Inclination of trunk in sitting position, sm						
1st year	6.1±0.65	6.3±0.59	5.9±0.41	>0.05	>0.05	>0.05
2nd year	11.9±0.63	9.8±0.57	7.1±0.45	<0.05	<0.01	<0.001
3rd year	16.5±0.61	14.3±0.55	9.0±0.49	<0.05	<0.001	<0.001
4th year	18.1±0.58	15.3±0.56	10.6±0.56	<0.01	<0.001	<0.001
5th year	19.6±0.56	17.8±0.54	11.2±0.59	<0.05	<0.001	<0.001
p (1–5)	<0.001	<0.001	<0.001			
Holding the body in a horizontal position, sec						
1st year	97.4±3.75	100.7±3.61	103.1±2.66	>0.05	>0.05	>0.05
2nd year	118.9±3.92	121.8±3.85	112.4±2.91	>0.05	>0.05	>0.05
3rd year	167.2±4.17	151.3±4.06	127.9±3.25	<0.05	<0.001	<0.001
4th year	212.6±4.46	189.2±4.21	139.1±3.58	<0.01	<0.001	<0.001
5th year	234.1±4.68	216.2±4.37	151.3±3.89	<0.01	<0.001	<0.001
p (1–5)	<0.001	<0.001	<0.001			
5 km - running, sec						
1st year	1408.1±8.22	1411.3±8.03	1398.5±6.43	>0.05	>0.05	>0.05

2nd year	1290.8±8.13	1311.1±7.99	1353.4±7.12	>0.05	>0.05	<0.51
3rd year	1255.7±8.08	1278.9±8.05	1316.2±7.95	<0.05	<0.01	<0.001
4th year	1212.3±8.06	1242.4±7.96	1288.3±8.62	<0.05	<0.001	<0.001
5th year	1182.3±7.98	1218.4±7.94	1256.8±9.35	<0.01	<0.001	<0.001
p (1–5)	<0.001	<0.001	<0.001			

The analysis of the results in holding the body in a horizontal position showed that at 1st and 2nd years of study the results of studied groups did not differ significantly ($p>0.05$). From 3rd to 5th years of study a significant advantage of the results of cadets of the EG1 and EG2 above the results of the CG was set ($p<0.05–0.001$). The greatest effect of the kettlebell lifting training by the methodical system for the development of static endurance of the back muscles was found at the end of the experiment, where in EG1 the average result in this exercise is the best (3 min 54 sec) and significantly better than in the EG2 (3 min 36 sec) and CG (2 min 31 sec) for 17.9 sec and 1 min 23 sec respectively ($p<0.01$; $p<0.001$). The difference between EG2 and CG is also reliable and is 1 min 05 sec ($p<0.001$). During the study the results of the cadets of all three groups have significantly improved ($p<0.001$), but in the cadets of CG the difference between output and ending data is 48.2 sec, then in EG2 and EG1 the difference is significantly greater (1 min 56 sec and 2 min 17 sec respectively), which confirms the superiority of the methodical system.

The analysis of the results in 5 km - running showed a similar trend to the 3 km - running – in the 2nd year of study the significantly better level of endurance in cadets EG1 and EG2 than in CG was set ($p<0.05–0.001$). And the value the difference increased to the 5th year of study to 1 min 15 sec and 38.4 sec respectively. Since the 3rd year of study the results in EG1 have been significantly improved not only in comparison with CG, but also with EG2. At the end of the pedagogical experiment the difference between EG1 and EG2 was the highest and was 36.1 sec ($p<0.01$). Analysis of the dynamics of the results in 5 km - running during the experiment indicates the improvement of the level of endurance in all groups ($p<0.001$), but the largest increase was recorded in EG1 – 3 min 46 sec, which indicates the positive influence of exercises with kettlebells by the methodical system on the level of development of endurance of the cadets.

5. Discussion and Conclusion

Kettlebell lifting, as one of the simplest and most available military means of physical training, can have a positive effect on the physical development and fitness of future officers, both in the process of their training in HMEI and in the process of future service [8, 9, 11, 12].The scientists [17, 18] mention that kettlebell lifting place high demands to the cardiorespiratory system of cadets and that the improvement of the results in kettlebell lifting correlates with the indicators of step-test, timed inspiratory capacity, 3 km race that proves high level of endurance development of the kettlebell lifters. The authors mention that systematic kettlebell lifting training makes the volume of cardiac muscle and blood vessels larger; changes blood composition (increase the quantity of erythrocytes and hemoglobin) [19, 20]. Studies of many scientists [15, 17, 18, 20] have shown that in the process of kettlebell lifting, there is a significant decrease in the heart rate in rest, stabilization of blood pressure and body mass index. As a result of kettlebell exercises, the musculoskeletal system strengthens, the circumference of the chest increases, the vital capacity increases; the activity of the basic systems of an organism is improved.

Our researches of physical fitness of cadets of the experimental and control groups have shown the significant influence of exercises with kettlebells by the developed methodical system on the level of development of the basic physical qualities of future officers, compared with the current system of physical education. The most pronounced positive effect of kettlebell lifting classes was found on the development of endurance, strength qualities, static endurance of the muscles of the body and flexibility.

At the end of the pedagogical experiment the level of physical qualities (endurance, strength qualities, static endurance of the muscles of the body, flexibility) of the cadets of EG1 and EG2 in comparison with the CG was determined to be the best ($p <0.05–0.001$) according to the results in such tests: pulling up on a cross-beam – for 4.6 times (20.3%) and 3.2 times (15.1%), 3 km - running – for 40.3 sec (5.6%) and 22.5 sec (3.2%), lifting with a coup on a cross-beam – for 6.7 times (44.4%) and 5.5 times (39.6%), bending the arms on the bars – for 12.9 times (33.9%) and 10.2 times (71.2%), complex power exercise – for 17.6 times (21.6%) and 16.1 times (20.2%), the inclination of trunk in sitting position – for 8.4 cm (42.9%) and 6.6 cm (37.1%), holding the body in a horizontal position – for 1 min 23 sec (35.4%) and 1 min 05 sec (30.1%), 5 km - running – for 1 min 15 sec (5.2%) and 38.4 s (3.1%). At the same time, for the majority of tests, no significant difference was found between the indicators of EG1 and EG2 ($p>0.05$) that indicates the positive effect of exercises with kettlebells

in both variants of organization of classes according to the methodical system. The high level of these physical qualities in graduate cadets will ensure the effective execution of assignments in the conditions of their future military-professional (combat) activity.

Conclusions

The model of the methodical system combines the components of pedagogical process and focuses on the personality of future officers who should have a high level of physical and methodical preparedness and health, has fitness competencies for the implementation of physical education and sports in the field of professional activity, and who can effectively perform the tasks of military-professional (combat) activity. Experimental verification of the effectiveness of the methodical system of kettlebell lifting training of cadets in the process of physical education showed its more positive effect, compared with the current system of physical education, to improve the indicators of physical preparedness of cadets – at the end of the experiment in cadets of the EG1 and EG2 recorded significantly better ($p<0.05–0.001$) level of development of endurance, strength qualities, static endurance of the muscles of the body, flexibility.

Prospects for further research in this direction. The dynamics of physical fitness of officers, which going info kettlebell lifting at HMEI, during their professional activity is expected to be examined.

Conflict of interest. The author declares that there is no conflict of interests.

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Effects of Normobaric Hypoxia on Sensory-Motor Responses in Elite Esports

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Abstract

Objective of the study was to analyze effects of intermittent normobaric hypoxia (INH) on the elite videogame players' sensory-motor functionality. Sampled for the study were 14 professional videogame competitors specialized in Action event whose normal and post- intermittent-normobaric-hypoxia mental/ physiological responses were rated by laboratory experiment using hypoxic (10% oxygen) gas mix for the fast intellectual responsiveness and thinking capacity tests, hand tapping test and the flash mergence/ discrimination tests. The controlled intermittent normobaric hypoxia was found to increase the error rates in the angles/ distances discrimination ability rating tests; contribute to the anxiety and stress rates; and speed up fatigue in the tapping test. It was also found that the intermittent normobaric hypoxia is of a delayed detrimental effect on the players' intellectual working capacity. The controlled intermittent normobaric hypoxia was tested to be of delayed depression effect on the interval intellectual working capacity, thinking ability and overall performance albeit may still be beneficial for routine operations that require responses to simple signals.

Keywords: normobaric hypoxic training, esport competitors, esport competitors, sensory-motor functions

1. Introduction

Growing competitiveness and stressors in the modern societies associated with unfavorable climatic and other negative environmental developments are increasingly stressful for the human life and operations and, hence, are rated among the core issues in modern physiology [1], with effects of hypoxic conditions on the human performance being ranked among the top-priority study subjects by the biomedical research communities [5] as demonstrated by quite a few study reports [1, 2, 3, 4]. Hypoxia is commonly described as the standard pathological response largely due to the mitochondrial ferment dysfunctions in the oxygen-deficient environments [6]. Normal oxygen supply is believed to be critical for good performance, energy generation and normal functionality of the respiratory/ blood circulation/ biological oxidation systems. Operational dysfunctions in the above bodily systems may be caused by endogenous hypoxia [7] with a wide variety of triggering mechanisms. External respiration disorders, for instance, may evoke respiratory/ breathing hypoxia [8, 9]; whilst depressed blood circulation function may result in circulatory hypoxia. Severe reductions in erythrocyte/ hemoglobin activity may cause hemic hypoxia. Oxygen consumption related disorders in the biological oxidation processes may provoke tissue hypoxia [10] due to the short supply of oxygen needed to maintain the metabolic transformations in the working cells. Training and competitive stressors in modern sports often evoke workload-specific hypoxia; with the intermittent hypoxic trainings (IHT) being widely used at the same time by the elite sport training systems among the other ergogenic tools to improve the athletes' physical fitness [11]. Effects of intermittent normobaric hypoxia on the intellectual working capacity, however, are still underexplored in many aspects. We have made an attempt to study and analyze effects of normobaric hypoxia on the sensory-motor functionality in elite videogame players.

Objective of the study was to analyze effects of intermittent normobaric hypoxia (INH) on the elite videogame players' sensory-motor functionality.

2. Methods

The study was run at the N.I. Volkov Biochemistry and Bioenergy Sub-department of Russian State University of Physical Education, Sport, Youth and Tourism (SCOLIPE, Moscow). Sampled for the study were 14 professional videogame competitors specialized in Action event who gave their informed consent for the experiments. It should be mentioned that the Action event is highly demanding to the player's

response rates, tactical thinking and decision-making efficiency rates and attention focusing skills – that were rated by the following tests:

Automatic intellectual response rating tests: (1) Simple sensory-motor hand response to flash test (s); (2) Simple sensory-motor hand response to beep test (s); (3) Response to moving object test (s); and (4) Choice hand response test (s).

Motor function rating tapping test, with the subject tested by the 60-second maximal-frequency clicks, followed by the 10-second interval performance ratings and analysis.

Thinking capacity rating tests: (1) Individual minute counting test, with the subject required to count one minute in mind versus the actual time count; (2) Angular rotation discrimination capacity test, with the subject offered a 2-dimensional object (a sort of a clock face with two hands rotating around the axis in the middle of the screen) to memorize the rotation rates and match them later with one of four rotating images; (3) Segment discrimination capacity test, with the subject required to measure off the pop-up segments on an arbitrary scale; (4) Segment quantifying capacity test, with the subject required to measure off some segments in arbitrary units; (5) Pop-up angles quantifying test, with the subject required to quantify the pop-up angles in standard degrees; (6) Angles matching test, with the subject required to memorize a pop-up geometric object to later match its angles with one of four options; (7) 3D angular rotation discrimination capacity rating test, with the subject required to rate successively rotation of a 3D object around X, Y and Z axes in the Cartesian coordinate system (with the rotation ranges varying within the range of 5-300 degrees) and enter the scores in the relevant boxes. In each of the above tests, individual error rates were automatically computed and analyzed.

Other tests: (1) Critical flash fusion test, with the subject required to discriminate the growing-intensity visual signals (flashes) generated by the test system to mark the frequency point ((fusion point frequency rate) when he/she is further unable to discriminate the flashes; (2) Critical flash discrimination capacity test, with the subject required to discriminate the falling-pace visual signals (flashes) generated by the test system to mark the frequency point when he/she starts discriminating the flashes (the discrimination point frequency rate);

The study was programmed to: (1) Obtain the pre-experimental (background) test data; (2) Test effects of the intermittent normobaric hypoxia (caused by 10% oxygen gas mix) using the above standard laboratory tests; and (3) Obtain the post-intermittent-normobaric-hypoxia test rates.

3. Statistical results

The competitive functionality and working capacity rating test data and analyses are given in four tables hereunder. We gave a special priority in our analyses to the dominant hand response test indices; thinking capacity test indices; visual analyzer system test indices; and dominant hand pace control capacity indices: see Table 1.

Table 1. Videogame players' dominant hand response test indices, s

Test	**Background test index, mean ±SD**	**INH-specific test index, mean ±SD**	**Variation range mean ±SD**
Hand response to flash	0,24±0,03	0,19±0,03	0,05±0,02**
Hand response to beep	0,59±0,13	0,43±0,08	0,15±0,10*
Response to moving object	0,08±0,03	0,06±0,05	0,01±0,03
Choice response	0,37±0,03	0,29±0,05	0,09±0,03**

*Note: significant difference with **p<0.05; * p<0.01*

The above test data were interpreted as indicative of INH generally speeding up the responses to the key signals versus the background (pre-experimental) response rates. Given in Table 2 hereunder are the thinking capacity test rates.

Table 2. Videogame players' thinking capacity test indices

Test	Background test index, mean ±SD	INH-specific test index, mean ±SD	Variation range mean ±SD
Individual minute counting, s	54,00±9,26	50,88±9,20	3,13±1,44*
Angular rotation discrimination capacity test error, %	0,00±0,00	4,15±4,86	-1,45±4,86
Segment discrimination capacity test error, %	8,93±7,66	20,18±16,53	-2,45±12,81
Segment quantifying capacity test error, %	9,25±5,27	16,93±12,59	-7,68±12,55
Pop-up angles quantifying test error, %	12,35±9,20	18,25±15,46	-5,90±15,17
3D angular rotation discrimination capacity test error, %	4,58±4,67	1,08±2,15	3,50±3,42

*Note: significant difference with **p<0.05; * p<0.01*

As demonstrated by the above test data, the intermittent normobaric hypoxia tends to increase the error rates in the segments/ angles quantifying capacity tests; plus increase the errors in the time assessment (minute counting) test – that may be interpreted as indicative of the growing intermittent-normobaric-hypoxia-induced anxiety and stress. Given in Table 3 hereunder are the critical video signal (flash) discrimination capacity test data (flash fusion and discrimination frequency points).

Table 3. Critical flash discrimination capacity test data, Hz

Test	Background test index, mean ±SD	INH-specific test index, mean ±SD	Variation range mean ±SD
Flash fusion frequency point, right eye	30,25±4,69	27,90±5,88	2,80±13,69
Flash discrimination frequency point, right eye	34,43±7,70	35,53±9,49	-0,75±17,63
Flash fusion frequency point, left eye	29,83±6,14	26,40±5,69	2,40±1,98*
Flash discrimination frequency point, left eye	35,65±8,74	36,28±9,19	-4,40±1,47

*Note: significant difference with **p<0.05; * p<0.01*

On the whole, the visual/ CNS system functionality rates obtained by the data reception/ processing tests may be interpreted as indicative of the intermittent-normobaric-hypoxia-specific depression of the ionic transmission and working capacity associated with a faster fatigue. We made a special emphasis in the study on the dominant hand pace rating test data (given in Table 4 hereunder) since success in the modern videogame sports largely depends on the relevant qualities and skills.

Table 4. Dominant hand pace rating 60s test data

10-second test intervals	*Background test index, mean ±SD*	*INH-specific test index, mean ±SD*	*Variation range mean ±SD*
First	75,25±9,00	72,25±7,50	3,00±4,24
Second	74,00±12,7	70,75±6,65	3,25±8,66
Third	71,00±11,9	71,75±10,56	-0,75±8,66
Fourth	67,00±9,02	66,00±7,16	1,00±6,98
Fifth	66,50±6,61	61,50±5,97	5,00±6,22

Sixth	67,00±10,9	62,75±7,37	4,25±10,90

Given on Figure 1 hereunder is the intermittent-normobaric-hypoxia-induced depression of the dominant hand pace rating tapping test

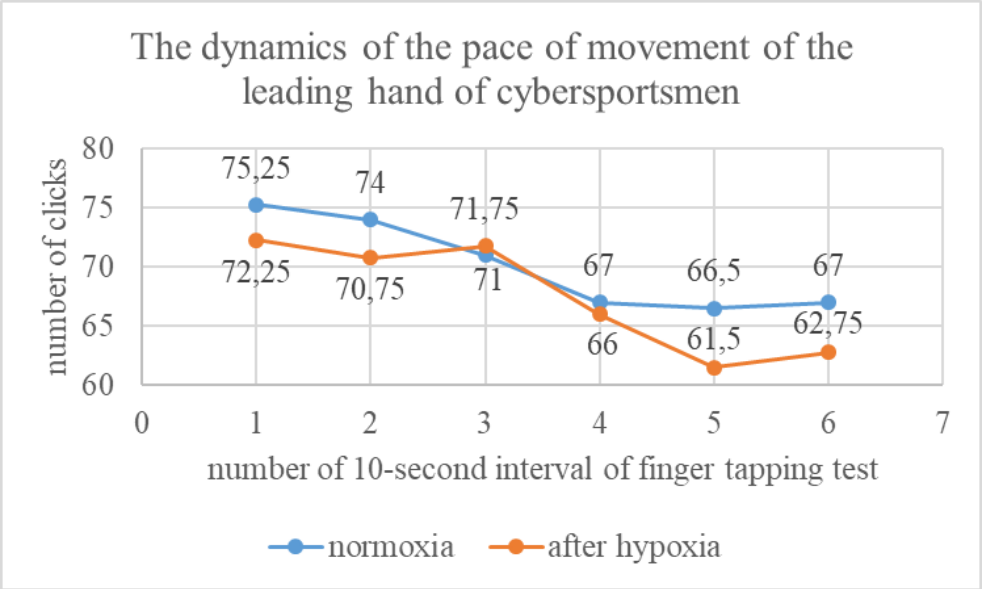


Figure 1. Intermittent-normobaric-hypoxia-induced depression of the dominant hand pace
Clicks
10-second tapping test intervals
Background Post-INH

On the whole, the tapping tests showed the functionality depressions in every test interval versus virtually no changes to the CNS functionality rates, with the test data indicative of the delayed intermittent-normobaric-hypoxia-specific depression of the videogame players' working capacity. It may be concluded, therefore, that the oxygen-deficient environments are detrimental to the players' intellectual capacity albeit the moderate depression of the thinking abilities by the hypoxic environment may be beneficial for the semi-automatic intellectual operations.

4. Discussion

The test data and analyses demonstrate that, in spite the relatively high functionality and specific physical fitness rates, the players exposed to extreme normobaric hypoxic conditions are tested with delayed intellectual/ thinking capacity depression i.e. sags in the interval working capacity rates; albeit the intermittent-normobaric-hypoxia may still be beneficial for semi-automatic responses to simple signals. This means that the players are exposed to negative intermittent-normobaric-hypoxia-related effects on the sensory-motor functions and working capacity on the one hand; but may still operate quite efficiently and effectively in such conditions on the other hand. It should be mentioned that the global research is still in need of detailed studies of the hypoxic training effects on the videogame players' intellectual working capacity. Despite some fragmented studies of the relevant matters, they mostly relate to therapeutic and veterinarian services, and their findings appear rather contradictory in facts.

Hypoxia was reported to inhibit inter-neurocyte contacts and even kill neuricytes en masse. Some other studies have demonstrated intermittent hypoxic trainings being beneficial for the intellectual working capacity. Thus S.N. Basovich [12] gave extensive evidence of the beneficial effects of hypoxic trainings on the mental disorders origins and healing, with the early modest hypoxia reported to facilitate the brain development process and thereby improve the intellectual capacities. Regular intermittent hypobaric hypoxic training model tested on white rats was found to spur up the protein synthesizing process and RNA concentration in brain – and thereby improve the conditioned passive-avoidance reflexes and tolerance to

electric shocks [13]. Furthermore, modest intermittent hypoxic training was tested (on mice) to improve the spatial learning and memorizing qualities in the post-natal development process [14]. The authors found that the spine-associated Rap-specific GTPase-activating protein (indispensable for the synaptic plasticity) generation process is boosted by intermittent hypoxic trainings.

One more study team [15] reported positive effects of an intermittent hypoxic preconditioning model on the spatial cognitive abilities in mice, with the tolerance time found to gradually grow with the intermittent hypoxic training intervals. It was also found [16] that the short-time interval neonatal hypoxic training facilitates progress of the cognitive functions and improves the brain tissue formation in adult rats. On the other hand, a few studies [17, 18] reported motor activity depressions and anxiety growths in descendents of the rats exposed to antenatal intermittent-normobaric-hypoxia in the early growth period. The same author [19] found that the interval normobaric hypoxic training suppresses the antioxidant defense system and activates the glutamine acid dissociation process to increase the anxiety and emotional tension rates and behavioral deviation risks.

Our study has found hypoxic trainings being mostly of depressing effect on the videogame players' intellectual working capacity albeit the sample tested widely different in responses to unrepeated hypoxia due to apparently different individual hypoxic tolerance rates. However, the finding on the negative effects of hypoxic training on intellectual working capacity cannot be considered final since it needs to be supported by further detailed studies of the relevant neurochemical processes.

5. Conclusion

The study data and analyses found the intermittent normobaric hypoxia being of a delayed depressing effect on the videogame players' intellectual working capacity on the whole and interval fatigue in particular; albeit may still be beneficial for operations that require semi-automatic responses to simple signals.

Asknowledgement

The authors appreciate support from the Russian State University of Physical Education, Sport, Youth and Tourism (SCOLIPE, Moscow) management and the sampled videogame players who kindly agreed to participate in the test program.

Conflict of Interest

All authors confirms that there is no conflict of interest with this study or authors.

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Physical Rehabilitation after Intramedullary Osteosynthesis in Athletes with Tibia Shaft Fractures

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Abstract

The results of dynamics of goniometry indicators in the knee joint, myometrics of the quadriceps femoris, assessments of sensorimotor reactions, as well as the results of jump tests at the time of final testing are presented. The contingent of 56 athletes, divided into the main and control groups, equal in numbers and research indicators. The athletes of the control group were engaged in the basic program of physical rehabilitation, developed for patients with tibia shaft fractures from the Institute of Traumatology and Orthopedics of the National Academy of Medical Sciences of Ukraine. The athletes of the main group were engaged in the comprehensive program of physical rehabilitation, develop by us and included a basic program, expanded at the expense of means and methods, aimed at restoring special physical capacity, specific physical qualities, motor skills and capacities. At the end of the experiment a comparative analysis of the data obtained in the main and control groups was conducted. It should be noted that the results of the analysis of motor function of injured lower extremities confirmed the better effectiveness of the developed program. This is evidenced by statistically significant better quantitative changes in the studied indicators of athletes in the main group.

Keywords: physical rehabilitation, lower extremities, athletes; recovery, functioning, physical loads, physical exercises, functional abilities.

Introduction

Specialized training and competitive loads in modern sports of higher achievements cause functional disorders of the musculoskeletal system, which, due to the lack of their targeted detection for a long time, may remain undiagnosed, creating morphological functional basis for both acute and chronic injuries, and for the development of visceral pathology (Roy et al., 2011; Tychilov et al., 2013; Zazirnyi, 2015).

Data from modern studies indicate that athletes in various sports most often damage the lower extremities (Koriahin, 2017; Platonov, 2015; Valeev, 2009). In this case, the frequency of tibia fractures is from 23 to 35.5% of the total number of injuries and from 18 to 61.5% among all fractures of the long tubular bones of the extremities (Alfimov et al., 2011; Doroshenko, 2015). Shaft fractures of tibia are most commonly found, which accounting for 84,4 to 87,9 % (Medvedev, 2010).

The development of modern surgical techniques to restore the integrity of the tibia suffered from fracture with the use of blocking intramedullary osteosynthesis allows precisely and consistently to match bone fragments. However, the complexity and duration of restorative treatment of athletes, the lack of the development of physical rehabilitation programs aimed at restoring sports readiness for training and competitive loads, force to activate the search for more effective solutions (Tretyakova, 2013).

General approaches to the physical rehabilitation of athletes with tibia shaft fractures are similar to recovery of non-sports patients. However, the specifics of sports activities require the development of qualitatively other comprehensive programs of physical rehabilitation (Nikanorov, 2015; Platonov, 2015; Vitomskyi, 2017).

Existing programs of physical rehabilitation today are not of a comprehensive nature; only some stages and periods of the recovery process are fully developed. The most fully developed issues are the recovery process of athletes with tibia shaft fractures at the in-patient stage of rehabilitation (Dvorak, 2009; Evans, 2013).

The components of post-clinical stages are less developed, which is especially important for the return of injured athletes to a full range of training and competitive activities.

These provisions are of great scientific and practical interest, actualize the search for new solutions to the recovery process and require the development of an effective comprehensive program of physical rehabilitation of athletes with tibia shaft fractures.

Material and methods

General Background

The work was carried out in accordance with the Plan of scientific research work of physical rehabilitation department of NUUPES and "Consolidated plan of scientific research work in the sphere of physical culture and sport for 2011-2015" of Ministry of Ukraine for Family, Youth and Sports on the theme 4.4. "Improvement of organizational and methodological bases of programming of the process of physical rehabilitation at dysfunctional disorders in different systems of the human body", state registration number 0111U001737, in accordance with the "Scientific research work Plan of NUUPES for 2016–2020 the theme 4.4. "Organizational and theoretical-methodical bases of physical rehabilitation of persons of different nosological, professional and age groups", state registration number 0116U001609.

Research Sample

The research was conducted on the basis of the Department of Traumatology and Orthopedics of the City Clinical Hospital No. 7 in Kyiv, the Institute of Traumatology and Orthopedics of the National Academy of Medical Sciences of Ukraine, and the Center for Sport Rehabilitation "Olimpiyskiy".

The contingent of the subjects was 56 athletes with tibia shaft fractures. At the stage of the experiment forming, a comprehensive program of physical rehabilitation for athletes with tibia shaft fractures was implemented. The athletes were distributed to the main (MG; n = 28) and control (CG, n = 28) groups, where the main group was engaged in the developed comprehensive physical rehabilitation program, and the control group - according to the standard program of the medical institution. By their composition, the groups were homogeneous and completed on the basis of the results of the recording experiment without reliable differences in the motor function of the injured lower extremity ($p>0,05$).

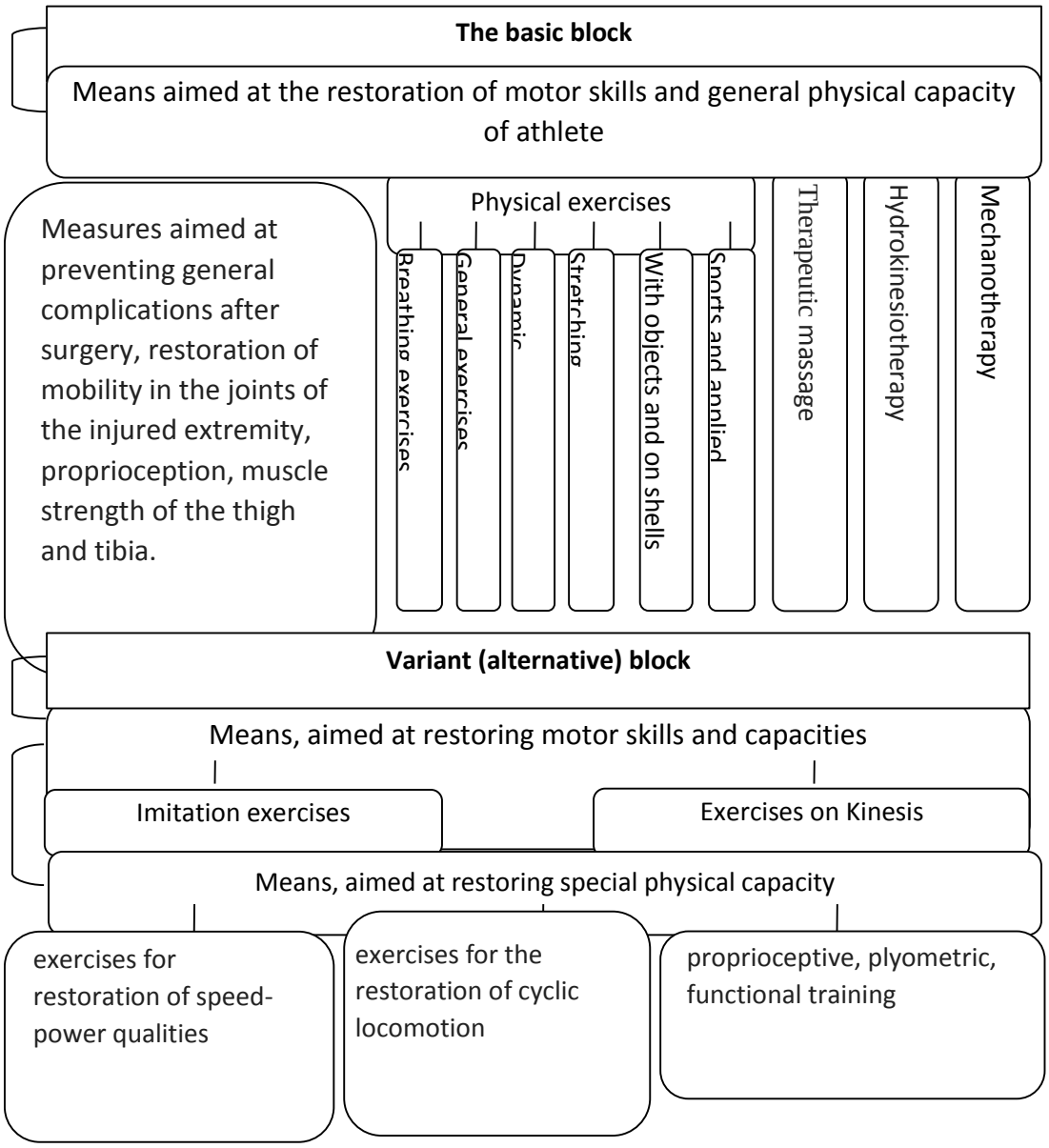
Research Procedure

All the athletes held a comprehensive program of physical rehabilitation, the total duration of which was 7 months.

The developed complex physical rehabilitation program included 2 blocks (picture 1).

The basic block - presented by the program of physical rehabilitation of patients with tibia shaft fractures developed by the Institute of Traumatology and Orthopedics of the National Academy of Medical Sciences of Ukraine where recovery process of athletes of control group was done, and also was adapted by us for tasks solving to recover the athletes of main group.

Variant (alternative) block – presented by means of recovery of special physical capacity, which have been used for the athletes from the main group.



Picture 1. Scheme of complex program of physical rehabilitation after intramedullary osteosynthesis in athletes with tibia shaft fractures.

Immediately after the course of physical rehabilitation, objective instrumental research was conducted.

Basic **hypothesis:** the use of a variant block should be able to restore the special physical capacity after an intramedullary osteosynthesis in athletes with tibia shaft fractures.

Instruments

Goniometry was carried out in the knee joint of the injured lower extremity with the help of a goniometer V.O. Hamburtseva; assessment of the size of the thigh and tibia of lower extremities; myotometry - assessment of elastic-viscous nature of quadriceps femoris with the help of the Siremay myotonometer (indicators: tone of the muscle in rest (A), muscle tone in the state of isometric pressure (B), muscle tone in the state of maximum relaxation (C), contractility coefficient (K1= B–A).

Evaluation of sensorimotor reactions (speed of simple visual-motor reaction, speed of complex visual-motor reaction) using a package of psycho-physiological tests "Jaguar", a comprehensive computer psychodiagnostic program "Personal Psychology" Windows version Effecton Studio 2010.

Performed jump tests in the final examination: 1 - single jump in length; 2 - a series of jumps in length of 6 m per hour; 3 - a triple jump in length; 4 - cross jump in length; 4 – crossed jump in length. Also, assessment of symmetry of motor function of the lower extremities was used based on the Lower Extremity

Symmetry Index (LSI) symmetry criterion, which allows comparing the motor function during the exercise of the physical load of a healthy and injured extremity.

Jump test to overcome the length (1, 3, 4):

$$LSI = \frac{\text{відстань, подоланатравмованоюкінцівкою}}{\text{відстань, подоланаздоровоюкінцівкою}} \text{x}100\%$$

Time test to overcome the distance (2):

$$LSI = \frac{\text{часвиконанняздоровоюкінцівкою}}{\text{часвиконаннятравмованоюкінцівкою}} \text{x}100\%$$

Data Analysis

Mathematical processing of numerical data was carried out using methods of variation statistics. The analysis of the correspondence of the type of distribution of the quantitative indices of the normal distribution law was checked by the criterion of Shapiro-Wilka (W). The following methods of statistical processing were used: descriptive statistics; selective method; parametric and nonparametric criteria; parametric dispersion analysis; nonparametric dispersion analysis of Kraskele-Wallis. The selective average, the standard deviation of S was calculated. For the samples, the distribution of which did not conform to the normal law, the median, the lower and upper quartile Me (25%, 75%) were also calculated. To determine the reliability of the differences between the samples, the reliability level was used p = 95% (significance level 0.05). Some hypotheses were tested at a higher level of reliability p = 99% (significance level 0.01). Statistical processing of the results of the study was conducted on a personal computer using the MS Excel 2010 Statistical Software 6.0 (StatSoft, USA) software packages.

Results

The largest number of examined athletes, according to age-related periodization, corresponded to the first mature age (25-45 years), these patients accounted for 51.78% (n = 29) among the studied contingent. Youth athletes and adolescents were respectively 37.50% (n = 21) and 10.71% (n = 6) of all injured. In studying sports qualification, we received the following data: high-skilled athletes with tibia shaft fractures who have the title of "Master of Sports of Ukraine" and "Candidate for the Master of Sports of Ukraine" accounted for the largest group - 67.85% (n = 38) . Among other injured, 16.07% of athletes had I sport category, II level - 8.92%, III level - 7.14%, which totally accounted 18 athletes.

The study of mobility in the knee joint of the injured extremity at athletes was carried out at the end of the second week after intramedullary osteosynthesis in the early post-clinical stage. The obtained data showed a significant decrease in the available range of motion, as a result of developed contracture. Range of flexion in the knee joint from injured athletes was 91.0 ± 4.98 ° (which corresponded to 70% of the norm 130 °).

The first assessment of the circumference of the thigh and tibia at the athletes was carried out in the pre-operational stage. The obtained data identified the dominance of the index of the size (circumference) of segments of the injured lower extremity over the healthy one. Indicator of the size of the thigh of the injured extremity was 61,9 ± 5,08 cm, and healthy - 58,9 ± 4,89 cm; the index of the size of tibia of the injured extremity was 39.1 ± 2.54 cm, and the healthy one was 36.8 ± 2.46 cm. The obtained data indicate edema development, caused by an ischemic process as a result of damage to the tibia bones and intraoperative traumatization of soft tissues.

In the previous studies of the contractile function of quadriceps femoris of the injured extremity athletes in the pre-operational stage, the following results were obtained: the tone of the muscle at rest (A) was 50.8 ± 2.96 points the index of muscle tone in the state of isotonic stress (B) was 60.9 ± 2.33 points; the index of muscle tone in the state of maximum relaxation (C) amounted to 43.8 ± 2.30 points. In all examined athletes, the integral index of the functional state of the muscles - the coefficient of contractile function was significantly reduced, with a relative norm of 16 to 18 points, and amounted to 10.0 points. The low value of this indicator is due to the rigidity of the quadriceps femoris that developed as a result of injury.

The study of sensorimotor reactions in athletes with tibia shaft fractures allowed obtaining the following average data: the index of the simple visual-motor reaction was 355.5 ± 18.74 ms, the index of complex visual-motor reaction was 359.7 ± 22.33 ms, the time index motor reaction was 80.1 ± 7.03 ms.

The obtained results of the experiment allowed to estimate the initial morpho-functional state of athletes with tibia shaft fractures and consider it at the development of comprehensive program of physical rehabilitation.

Implementation of the comprehensive program of physical rehabilitation in the main group of the survey allowed to fully restore the range of flexion in the knee joint of the athletes. In the control group, there was also an increase in mobility in the knee joint of the injured extremity, but this figure did not reach the normative values. The difference was 1.9%. The range of active flexion in the knee joint of the athletes from MG increased to 130.5 ± 2.02°, reaching the normative values; and in patients with CG the result was worse 127.6 ± 3.03 ° (p <0.01).

Having examined the dynamics of circumference size of thigh and tibia, one can state that muscle hypotrophy has been eliminated in all groups of the survey, but if in the main group there were no significant difference between injured and healthy extremity regarding circumference size of thigh and tibia indices, then in the control group the difference between these indicators was the following: hip circumference - 3.2%, tibia - 1.4% (p <0,05).

During the repeated study in the late period after surgery, the tone of the muscle in rest (A) at athletes from MG decreased to 47.5 ± 0.94points (p <0,01), which is associated with the reduction of pain syndrome, as well as the general physical activity due to limitation of injured extremity movement. In CG, this indicator decreased to a lesser extent - up to 50.7 ± 1.36 points (p <0,01), which is associated with the remaining of pain syndrome. At the final stage of the study indicator A showed positive dynamics and amounted to 49.1 ± 0.98 points in MG, (p <0,01), and in CG this indicator decreased and amounted to 47,5 ± 1,07 points.

The indicator of muscle tone in the state of isometric pressure in athletes of the MG at the final stage of the study significantly increased to 67.3 ± 0.93 points. In patients from CG, this indicator was lower (p <0.01) and amounted to 59.2 ± 2.94 points. The indicator of muscle tone in the state of maximum relaxation in athletes of the MG as a result of the restorative measures also demonstrated a positive dynamic of 47.8 ± 0.90 points at the end of the study. In CG, a similar indicator dropped at the final stage of the study to 46.3 ± 1.02 UM. (p <0.01). In the surveyed athletes from MG, the final result of the contractile function (K1) was statistically (p <0.01) better than in the CG and amounted to 18.2 ± 0.95 points, and significantly lowered, with a relative norm from 16 to 18 points. But in the CG the value did not reach the norm and amounted to 11,6 ± 2,11 points.

The criterion for admission to complete training loads is the performance of jump tests on healthy and injured lower extremities with an index of symmetry (LSI) of more than 90%. According to the results of the study after the restorative treatment the main group of athletes reached the norm of 87.5%, the control group - 64.28%. The obtained data indicate the effectiveness of the developed and implemented complex program of physical rehabilitation and its advantages over the basic program of restoration of athletes with tibia shaft fractures.

Data obtained at the stage of previous studies indicate the negative impact of pain on the speed of sensorimotor reactions in athletes. Restorative measures allowed to improve these rates for athletes of both groups.

So, in the MG of athletes, the index of simple visual-motor response at all stages of the study showed positive dynamics, decreasing to 321,9 ± 21,34 ms at the time of the final examination.

In the CG, changes in the indicator of simple visual-motor response were less: they showed a negative dynamic and increased to 361.8 ± 19.17 ms in the early post-clinical stage, which was associated with pain manifestation, but then decreased to 344.5 ± 16.10 ms. The differences are statistically significant between groups at p <0.05.

The index of complex visual-motor response in athletes of MG also decreased during the restorative treatment to 323.9 ± 23.78 ms. The CG athletes had a worse result of 350.6 ± 21.63 ms. (p <0.05). The time of the motor response in the MG also decreased to 71,0 ± 6,92 ms, and in the CG to 76,4 ± 6,83 ms (p <0,05).

Discussion

The development of modern surgical technologies for restoration of the integrity of the tibia after shaft fractures allows to match bone fragments precisely and stably, but the complexity and duration of restorative treatment of athletes, the lack of development of physical rehabilitation programs aimed at restoring sporting conditions and a complete return to training and competitive activities, forces to search for more effective solutions.

The obtained results confirm the data of the leading experts in the field of sports trauma and physical rehabilitation about linear correlation between the number of injuries of the tibia of athletes depend on their qualification and skills. We associate this with the fact that raising the level of athlete's qualifications leads to

an increase in the volume and intensity of training and competitive loads and thus increases the risk of injury to the shaft bones (Platonov, 2015).

Taking into account the data of numerous authors (Valeev, 2009) that the damage to the tibia leads to a reflex muscle tone increase during pre-operational stage and early after intramedullary osteosynthesis stage, we have confirmed these data as a result of the studies. Moreover, pain syndrome also caused the increase of muscle tone.

The results of the first stage of the studies showed that the tone of the quadriceps femoris in athletes of both groups was elevated, which was the result of pain syndrome and postoperative reflex muscle spasm. Subsequently, the tone of the studied lower extremity muscles decreased as a result of a decrease in overall mobility and physical activity. Restoration of indicators of muscle tone that characterize the functional state of the neuromuscular system, as a result of the application of the developed comprehensive program of physical rehabilitation, was largely carried out by athletes of the CG.

It was confirmed that the main goal of physical rehabilitation of athletes with tibia shaft fractures is a complete clinical and functional recovery in the system of sports training (Miroshnichenko, 2011; Alfimov, 2011).

Our studies confirmed the data (Doroshenko, 2015; Koriahin, 2015; Valeev, 2009) on the positive effect of means and methods of physical rehabilitation on the functional condition of athletes after intramedullary osseosynthesis in tibia shaft fractures.

The results of our work substantially supplemented the data of a number of authors (Tsykunov, 1997; Naku, 2012) on the study of biomechanical characteristics of the function of the musculoskeletal system in the dynamics to determine the effectiveness of the restoration treatment of athletes with tibia shaft fractures.

Such are the data on the features of the functional state of the knee joint, the tone of the quadriceps femoris of athletes with tibia shaft fractures after intramedullary osteosynthesis (Mohammadreza, 2012; Nikanorov, 2015), given by many authors describing the peculiarities of the use of means and methods of physical rehabilitation in studied patients (Nikanorov, 2015; Roy et al., 2011).

Conclusions

Implementation of the developed program allowed achieving better results of the range of motion of the knee joint. Investigating the tone of the quadriceps femoris shows that the changes in the indicators that occurred under the influence of our complex physical rehabilitation program developed by us were higher and had a more stable effect compared with a group of athletes who were engaged in the generally accepted method.

Positive dynamics was noted in the study of indicators of sensorimotor reactions. The indicators obtained in the main group were statistically more significant than similar indicators obtained in the control group of the study. At the end of the forming experiment, the difference between the index of simple visual-motor reaction in the main and control groups of athletes was 7.0%, between the index of complex visual-motor reaction - 8.2%.

The synthesis of the obtained data confirms the effective realization of the complex program of physical rehabilitation of athletes with tibia shaft fractures, which was developed by us, which indicates improvement of the motor function of the injured lower extremity, as well as general and special physical capacity in the process of restorative measures.

Conflicts of interest

The authors declare that there is no conflict of interest.

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Formation of value orientations in youth during physical training

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Abstract

The purpose of this study is to determine and scientifically justify the indices of development of value orientations in students based on the introduction interactive technologies during professionally oriented physical education. The timeliness of the research: one of the relevant problems of modern pedagogical science is the need to determine the influence of professional-applied physical training on the formation of the personality of students. For the effective functioning of modern society, a qualified specialist is required who not only possesses perfectly a certain specialty, manages to rule his state of physical fitness, psychosomatic health, but also has highly developed value orientations. The participants of the research: we experimentally controlled the effectiveness of the implemented measures during professionally oriented physical education at three general educational institutions (n=92). The pedagogical experiment was conducted in accordance with the physical education schedule (three lessons a week) and included an experimental program that regulated the planning, organization, control, regulation, correction and promotion of the development of value orientations in the students. The methods of the research: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics. The process of forming value orientations in students youth during professionally oriented physical education should be structured as a pedagogical system that is an open type with complex organizational and pedagogical conditions to ensure optimal functioning in an educational environment. Conclusions. A comparative analysis of the results of the research shows the effectiveness of the author's approach and the possibility of its introduction into the practice of the educational process of vocational schools.

Keywords: professionally applied physical training, value orientations, youth

1. Introduction

One of the relevant problems of modern pedagogical science is the need to determine the influence of

means of professional-applied physical training on the formation of the personality of students, which would harmoniously combine spiritual wealth, moral purity and physical perfection. Scientific and technological progress changes the society in technological terms that leads to an increase of requirements for professional ability, competence, spiritual, moral, functional, physical perfection of a man. For the effective functioning of society, a qualified specialist is required to master a certain specialty, to maintain a good state of physical fitness and psychosomatic health, and finally, to possess highly developed value orientations. Modern society feels the need of competent, competitive, professionally mobile specialists who are capable of continuing vocational education and have a high level of universal and professional culture, psychosomatic health, being able to creatively solve social and personal problems.

2. Literature Review

The main tasks of physical culture and sports are a constant improvement of the level of health, physical and spiritual development of the population, promotion of economic and social progress of society [1, 2, 3]. Consequently, physical culture and its integral part, professionally applied physical training, should be considered as a purposeful activity, aimed at creating effective conditions for the physical and spiritual development of students on the basis of universal values that would contribute to moral, aesthetic and professional development with the goal of further self-realization [4, 5]. Physical culture and sports, professionally oriented physical education of students are powerful social-pedagogical systems of formation, pedagogical correction and perfection of the moral structure of the personality of future specialists. In the context of this position, the scientific point of view is that the physical education and sport are professionally oriented to physical education, has specific educational qualities. This is primarily due to the fact that in such pedagogical systems interactive forms of educational and educational activity of students are effectively implemented, various psychological and pedagogical situations of educational orientation are used, the solution of which is supported by the results of their psychomotor activity, psycho emotional experience and causal type of attribution [6, 7, 8].

The formulated position is reinforced by the fact that physical culture and sport, physical education is inherently polyfunctional in nature. Such a point of view finds its confirmation in the practice of upbringing by ensuring the formation of the moral and spiritual qualities of the individual, psychomotor development, organization of useful social and professional activity, disease prevention and rehabilitation, physical and psycho-emotional recreation and communication [9, 10, 11]

The analysis of the state of physical education, its positioning in the context of the formation of value orientations in youth has shown the need for the development of new scientific and technological and organizational and pedagogical approaches that are capable of solving the actual social and pedagogical problem, the essence of which is the introduction into the educational environment of the educational establishment of organizational and pedagogical factors and technologies for the formation of value orientations, including the means of professionally oriented physical education (physical training day) [5, 8, 11, 12].

In our view, the optimization of the professional training of students by means of physical education should take place through the implementation of the following structural and logical level-based scheme: psychosomatic health level, the level of psychophysical ability to work, value orientations formation level, professional preparedness level, and the ability for professional mobility.

The aim of this study is to determine and scientifically justify the indices of development of value orientations in students based on the introduction interactive technologies during professionally oriented physical education.

3. Method

3.1. Participants

We experimentally controlled the effectiveness of the implemented measures during professionally oriented physical education at three general vocational establishments (n=92): Higher Professional College (n=34), Technical Lyceum (n=27), Professional Lyceum (n=31). Control and experimental groups were staffed by students (boys aged 15–17) who, according to the state of health, were included to the main training group. According to the results of the medical examination and pedagogical diagnosis, these groups were homogeneous. According to the indices of development of value orientations (motivation of successful activity, self-evaluation, etc., level of psychomotor abilities, psychosomatic health, development of physical qualities, etc.), the fluctuations were within the limits that did not have statistically significant differences

(p>0.05).

3.2. Materials

The pedagogical experiment was conducted in accordance with the physical education schedule (three lessons a week) and included an experimental program that regulated the planning, organization, control, regulation, correction and promotion of the development of value orientations in the students. The experimental program was agreed with the leadership and educational collectives of educational institutions (in terms of «projective sessions» and conferences that were held once a month). The implementation of the planned activities took place in cooperation with the teachers of physical education, sports trainers, as well as with the teachers of the departments of physical education, sport and health, who also worked on the project and provided the work of «projective sessions» before the beginning of the educational experiment and in the process of its implementation. To determine the probability of difference in the results of the study the Student's test was done. The significance for all statistical tests was set at $p<0.05$. All statistical analyses were performed with the SPSS software, version 21, adapted to medical and biological researches.

Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics.

3.3. Procedure

The implementation of activities of professionally oriented physical education was carried out by implementing adequate means, methods, pedagogical technologies, interactive forms of organization of the educational process of students, constructed on the basis of diagnostic objectives and tasks of professional training of future specialists. The pedagogical experiment was conducted in three stages, which were aimed at the implementation of the tasks of professionally oriented physical education in the context of the development of value orientations of students, namely:

- the formation of the ability to establish qualitative-static (situational) links between the results of educational activities and value orientations (83 classes with elements of professionally applied physical training, 9 activities for extra-curricular physical education and sports activities);
- the formation of the ability to establish qualitative-dynamic links between the results of educational activities and value orientations (65 classes with the elements of professional-applied physical training, 12 activities for extra-curricular physical education, sports and sports activities);
- the formation of the ability to establish qualitative and perspective links between the results of educational activities and value orientations (54 classes with elements of professional and applied physical training, 15 activities for out-of-school physical culture, fitness and sports work).

The content of each stage was determined by the purpose and objectives of its implementation, as well as a set of interactive technologies for their solution, technology management and pedagogical monitoring, the dynamics of educational achievements of students in the process of professionally oriented physical education.

4. Results

In the course of the study it was found out that at the beginning of the experiment there were no statistically significant differences in the indicators of the development of value orientations in the students of the control and experimental groups. The results of the educational experiment presented in Table 1 indicate that under the influence of the experimental program students of the experimental group had statistically regular positive changes. Thus, the analysis of the results of the experiment gives reasoned arguments that the adaptation by students of the purposes of forming value orientations by means of professionally oriented physical education, their further differentiation at the level of specific lessons, forms of extra-curricular physical culture, recreational and sports work, independent classes led to the emergence of a systemic impact and cumulative educational effects of educational environment.

Table 1. *Dynamics of development indices of value orientations in students of the control and experimental groups during the experiment.*

Criteria for assessing the level of development of value orientations	Evaluation of indices (X±m), points			
	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Attitude towards personal psychosomatic health	3.62±0.02	4.27±0.03*	3.58±0.02	9.81±0.07**

Attitude to educational activity	2.98±0.01	3.10±0.02*	2.81±0.01	9.33±0.06**
Attitude to professionally applied physical training	3.27±0.02	3.81±0.02*	3.25±0.02	10.62±0.08**
Relation to the historical memory of the people	2.86±0.01	3.33±0.02*	2.70±0.01	9.85±0.07**
Attitude to the Motherland	3.31±0.02	3.65±0.02*	3.28±0.02	10.58±0.08**
Respect for the rights and freedoms of other people	2.90±0.01	3.43±0.02*	2.80±0.01	10.60±0.08**
Social responsibilities of a person	2.61±0.01	3.29±0.02*	2.53±0.01	10.13±0.08**
Affiliate Dominance	3.26±0.02	3.65±0.02*	3.05±0.02	10.47±0.08**
Self-education ability	2.83±0.01	2.99±0.01*	2.75±0.01	10.24±0.08**
Attitude to the culture of the country	3.01±0.02	3.54±0.02*	2.91±0.01	8.74±0.06**
Ability to self-education	2.13±0.01	2.60±0.01*	2.02±0.01	9.31±0.07**
Ability to determine the goals of education	3.41±0.02	3.91±0.02*	3.24±0.02	10.0±0.08**

Note: *the results do not have statistically significant comparative dynamics ($p>0.05$); **the results have statistically significant comparative dynamics ($p<0.001$).

It was found out that the level of development of indicators of value orientations of students in the experimental group in comparison with similar indices of the students in the control group had a statistically significant growth dynamics. Thus, in the experimental group, the attitude of students to personal psychosomatic health was 9.81 points, while in the control group it was 4.27 points; the ratio of attitudes to educational activities is 9.33 points and 3.10 points, respectively. Assessment of the attitude towards professionally oriented physical education (professionally applied physical training) – 10.62 points and 3.81 points respectively. The influence of interactive methods and pedagogical technologies of educational activities of students aimed at the formation of value universal human and professional orientations, the attitude towards self-identity as a social and personal value caused the high dynamics of the formation of a positive attitude to the historical memory of the people in the students of the experimental group, on average up to 9.85 points (control group – 3.33 points); positive attitude towards the Motherland in the experimental group – up to 10.58 points (control group – 3.65 points); respect for the rights and freedoms of other people in the experimental group – up to 10.60 points (control group – 3.43 points); social responsibilities in the experimental group – up to 10.13 points (control group – 3.29 points); a positive attitude to the culture of their country in the students of the experimental group – to 8.74 points (control group – 3.54 points). We also have the opportunity to argue that the influence of methods, tools and forms of professionally oriented physical education led to an increase in partner dominants in experimental group students to 10.47 points (control group – 3.65 points), which we considered as a value orientation that integrates psycho-emotional personality structure.

The next step in assessing the effectiveness of the implemented measures of professionally oriented physical education of students was to determine their impact on the development of education and self-education. To do this we conducted the analysis of the components of education and self-education (the ability to self-organization, self-evaluation, self-control, self-fulfillment, etc.) of students. These results allowed to establish that the systematic influence of interactive forms of professionally oriented physical education (subject-subject mechanisms of interaction, mutual educational impact, etc.) provided a positive dynamics in the development of education and self-education, on the basis of which the needs for continuing education, development and preservation of psychosomatic health, professional development, professional mobility. It was found out that in the experimental group, the ability of students to self-education had higher rates of growth (up to 9.31 points) compared to those in the control group (2.60 points). In the context of the study, we considered it expedient to determine the impact of professionally oriented physical education on the development of the ability to formulate the goals and objectives of vocational training. The analysis of the results suggests that the implemented measures contributed to a higher rate of

formation of the needs-motivation sphere of the experimental group (10.0 points) compared with the control (3.91 points). The positive dynamics of indices is explained, in our opinion, by an individualized approach to the development of cognitive, axiological, praxeological, affective and motivational components of the conscious attitude of students to educational activities in the process of physical education and professional training. We consider the important argument in explaining this fact to be the realization in the process of the educational experiment of systemic effects of the effective reinforcement of the influence of interactive technologies, as well as the operational development of psychomotor professionally oriented abilities, motor skills and abilities of students of the experimental group (the phenomenon of «stimulating influence of the useful result»).

Our next scientific position was to determine the impact of professionally oriented physical education as an open type of a pedagogical system, which ensured the implementation of an experimental program. The result of the effectiveness of educational effects was the dynamics of students' development of such value orientations as self-organization, diligence, persistence, and self-evaluation. We considered these qualities as personal formation that provided the subject of the educational process with successful activity as well as the ability to establish qualitative-static, qualitative-dynamic and qualitative-perspective relationships between the results of educational activities and the pace of the development of value orientations (Table 2).

The analysis of the data shows that the ability of students to knowingly establish links between the results of educational activities, actions, behavior (as factors of value orientations) provides growth indices that characterize the ability to self-organization, diligence, perseverance, self-evaluation, self-control, tolerance. In the experimental group, these indices have higher and statistically significant growth rates compared to the control group.

Table 2. *Indices of formation in students' ability to self-organization, diligence, persistence, self-evaluation under the influence of professionally oriented physical education.*

Value orientations	Assessment of the level of formation level (X±m), points			
	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Self-organization	3.65±0.02	3.71±0.02*	8.97±0.05	9.86±0.06**
Durability	3.16±0.02	3.53±0.02*	7.83±0.04	9.69±0.06**
Persistence	3.06±0.02	3.48±0.02*	7.49±0.04	9.83±0.06**
Self-assessment	3.05±0.02	3.22±0.02*	8.51±0.05	9.84±0.06**
Self-control	3.02±0.02	3.21±0.02*	7.23±0.04	9.78±0.06**
Tolerance	3.62±0.02	3.89±0.02*	8.39±0.05	10.58±0.07**

Note: * the comparison of estimates does not have statistically significant differences ($p>0.05$); ** the comparison of the estimates is statistically significant ($p<0.001$).

In order to substantiate the effectiveness of the experimental program in the context of the reliability and sustainability of the educational, educational and psychomotor educational achievements of the students, we consider it expedient to determine the factors that influence the formation of motivation to professionally oriented physical education and professional training (Table 3).

Table 3. *Indices of the formation in students the motivation of successful activity under the influence of professionally oriented physical education.*

The nature of the manifestation of the influence of motivators on the formation of attitude to successful activity	Assessment of the level of development of the motivation of successful activity (X±m), points			
	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
The conscious choice of the educational institution	3.34±0.02	3.95±0.02*	7.83±0.05	10.71±0.06**
The desire for professional self-	4.45±0.03	4.89±0.03*	8.37±0.05	11.54±0.06**

realization				
The desire to do physical exercises independently	3.98±0.02	4.22±0.03*	7.88±0.05	10.15±0.06**
Attracts the content of professionally oriented physical education	4.03±0.02	4.29±0.03*	7.96±0.05	11.63±0.06**
Consciously apply to professionally oriented physical education as a professional value	3.05±0.02	3.77±0.02*	9.11±0.06	11.26±0.06**
Additionally, I attend activities of out-of-school physical culture, recreational and sports work	3.12±0.02	3.39±0.02*	8.72±0.05	10.94±0.06**
I know and understand the indices of my own psychophysical development that can substantiate the importance of professionally oriented physical education	3.48±0.02	3.85±0.02*	7.74±0.05	9.80±0.06**
Perform an independent search for additional information on the values of professionally oriented physical education	3.02±0.02	3.65±0.02*	7.94±0.05	10.80±0.06**
The measures of professionally oriented physical education attract	3.10±0.02	3.44±0.02*	8.62±0.05	10.83±0.06**
I have the skills of psychomotor control	3.11±0.02	3.56±0.02*	8.24±0.05	10.27±0.06**
I carry out development and preservation of psychosomatic health	4.12±0.03	4.38±0.03*	7.55±0.05	9.68±0.06**
I have a method of development of physical qualities	3.05±0.02	3.42±0.02*	7.80±0.05	9.94±0.06**
I have a method of forming motor skills and abilities	3.10±0.02	3.58±0.02*	7.41±0.05	9.86±0.06**
Supporter of a healthy lifestyle	2.98±0.01	3.11±0.02*	8.06±0.05	10.24±0.06**
I understand the psycho-physiological mechanisms of influence the body of harmful habits	3.15±0.02	3.61±0.02*	7.10±0.05	9.45±0.06**

Note: * the results do not have statistically significant dynamics ($p>0.05$); ** the results have statistically significant comparative dynamics ($p<0.001$).

A comparative analysis of the results of the study was carried out on the indices that fulfilled the function of the criteria for assessing the development of motivation students in educational and educational activities. Consequently, the dynamics of the development of the motivation of successful activity in students of the experimental group has a stable character of formation that is characterized by indices of variations of average estimates of its formation.

Thus, in the experimental group, the indicator characterizing the level of the formation of a conscious choice of an educational institution has a range of fluctuations of 5.34–10.71 points (control group 3.13–3.95 points); an indicator characterizing a stable desire for professional self-realization in the experimental group was 5.43–11.54 points (control group 4.05–4.89 points); a stable desire to independently engage in physical exercise and sports in students of the experimental group amounted to an average of 5.53–10.15 points (control group 3.68–4.22 points); attracts the content of professionally oriented physical education – in the students of the experimental group 4.87–11.63 points (control group 3.35–4.29 points); a conscious attitude to professionally oriented physical education as a specialty – in the students of the experimental group 4.78–11.26 points (control group 2.89–3.77 points); the need for additional attendance of activities of out-of-school physical culture, health and sports work - in the students of the experimental group 5.69–10.94 points (control group 2.98–3.39 points); understanding of the need to know the indices of their own psychophysical development and the ability to substantiate the significance of physical education – in the students of the experimental group 5.39–9.80 points (control group 3.05–3.85 points); carry out independent search of

additional information on the significance of the influence of physical education as a professional value – in students of the experimental group 4.63–10.80 points (control group 2.83–3.65 points); attracting activities of professionally oriented physical education – in the students of the experimental group 5.34–10.83 points (control group 2.84–3.44 points); have skills of psychomotor control – in students of experimental group 4.88–10.27 points (control group 2.94–3.56 points); carry out the development and preservation of psychosomatic health – in the students of the experimental group 5.39–9.68 points (control group 3.84–4.38 points); have a method of development of physical qualities – in the experimental group 4.79–9.94 points (control group 2.85–3.42); have a method of forming motor skills and abilities – in the experimental group 4.98–9.86 points (control group 2.67–3.58); lead a healthy lifestyle – in students of the experimental group 5.14–10.24 points (control group 2.57–3.11 points); understand the mechanisms of influence the body of harmful habits – in the students of the experimental group 4.67–9.45 points (control group 2.79–3.61 points).

5. Discussion and Conclusion

The analysis of literary sources and scientific research has shown that the problem of the use of physical culture and sports with the purpose of forming the motivation to develop the value orientations in youth is relevant in the modern theory and a practice of vocational education [1, 2, 4, 5, 9, 11, 13–16]. In our opinion, along with the achievements of other scholars, the rationale for the stated positive dynamics, we see the need to adhere to certain psychological and pedagogical laws, the implementation of which in the educational process is the result of the developmental influence of professionally oriented physical education, namely:

1. Interiorization approach to the formation of the goals of the (goal-setting) of the professionally oriented physical education, on the basis of which is the education of abilities to goal formation, that is a motivate factor for education, self-education, self-actualization, self-evaluation, diligence, perseverance in achieving the goals and objectives of educational activity;

2. Formation in students conscious and constructive attitude to personal psychosomatic health; development of psychomotor abilities, motor skills and abilities; positive dynamics of their professional preparedness, professional mobility. On the principles of such an approach (due to the implementation of the subject-subject interaction of students in dyads, triads, micro groups, small groups), the systemic effect of the development of adequate self-evaluation, cognitive, praxeological, axiological, and personal components of the motivation of successful activity is achieved;

3. Systematic reinforcement of the results of the students goal-forming activity, formation of value orientations, a causal type of attribution, actions and behavior (psychomotor development, professionally oriented physical qualities, motor skills and abilities in the context of their transposition into the structure of the individual).

Conclusions.

The presented results of the study allow to determine the content of professionally oriented physical education that should be based on the implementation of certain conceptual provisions, the essence of which is as follows:

1) the content of the structural and functional components of the education of the personality of students, their vocational education and professionally oriented physical education must be determined by the system-forming function of structured goals of the formation of a competitive, competent, healthy specialist capable of social self-realization in the labor market and modern challenges of socio-economic development countries;

2) the process of forming value orientations in students during professionally oriented physical education should be structured as a pedagogical system that is an open type with complex organizational and pedagogical conditions to ensure optimal functioning in an educational environment;

3) the implementation of innovative technologies of the subject-subject structure aimed at forming the ability to establish qualitative-static, qualitative-dynamic, qualitative-perspective relationships between the results of educational activities, actions, behavior and value orientations of the individual (self-organization, diligence, self-evaluation, self-control, tolerance, self-actualization, self-realization), and as an integral result of education – the development of the desire for education, self-education, professional self-realization;

4) the formation of active social and personal attitude among students in relation to measures of professionally oriented physical education, creative use of physical culture and sports as factors of the optimization of professional training.

A comparative analysis of the results of the research shows the effectiveness of the author's approach and the possibility of its introduction into the practice of the educational process of vocational schools.

Prospects for further research in this direction. An analysis of the level of physical fitness of student youth of vocational schools will be conducted in the future.

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Legal Preconditions of Creation of the System for the Prevention of Gene Doping in Sport and Counteraction to Forming an Artificial Athlete

The reported study was funded by RFBR according to the research project № 18-29-14082 "Construction of legal models of the regulation of genetic modifications of athletes and counteracting genetic doping in sport"

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Abstract

This article discusses issues related to identification of the legal prerequisites for the prevention of gene doping.

The article identifies promising risks and threats to the field of sport caused by the continued expansion of genetic technologies in everyday life.

This study also raises problems that need to be addressed and questions that society needs to answer in the near future in order to build a system of resistance to gene doping.

Keywords: Gene therapy, Gene doping, Prohibited method, WADA, TUE

1. Introduction

Human throughout the history has been perceiving the world around and doing soul-searching. The worldview, ideology, the surrounding circumstances, the quality of life have changed over times, but Homo sapiens hasn't lost the desire to explore the modernity and unknown. We owe a great deal to scientific progress - most of the things we are used to have been created by human hands, they are a consequence of the cognitive activity that people have been doing since time immemorial. Science, which is the fulfillment of the desire for the unknown, provides more and more new discoveries. The invention of writing allowed people to transmit information not only from mouth to mouth, but also through the centuries, the creation of an electric incandescent lamp made it possible to illuminate the whole world, and the discovery of penicillin made it possible to cope with a huge number of diseases. Discoveries and inventions greatly change the world and the role of human in it. However, any innovation also entails the risks associated with its use. Those discoveries and inventions that relate to the person himself and to the changes that can be produced are of particular danger. One of these areas in modern science is the investigation of the human genome and methods of its editing.

2. Human genome and gene therapy: potential and risks

Investigation of the human genome is one of the most significant challenges of the 21st century. It is difficult to overestimate the contribution of such fundamental research as "The Human Genome Project" (HGP), "The Genome Project-Write" and others to the human history. They have discovered and continue to develop scientific knowledge about the structure of the human genome, which allows making a significant progress in medicine, understanding of human nature.

Gene therapy is the result of the above mentioned researches, the result of mankind's desire to explore its own genome. U.S. National Library of Medicine provides with the following determination: "gene therapy is an experimental technique that uses genes to treat or prevent disease".[1] It seems that it can replace the existing methods of treatment and lead to achieving more effective results by changing the genes in the patient's cells.

Nowadays the following approaches to the implementation of gene therapy are known, among which:

- Replacing a mutated gene that causes disease with a healthy copy of the gene.
- Inactivating, or "knocking out," a mutated gene that is functioning improperly.

[1] US National Library of Medicine. Your Guide to Understand Genetic Conditions. What is gene therapy? URL: https://ghr.nlm.nih.gov/primer/therapy/genetherapy [Accessed 03 March 2019].

– Introducing a new gene into the body to help fight a disease. [1]

Despite promising prospects for curing a huge number of diseases (some researchers aspire not only to cure diseases, but also to change the processes that we face as the inevitable companions of human life, such as aging of the human body) almost every information source mentions that nowadays the technology of gene therapy remains extremely risky, the ways of its realization are experimental, and the consequences of its use are not fully predictable.

Most of the risks of gene therapy are connected to the means by which the necessary genes are delivered to the cells. These means are called "vectors", which are understood to be viruses that, by their very nature, can "penetrate" into cells and deliver the necessary genetic material. Among the risks that such method of transferring genes carries are the following:

Unwanted immune system reaction. Your body's immune system may see the newly introduced viruses as intruders and attack them. This may cause inflammation and, in severe cases, organ failure.

Targeting the wrong cells. Because viruses can affect more than one type of cells, it's possible that the altered viruses may infect additional cells — not just the targeted cells containing mutated genes. If this happens, healthy cells may be damaged, causing other illness or diseases, such as cancer.

Infection caused by the virus. It's possible that once introduced into the body, the viruses may recover their original ability to cause disease.

Possibility of causing a tumor. If the new genes get inserted in the wrong spot in your DNA, there is a chance that the insertion might lead to tumor formation."[2]

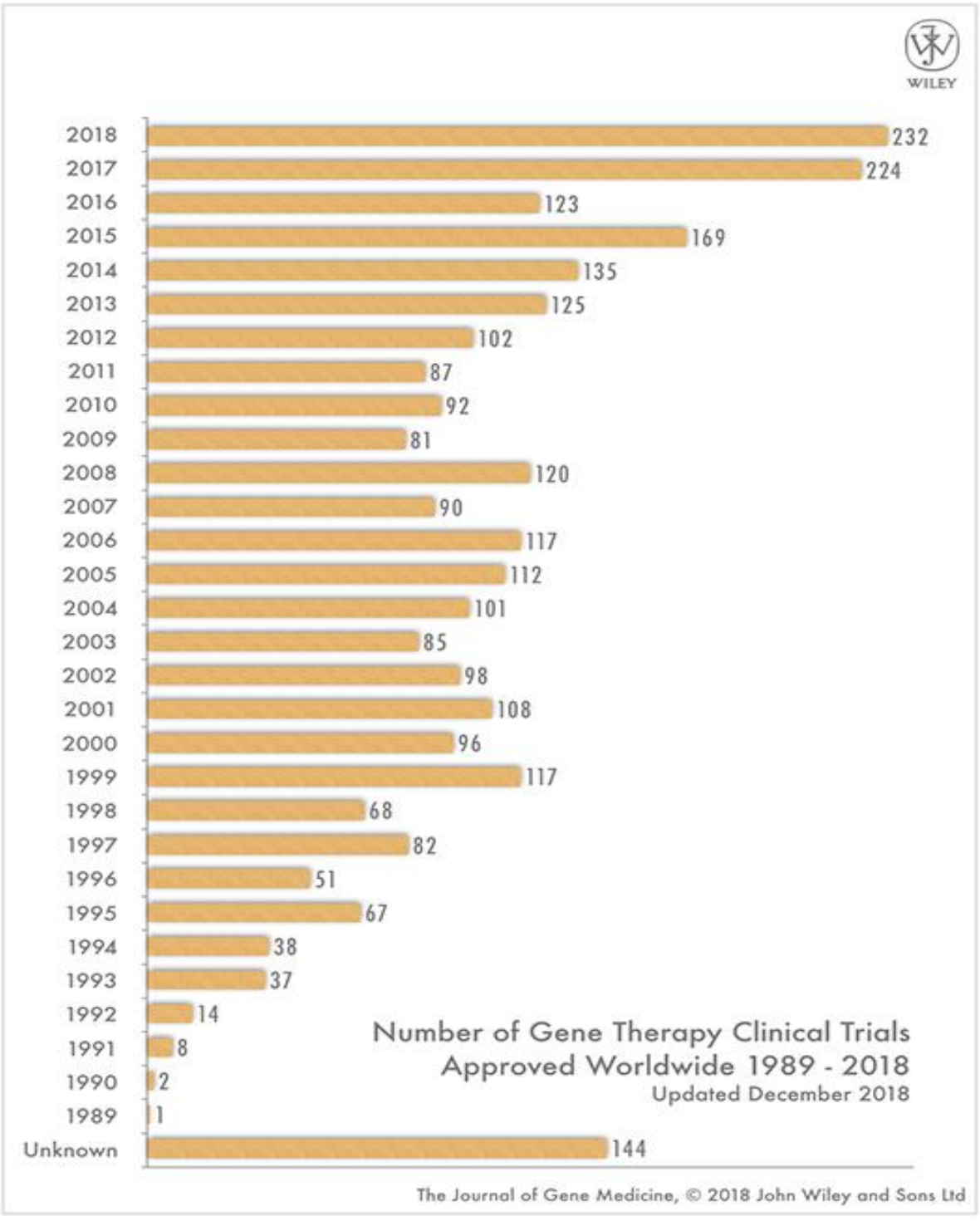
However, it can be noted that the intensity of the clinical trials of gene therapy has an increasing tendency. Gene Therapy Clinical Trials Worldwide provided by The Journal of Gene Medicine provides statistics showing that the number of clinical trials has steadily increased in recent years[3] ***(Table 1)***.

[1] US National Library of Medicine. Your Guide to Understand Genetic Conditions. What is gene therapy? URL: https://ghr.nlm.nih.gov/primer/therapy/genetherapy [Accessed 03 March 2019].

[2] MAYO Clinic. Gene therapy. URL: https://www.mayoclinic.org/tests-procedures/gene-therapy/about/pac-20384619 [Accessed 03 March 2019].

[3] The Journal of Gene Medicine. URL: http://www.abedia.com/wiley/years.php [Accessed 03 March 2019].

Table 1. *Number of Gene Therapy Clinical Trials Approved Worldwide 1989-2018*



A person's desire to study the genome, the increasing volumes of clinical trials in gene therapy, along with the knowledge about the possibilities of using the latest technologies in this area, lead to potential risks for another significant area - sport.

3. The main purpose of doping prevention

The purpose of doping prevention is determined by the core figure of such regulation - a person. It is his defense that anti-doping rules are oriented to. A person is the supreme value, his life, health and freedom are the key aspects of all spheres of public life, the right for equal protection of the law without any distinction is the fundamental concept of any legal system. The abovementioned is confirmed everywhere by a multitude of documents both at the international and national levels. The protection of these rights is the fundamental goal of doping prevention in sport. The athlete who is protected from exposure to substances and methods that can damage his health; the athlete who has the opportunity to realize his potential head-to-head in a sport competition, where his own abilities, talent and quality of sports training, but not the effectiveness of the drug that was introduced to him are of paramount importance. A spectator who empathizes with the representative of his country at an international competition or his favorite team in the common championship, who has the right to expect that all athletes are "clean" and compete only by their own strength. This indicates that it is human rights that are the measure that makes it possible to talk about the need for anti-doping regulation.

What should be the responsibility for the violation of human rights in this regard? Different jurisdictions have different experience. For example, in Germany the Anti-Doping Act, which entered into force in January 2016, criminalizes the use of doping (up to imprisonment). According to the position of the German legislators, this act is aimed at solving two problems: the prevention of harm caused by the doping to the athlete, as well as the protection of the sports movement in fact against fraud, since sports competitions, among other things, include the financial aspect[1].

Sport, especially professional sport, has become a huge industry, in which, not only the competitive aspect, but the financial component plays a significant role, provided by the entertainment nature of sports competition, the betting industry, which accumulates a huge amount of money and is based on the result of sports competition, sponsorship of individual athletes and teams who earn thanks to their enduring success in the field of sports, etc. These factors altogether constitute a threat to the achievement of the doping prevention goal. And it is logical that these factors are the main driver of the emergence of new prohibited methods, the disclosure of which presents particular difficulties.

However, the use of doping raises not only the question of the "cleanliness" of the sport, but also the question of the health status of the athlete who took such a step. So, the problem of doping can often be found in the reports of the World Health Organization. For example, the document «Programme on substance abuse. Drug use and sport. Current issues and implications for public health»[2] focuses on the problem of the long-term health effects of doping. At the same time, it is indicated that doping has become an actual phenomenon not only for highly qualified adult athletes, but also for young athletes, which requires even more attention and study. The above mentioned only confirms that doping is not only a problem of the sports community, but it also affects the health of people. We can state that doping has become one of the "professional diseases" of athletes, some of whom are trying to get sick in an effort to achieve better results.

4. New prohibited method

On September 30, 2002, the World Anti-Doping Agency (WADA) published a list of prohibited substances and methods, and it was the first time gene doping was included in this list.[3] At that time, gene doping was defined rather broadly and was considered as "the non-therapeutic use of genes, genetic elements and/or cells that have the capacity to enhance athletic performance."[4] Since then, it can be argued

[1] With a critical view on both as justification for criminal punishment, U. Steiner, Deutschland als Antidopingstaat, ZRP 2015, 51; Cf. BT-Drucksache 18/4898. p. 22.

[2]Programme on Substance Abuse. Drug use and sport. Current issues and implications for public health World Health Organization, 1993 URL: https://apps.who.int/iris/bitstream/handle/10665/60747/WHO_PSA_93.3.pdf;jsessionid=33DB01D395E003AA1551953491E89DF2?sequence=1 [Accessed 03 March 2019].

[3] WADA and IOC publish new list of banned substances and methods URL: https://www.olympic.org/news/wada-and-ioc-publish-new-list-of-banned-substances-and-methods-1 [Accessed 03 March 2019].

[4] WADA. Prohibited list documents. URL: https://www.wada-ama.org/en/resources/science-medicine/prohibited-list-documents [Accessed 03 March 2019].

that the sports community has officially recognized the threat of gene doping for the development of sports movement around the world.

While investigating the evolution of understanding of gene doping in WADA documents, its heterogeneity should be noted. Thus, in various editions of the prohibited substances and methods list, there is a difference in the degree of concretization of this notion. For example, in contrast to the first edition, the 2009 edition determined gene doping, deepening into special terminology, where among others "Peroxisome Proliferator Activated Receptor δ (PPARδ) agonists (e.g. GW 1516) and PPARδ-AMP-activated protein kinase (AMPK) axis agonists (e.g. AICAR) are prohibited"[1] is noted. It should also be mentioned that the current edition of January, 2019 [2] partly returns to a broad approach to the definition of gene doping and does not focus on the terminology of genetics. It provides for 3 positions, which "with the potential to enhance sport performance, are prohibited:

1. The use of polymers of nucleic acids or nucleic acid analogues.
2. The use of gene editing agents designed to alter genome sequences and/or the transcriptional, post-transcriptional or epigenetic regulation of gene expression.
3. The use of normal or genetically modified cells."[3]

The above heterogeneity in the understanding of gene doping makes it possible to understand that the opinion of the sports community regarding this problem is under active formation and is only looking for its niche.

The question of understanding gene doping is the core question since it defines reference points for its prevention. It is obvious that the improvement of gene therapy technologies, the expansion of knowledge about the human genome and the variability of ways to improve various indicators of an athlete will change the approach to the definition of this notion and the possible ways of counteracting.

5. Gene therapy and gene doping: a question of correlation

From a formal point of view, the prevention of gene doping should be based on the same foundations on which the entire system of anti-doping regulation is built.

Article 4.3.1 of The World Anti-Doping Code has established a number of criteria that determined what can be included in the list of prohibited substances and methods, among which are indicated:

"4.3.1 A substance or method shall be considered for inclusion on the *Prohibited List* if *WADA*, in its sole discretion, determines that the substance or method meets any two of the following three criteria:

4.3.1.1 Medical or other scientific evidence, pharmacological effect or experience that the substance or method, alone or in combination with other substances or methods, has the potential to enhance or enhances sport performance;

4.3.1.2 Medical or other scientific evidence, pharmacological effect or experience that the *Use* of the substance or method represents an actual or potential health risk to the *Athlete*;

4.3.1.3 *WADA's* determination that the *Use* of the substance or method violates the spirit of sport described in the introduction to the *Code*." [4]

According to the gene therapy information that is in the public domain and is mentioned in this article, the use of this technology carries a significant amount of health risks, which is consistent with Article 4.3.1.2 of the WADA Code. Moreover, the experimental stage, in which the vast majority of research in this area is, does not exclude Article 4.3.1.2 of the WADA Code, associated with the potential to enhance sport performance. This leads to the conclusion that the possibility that gene therapy can be a masked gene doping

[1]The World Anti-Doping Code The 2009 Prohibited List International Standard. URL: https://www.wada-ama.org/sites/default/files/resources/files/WADA_Prohibited_List_2009_EN.pdf [Accessed 03 March 2019].

[2] The World Anti-Doping Code International Standard. Prohibited List January 2019. URL: https://www.wada-ama.org/sites/default/files/wada_2019_english_prohibited_list.pdf [Accessed 03.03.2019].

[3] The World Anti-Doping Code International Standard. Prohibited List January 2019. URL: https://www.wada-ama.org/sites/default/files/wada_2019_english_prohibited_list.pdf [Accessed 03.03.2019].

[4] World Anti-Doping Code URL: https://www.wada-ama.org/en/resources/the-code/world-anti-doping-code [Accessed 03.03.2019].

is quite high. The method presented as a treatment can consciously include more extensive purposes of use, along with an unexpected effect[1].

6. What to do if gene therapy is vital?

Gene therapy appears to be a promising method for treating diseases connected to various gene defects, heart problems, cancer, diabetes, schizophrenia and others[2]. Many of them do not have a proven approach to treatment that provides a good result that is why the continuation of the development of gene therapy is vital for humanity. At the same time, as it was already stated, the results of such medical method may have various, sometimes unpredictable consequences. In this case, we can say that the usage of gene therapy is itself a threat to the anti-doping rules. We should pay attention to the following usage of the gene therapy that can have negative effects for the sport:

- can be directed solely at improving athletic performance;
- can mask a different effect aimed at improving athletic performance;
- can have a controlled side effect that improves athletic performance;
- can have an uncontrolled side effect that improves athletic performance.

The above listed possible negative consequences are merely theoretical assumptions, and therefore they cannot be considered as final conclusions. However, they give an idea of the possible ways of using gene therapy as gene doping.

The living anti-doping rules give a chance for athletes to use substances and methods from the prohibited list subject to Therapeutic Use Exemptions (TUE). Article 4.4.1 of The World Anti-Doping Code specifies that the presence of a *Prohibited Substance* or its *Metabolites* or *Markers*, and/or the *Use* or *Attempted Use*, *Possession* or *Administration* or *Attempted Administration* of a *Prohibited Substance* or *Prohibited Method* shall not be considered an anti-doping rule violation if it is consistent with the provisions of a *TUE* granted in accordance with the International Standard for Therapeutic Use Exemptions. Thus, in the case of such an exception, the use of gene doping will not be considered as a violation of anti-doping rules.

It should be noted that there are both supporters and opponents of the concept of TUE itself. The latter argue that the need to counteract gene doping makes the question of the validity of the use of TUE even more acute: the ethics behind TUEs are disputed, with some experts fearing the system is open to abuse.[3] Due to the impossibility to form an unambiguous forecast of the results of the use of gene therapy, we should approach to the answer to this question with extreme caution. Thus, due to the particular difficulty of detecting gene doping, the absence of clear boundaries between the allowable intervention subject to TUE and the unjustified effect that improves athletic performance, we can distinguish a number of possible ways to respond:

1) *Complete ban on TUE when applying gene therapy.* This approach will completely eliminate the legal basis for the application of gene doping, but will be a factor that discriminates athletes who need this type of treatment. It is impossible to limit the right of a person to participate in sports competitions due to the fact that a promising method of treatment of his illness is not fully permitted by the sports community. You cannot confront a person with a choice: sport or health.

2) *Partial ban on TUE when applying gene therapy.* Such an approach would limit certain types of gene therapy, for which it has been established that their potential for improving athletic performance was too good to continue competition equally with other athletes. In general, this method of reaction is slightly different from the previous one, since it only reduces the circle of people who are given the same choice: sport or health.

3) *The absence of a ban on TUE when applying gene therapy, subject to the provision of prior and subsequent monitoring of the athlete.* It seems that monitoring the status of an athlete before and after applying gene

[1] Mehmet Unal, Durisehvar Ozer Unal. Gene Doping in Sports // Sports Med 2004; 34 (6): 357-362 [online]. Available from URL: https://www.researchgate.net/publication/8549500_Gene_Doping_in_Sports [Accessed 03 March 2019]

[2]Gene Therapy. Net URL: http://www.genetherapynet.com/JoomlaTest2/index.php?option=com_content&view=article&id=164:diseases-treated-with-gene-therapy-&catid=97:patient-information&Itemid=14 [Accessed 03 March 2019].

[3] The Guardian. What is a TUE? 11 key questions on the Fancy Bears Wada leaks URL: https://www.theguardian.com/sport/2016/sep/15/tue-fancy-bears-wada-leaks [Accessed 03 March 2019].

therapy to him without setting appropriate bans will allow to approach the understanding the potential effect of medical interventions of this kind more effectively. The sports community should fully explore the possibilities of applying such technologies and the extent of their impact on the athlete and his results. However, in order to implement the ***fair play*** principles, consideration to public reporting of the fact that an athlete receives a TUE on gene therapy should be given, and the athlete, accordingly, should consent to the disclosure of such information. This will allow the world community to understand the degree and level of impact of gene therapy on athletic performance, as well as to increase the level of confidence in the TUE as a whole.

7. The prospect of the formation of a separate area of the sports movement, which includes athletes with genetic modifications

In the future the entertainment of sports competitions, the attention paid to the most successful athletes, the desire to achieve the highest sports results and other prompting factors may force society to reconsider existing views on gene doping and lead to the emergence of a new class of athletes who have certain genetic modifications. Such positions can be found in various sources, including the media[1], so you should pay attention to them.

It seems that such a scenario is possible only if gene therapy is recognized as a safe procedure, the technology of its application will be debugged and widely distributed. Indeed, if a person can use technology to increase certain indicators of physical or mental activity, sport in the traditional sense is unlikely to be very popular. It can be replaced by the competition of "genetically modified" athletes. This prospect is possible, but its implementation will mean that not athletes will win as competitions, but the level of development of gene doping technologies, the quality of research and development results.

This will raise the question: whether the "desire for the natural" is more meaningful for a person than entertainment, as well as sporting results that are inspiring and unattainable without the use of technology.

8. The significance of the problem of applying gene doping at the moment

WADA indicates on its official website: "despite sensational and scientifically unfounded claims occasionally seen in the media, WADA is not presently aware of any athletes who are gene doping. Nevertheless we want to be ahead of the game and make it clear that when or if such techniques as gene editing would be used to enhance performance beyond a return to normal function, then it would be prohibited."[2] Thus, the organization states that despite the absence of precedents at the current time, this issue deserves attention and preventive regulation. This is justified by the fact that the field of genomic research is under active development and we can only speculate as gene doping has ever been used historically. This guess can neither be proven nor disproved, because, unfortunately, the methodology of conducting full-scale tests of athletes for the presence of gene doping has not yet been developed. However, the lack of attention to the emergence of such a potential problem will be clearly erroneous and that is why it is necessary to strive for the emergence of technologies capable of detecting violations of athletes of anti-doping rules connected with gene doping.

9. Who should be the main regulator in the field of resistance to gene doping: the state or the sports organizations?

The issue of countering gene doping is associated with many unsolved problems:

- the multiplicity of risks of gene therapy as a technology;
- the absence of extensive experience in the use of gene therapy, which does not allow one to understand with precision what the consequences may be;
- the weak ability to detect cases of using gene doping;
- the absence of a clear understanding of permissible and unacceptable interventions during the conduct of gene therapy.

[1] The Business Insider. Humans of the future could be much faster than Usain Bolt or Michael Phelps. URL: https://www.businessinsider.com/genetic-modification-athletes-improve-athletic-performance-2016-8; Professor Andy Miah. URL: https://andymiah.net/blog/2004/11/04/genetically-modified-athletes-2 [Accessed 03 March 2019].

[2] WADA. Prohibited List Q&A. URL: https://www.wada-ama.org/en/questions-answers/prohibited-list-qa [Accessed 03 March 2019].

It seems that the independent sports community and organizations cannot effectively solve this problem. States with far greater resources and capabilities can greatly accelerate the resolution of these problems. The active involvement of government institutions in various jurisdictions will strengthen both the research unit aimed at identifying gene doping in general, as well as the legal unit in which the institutions promoted by the sports community will receive additional support at the national level.

Separately worth noting the issues of responsibility for the use of gene doping. It seems that the main type of responsibility in relation to athletes who are found to be engaged in the use of doping should be special, exercised by the sports community and affecting such negative consequences responsibility as sports disqualification. However, the use of gene doping may be connected with other persons involved in this process. In relation to them, it is possible to apply measures of responsibility by the State, but only if the main purpose of applying gene therapy was not to cure the disease, but to enhance the athletic performance of an athlete. The State plays one of the key roles in the field of prevention and counteraction of gene doping, since even in case of successful detection of using of gene doping by the athlete, it is impossible to influence other people who provided such intervention and are beyond the scope of the sports movement without attracting power institutions.

10. Conclusion

In this article, steps were taken to identify the legal prerequisites for the prevention of gene doping. The developed approaches to the understanding of gene therapy and doping in general, as well as the prospects for embedding resistance to gene doping into existing legal mechanisms, including TUE, were studied. The article identifies promising risks and threats to the field of sport caused by the continued expansion of genetic technologies in everyday life. The likely negative consequences of the use of gene therapy, which may have an impact on the sport, were built.

This study raises problems that need to be addressed and questions that society needs to answer in the near future in order to build a system of resistance to gene doping:

1. The problem of detecting gene doping remains unresolved. The basis for counteracting any offense is based primarily on the fact that it can be identified. Any attempts to build a legal system aimed at combating or preventing such offenses will not make sense if the methodologies for identifying gene doping cannot determine whether any manipulations have been made that enhance athletic performance. This problem does not apply to jurisprudence, but its solution will allow legal mechanisms to begin productive work. The right is in need of technology capable of identifying gene doping.

2. It is worth mentioning the question of defining the line between gene therapy, which is and is not doping. This question is at the intersection of law and science, as law allows us to identify and formalize the characteristics inherent in gene therapy and relevant to the prevention of gene doping, based on the results of scientific research. A clear understanding of the difference between permissible intervention, which does not have serious negative consequences for the sports movement, protection of the life and health of an athlete, fair play principles, and unacceptable is necessary. The definition of such a boundary will allow the developed legal mechanisms to point out the expected behavior of athletes and the entire background of his sports training. The question of whether gene therapy can be considered acceptable when it is the only way to combat an athlete's disease, but at the same time leading to consequences that greatly enhance its athletic performance, also deserves clarification. It seems that you cannot put an athlete in front of a choice: sports or health. However, providing TUE to athletes on a general basis in the event that the result of such exceptions significantly affects its physical and intellectual characteristics is also not the right solution. As a temporary alternative for the period of the development of gene therapy, a mechanism can be provided for mitigating the negative consequences through the publicity of the fact.

3. The question that needs to be answered is how can law become an effective and important regulator in preventing and countering gene doping? What standards and at what level should contain signs of gene doping and methods to combat it, preventive measures and responsibility? What is the place of law in solving this problem?

At the moment it is impossible to predict an unequivocal answer to these questions. It is impossible without an understanding of all the complexity and disclosure of all the features of the object of legal regulation to count on the development of highly effective legal regulations and norms. This will increase consistently along with the development of science itself, the results of which the lawyers are to regulate. However, not to consider this issue as a topical agenda will also be an omission. As the legal basis that we form today will be of great importance for the regulatory policy of tomorrow. Summarizing the work done,

the words of Publius Cornelius Tacitus (AD 56 – ca. AD 117) who was a senator and a historian of the Roman Empire should be quoted. Once he said: "Truth is confirmed by inspection and delay; falsehood by haste and uncertainty." This principle should guide the development of legal regulation in the field of averting and prevention of gene doping.

It should also be noted that the World Health Organization is discussing the prospects for effective international control over the editing of the human genome[1] The new advisory committee of the World Health Organization on the development of global standards for monitoring and supervising the editing of the human genome marked the work to create a reliable international control mechanism in this area. The Committee invited all those who conduct research in the field of human genome editing to start a dialogue with it in order to understand better the technical conditions and current control schemes of their activities and ensure its compliance with the latest and most modern scientific and ethical standards. It seems that the participation of the international sports movement in this initiative should be one of the main tasks of the largest organizations opposing doping in sport.

A deeper understanding of control mechanisms, the training of researchers in the field of genome research and specialists conducting gene therapy can be a helping hand in creating a single center for conducting gene therapy for athletes under the auspices of WADA in the future, which will allow any intervention of such a complex nature under the supervision both for the safety of the athlete, and for prevention of abuse. At the same time, this practice will help to accumulate colossal experience that will allow developing effective methods for detecting gene doping in the future.

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Formation of heath preserving competence of students of higher educational institutions of information technologies specialties

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Abstract

Study aim. The purpose of the study is to substantiate and develop the theoretical and methodological foundations for the implementation of health care technologies in improving the mental capacity of first-year students.

Research methods: theoretical analysis and synthesis of scientific and methodological literature, pedagogical observation, pedagogical experiment, biomedical methods and methods of mathematical statistics. For the study, we involved first-year male students of the State Telecommunications University (STU), Kyiv Ukraine, who were divided into two groups: experimental (EG) and control (CG). A total of 117 students participated in the research. The study of the pedagogical experiment continued throughout the academic year. During the experiment, the influence of active leisure on the mental capacity of students in the experimental group was determined.

Results. It is proved with a high degree of statistical reliability ($P < 0.001$) that students who regularly attend additional physical development classes are more organized, diligent, have easier contact with fellow students, better master the program material of academic disciplines, etc. The use of small forms of active leisure in the form of physical training break or a physical micro-pause during training sessions from theoretical disciplines, as well as additional physical exercises during free hours, contributes to mental capacity by removing or reducing the impact of fatigue processes.

Conclusions. The use of small forms of active leisure (physical training break and physical micro-pause) when conducting theoretical and laboratory training sessions with students of the experimental group have been experimentally substantiated; they are based on:

− use of physical training break and physical micro-pause between semi-pairs and pairs of theoretical disciplines and laboratory classes;

− use of a physical pause and physical training break during independent work on preparing for training sessions the next day in the hostel and in the conditions of his apartment;
− organization of independent recreational and training sessions on physical self-improvement in free time;
− participation in sports and recreational and sports events of the faculty, teaching and research institute and university.

To form, maintain, improve health and promote the development of physical qualities of each student in the process of learning at higher educational institution, which accounts for the "peak" of functional development of the body, the stabilization of all its systems is the most important task of each higher educational institution, which is defined today by society and the economy of the state.

Active leisure contributes to the functional restructuring of the body. Identifying the characteristic features of this restructuring is the way to solve the problem of improving students' mental capacity. Work and rest are integral and interdependent. Thus, fatigue involves the process of restoring the forces of the body, and the acceleration of this recovery is possible with the help of a certain type of motor activity. Hence, there is the need to substantiate the type of additional activity, which will ensure the restoration of body forces and activation of working capacity with maximum effect.

Keywords: competence, higher education institution, students, health, leisure, physical culture break, physical culture micro-pause

1. Introduction

Health is the public wealth and "state property", but everyone must maintain it on their own [2]. Adequate way of life, rejection of everything that destroys the body, primarily alcohol, smoking and drugs, and daily, systematic physical training based on that principle should solve the problem of maintaining health.

Hoping only for the help of doctors, as well as complaining about the imperfection of our body or the negative effects of the scientific and technological revolution (STR), is unwise and hopeless. Nature is not to blame for the diseases of our heart. STR does not deprive a person of physical activity at all, but, on the contrary, gives her the opportunity to create this in the most targeted and concentrated form - in the form of physical culture [3; 4].

In the middle of the XIX century, with all the energy that was produced and used on Earth, 94% came from the muscular strength of humans and domestic animals, 6% produced water wheels, windmills and a small number of steam engines. In 1952, only 1% of the energy was produced using the muscular strength of A.I. Berg (1964), in 1975 - only 0.5% of the energy was associated with the immediate muscular activity of a person I.V. Muravov (1978), and in subsequent years this percentage continues to decrease [1, 2].

Intensive development of computer technologies, their introduction not only in various areas of production, but also in the field of education, contribute to an increase in the processes of physical inactivity and hypokinesia among school and university students. That is why improving physical culture is now becoming extremely practical. After all, the formation of students' health preserving competencies enhances their physical and mental capacity.

The human body with great difficulty adapts to the modern conditions of life, although its adaptive capabilities are very great. However, they depend on several factors, including heredity, upbringing, working and living conditions, lifestyle, physical activity [6; 11]. When the adaptive abilities of a person are exhausted, the so-called diseases of civilization begin to develop: coronary heart disease, neurosis, vegetative dystonia, cancer, obesity, etc.

How can one explain the threatening increase in the number of cardiovascular diseases in highly developed countries and in Ukraine in particular? First of all, information overload and neuro-emotional stress are to blame. Or maybe the reason lies elsewhere? After all, modern man in most cases does not sufficiently train many mechanisms laid down by nature itself, does not stimulate the most important physiological processes. American scientist V. Raab, who studied the problem of atherosclerosis, in the early 60s of the XX century, called the heart of modern man "the heart of an active slacker" [12; 13].

Health is the result of the cumulative influence of many factors (economic, social, biological, pedagogical, etc.). Of course, in the complex of these factors, physical culture is assigned to one of the leading places. The basic position of medical ethics "Do not harm!", And the slogan of physical culture – "to develop, improve, strengthen, constantly improve!".

Now more than ever the problem of strengthening the health of the population with the help of physical culture. Physical culture and mass sports are of paramount importance in the general complex of

conditions that determine the optimal level of vital activity of the body of students [5; 10; 14].

Any movement, any muscular activity is not only energy, but also its accumulation. When a person goes, runs, jumps, performs exercises with dumbbells, he exercises on simulators, her breathing becomes quicker, the heart beats faster, the blood moves more intensively through the vessels, the body consumes more oxygen and is saturated with nutrients, that is, it returns itself to itself, but with excess, with interest. Some energy capital is formed, it provides even more energy expenditure at each next moment [3; 15].

The article discusses the problematic issues of modern education on the formation of health and physical education and sports competence of future highly qualified information technologies specialists.

2. Literature Review

The society, the higher school, has urgent tasks not only to introduce a competence-based approach to the field of education, new methods and technologies of education, but also to form and develop a steady desire among students to preserve and strengthen their health. After all, health is the very first, most important human need, which determines his ability to work and ensures the harmonious development of the personality. It is the most important prerequisite to the knowledge of the surrounding world, to self-affirmation and happiness of a person. The problem of preserving and strengthening the health of young people is important and is of paramount importance for society [1; 3; 4].

The problem of shaping the health of students' health preserving competencies is a very important task of the state and society. Every year, more and more health, health-preserving activity engaged into the educational process of all types and levels of higher educational institutions [2; 6].

An important factor in the preparation of future highly qualified specialists is quality education. The Law of Ukraine "On Higher Education" [8] states that "… The quality of higher education is a set of personality traits with a higher education, reflecting its professional competence, holistic orientation, social orientation and predetermines the ability to satisfy both personal spiritual and material needs and the needs of society".

In the State National Program "Education" (Ukraine XXI century) [7], one of the main tasks of the state is "... the development of creative abilities and skills of independent scientific knowledge, self-education and self-realization of the personality; training qualified personnel capable of creative work, professional development, mastering and implementing high-tech and information technologies competitive in the labor market", etc.

In state documents, in particular, in the Decree of the President of Ukraine dated February 9, 2016 No. 42/2016 "On the National Strategy for Improving Motor Activity in Ukraine for the Period up to 2025 "Physical Activity - Healthy Lifestyle - Healthy Nation" [16] specified that "The purpose of the National Strategy is to create conditions in society for improving motor activity and a healthy lifestyle in order to shape the health of citizens as the highest social value in the state".

Achieving this purpose involves the following main tasks:

promoting the creation of an all-Ukrainian fund for the development of motor activity and a healthy lifestyle "Active Ukraine is a healthy nation" with the aim of attracting extrabudgetary funds for the development of the material and sports base of mass sports and encouraging individuals, who have an adequate level of recreational motor activity, lead a healthy lifestyle and are characterized by a low risk of non-communicable diseases, properly take care of the health of their children;

formation of a value attitude of youth and young people to their own health, improvement of physical development and physical fitness, taking into account the requirements of future professional activities, etc."

3. Method

At the beginning and at the end of the academic year with the students of the experimental and control groups during the school day the state of mental capacity of young men-students was determined using the correction method (V.Ya. Anfimov, A.G. Ivanov-Smolensky) and chronograph (tapping test).

During the studies, the statistical significance of differences between the experimental and control groups was determined using Student's t-test, and the dynamics of the results in each of the study groups was also assessed.

3.1. Participants

To conduct the study, we identified the first-year students' educational groups of the State University of Telecommunications, divided into EG – 65 people and CG – 52 people. A total of 117 students participated

in the research.
The young men of the control group used passive rest for recreation, while the young men of the experimental group used active leisure in the form of physical exercise, micro-pause or physical training break, as well as additional self-study exercises with during free hours.

3.2. Materials

To conduct a study of the mental capacity of students during the school day and weekly training cycle, the correctional method was used (V.Ya. Anfimov, A.G. Ivanov-Smolensky). The test was conducted as follows: a letter table was laid before the student. Within one minute, the student had to look through the letters in each tape and cross out or underline certain letters. For example: underline the letter "a" and cross out the letter "e". The work began and ended with the teacher's signal. The number of letters scanned, and the number of errors made were taken into account.

With the help of the tapping test, studies of sensory-motor reactions characterizing the mobility of the nervous processes were carried out. The maximum frequency of movements of the hand of the primary hand depends on the functional state of the afferent and efferent pathways of the autonomic nervous system. To perform the test, it is necessary to draw a square of 10x10 cm on a piece of paper. A student sitting at the table and putting his hand on the table on command, not tearing the forearm from the table surface, with a pencil or ballpoint pen, puts dots with the maximum frequency in the intended square in any order within 10 seconds. Then counted the number of points. An indicator of the functional state of the motor sphere of the brain is the frequency of movements. The normal value of the maximum frequency of hand movements is 67-70 points in 10 seconds. In educational activities, the role of the time factor increases significantly due to the increasing demands for speed and accuracy of students' body reactions.

3.3. Procedure

The study of the pedagogical experiment continued throughout the academic year. During the experiment, the influence of active leisure on the mental capacity of students in the experimental group was determined. During theoretical classes at a certain time, students performed specially selected physical exercises in the form of a physical micro-pause or a physical fitness one. The duration of the exercise complex ranged from 20-30 seconds (physical micro-pause) to 50-65 seconds (physical training break). It has been established that the use of small forms of active leisure during theoretical studies during the school day effectively affects the improvement of students' mental capacity, confirmed by statistical certainty ($p < 0.05$-0.001).

4. Results

To form, maintain and strengthen the health of each student during the period of higher education, which accounts for the "peak" of functional maturation of the body, the stabilization of all its systems - the most important task of each higher educational institution, which is defined today by society and the state.
Indicators of the functional capabilities of the body and the physical qualities of young people in Ukraine compared to developed countries are at a low level, which is characterized by a tendency to accelerate the pace of aging of his body [3; 7; 8], an increase in various kinds of deviations in their state of health, poor physical fitness, an increase in the number of missed training sessions for the disease, an increase in the number of young men who, due to their state of health, cannot be recruited into the ranks of the Armed Forces of Ukraine, etc. Today, society cannot worry about the health of students. Annual medical examinations show that with each subsequent year, the number of first-year students with disabilities (Table 1) increases.

Table 1. *The dynamics of the disease young men of the 1st year of study of the State University of Telecommunications during the study period*

No.	Study period (academic year)	Students, %	
		Ill	Almost healthy
1.	2013/2014	45.0	55.0
2.	2014/2015	54.5	45.4
3.	2015/2016	54.4	45.6
4.	2016/2017	56.9	43.1

Thus, the data in the table indicate that the number of students who have had health problems during medical examinations is increasing every year.

Study and creative use of active leisure great importance in solving the problem of health promotion, increasing the efficiency of students of information technologies specialty at higher educational institutions, as well as extending their creative activity for many years, is acquired by. After all, I.M. Sechenov (1903) also drew attention to the fact that not a complete rest of tired muscles, but rest, is associated with the activity of another group of muscles, contributes to the greatest increase in efficiency.

Forced limitation of motor activity during mental activity of students reduces the flow of impulses from the muscles to the motor centers of the cerebral cortex. This reduces the excitability of the nerve centers, as a result, and mental capacity.

The study of changes in higher nervous activity under the influence of small forms of active leisure is of great importance due to the leading role played by the central nervous system and its highest section - the cerebral cortex in enhancing mental and physical performance.

In order to assess the impact of small forms of active leisure on improving the mental capacity of students, we used one of the simplest methods for studying higher nervous activity of a person, namely, the correction method (V.Ya. Anfimov, A.G. Ivanov-Smolensky).

The results of the study pedagogical experiment are given in tables 2-3. The obtained research data indicate uneven changes in indicators of young men.

So, if at the beginning of the experiment the young men of the experimental group had a decrease in the number of viewed characters in the Anfimov table with a slight increase in the third pair, the control group had a sharp decrease in the second pair of classes and an increase in the third. The number of viewed men of the control group on the third pair slightly exceeds the data at the beginning of the school day, but this is only a trend, not confirmed by statistical confidence ($p > 0.05$).

***Table 2**. Analysis of the study of indicators of higher nervous activity (Anfimov's table) of the first year students of SUT during the academic year (number of characters viewed)*

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	**M**	258.4	248.4	203.0	267.5	211.3	271.3
	± m	14.0	9.07	9.71	9.6	8.51	7.51
	t			4.67	2.05	4.20	2.76
	p			< 0.001*	< 0.05*	< 0.001*	< 0.01*
Control group	M	257.8	237.8	156.5	246.3	262.8	232.8
	± m	21.0	9.0	19.0	8.0	21.9	7.9
	t			5.06	1.0	0.23	0.59
	p			< 0.001*	> 0.05*	> 0.05*	> 0.05*
Comparative statistical probability between study groups	t	0.03	1.17	3.24	2.40	3.39	4.18
	p	> 0.05	> 0.05	< 0.01	< 0.02	< 0.001	< 0.001

** Comparison regarding the 1st pair of studies.*

***Table 3**. Analysis of the study of indicators of higher nervous activity (Anfimov's table) for young men of the 1st course of SUT during the school year (number of mistakes made)*

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	**M**	6.90	6.81	3.09	4.17	5.95	3.73
	± m	2.60	1.23	1.36	1.36	1.72	1.32

	t			1.92	2.04	0.43	2.42
	p			> 0.01*	< 0.05*	> 0.05*	< 0.02*
Control group	M	8.17	8.09	5.52	6.37	5.70	6.97
	± m	4.29	2.29	2.24	2.24	1.28	1.28
	t			0.81	0.76	0.89	0.62
	p			> 0.05*	> 0.05*	> 0.05*	> 0.05 *
Comparative statistical probability between study groups	t	0.36	0.72	1.35	1.22	0.16	2.49
	p	> 0.05	> 0.05	> 0.02	> 0.05	> 0.05	< 0.02

** Comparison regarding the 1st double lesson.*

Regarding the mistakes made when viewing the letter table at the beginning of the experiment, the young men of the experimental group made fewer mistakes on the second pair of training sessions, but on the third pair the number of errors slightly increased to 5.95 ± 1.72, whereas in the young men of the control group there is a noticeable slight decrease relative to the young men of the experimental group from 5.52 ± 2.24 to 5.70 ± 1.28. This improvement is insignificant and is not confirmed by statistical reliability; there is just a certain tendency towards improvement ($p > 0.05$). In general, during the school day, the number of viewed characters and the number of errors made at the same time occurred in waves - a decrease in the second pair and a slight increase in the third pair, although fewer errors than in the first pair.

By the end of the pedagogical experiment, the effectiveness of using small forms of active leisure to improve the performance of higher nervous activity of first-year students.

In particular, the number of viewed characters from the Anfimov table during the school day in the experimental group of young men increased from 248.4 ± 9.07 in the first pair of training sessions to 271.3 ± 10.5 in the third pair, as evidenced by the high degree of statistical confidence ($p < 0.01$). At the same time, in the control group of young men at the end of the school day there was a tendency to decrease the number of viewed characters (from 237.8 ± 9.0 to 232.8 ± 7.9; $p > 0.05$).

Regarding the mistakes made when looking at the table of Anfimov, then in the experimental group of young men from the first couple to the third one there was a clear trend of reducing the number of errors made, which is confirmed by statistical confidence ($p < 0.02$). While in the control group of young men, although a slight decrease in the number of errors was noted, only a tendency was noted, it was not confirmed by statistical certainty ($p > 0.05$).

The increase in the number of viewed characters and, at the same time, a decrease in the errors made over a certain time relative to the initial data of the young experimental group indicates a beneficial effect of active leisure on the functional activity of students' higher nervous activity. At the same time, in the young men of the control group, during the school day, under the influence of the training load, mental capacity decreased, as evidenced by the data in Table 3.

The positive effect of small forms of active leisure was observed in the analysis of sensory-motor reactions in the study groups during the school year (Table 4). At the same time, it should be noted that the indicators of sensory-motor reactions in the young men of the control group, at the beginning of the experiment, are significantly higher than in the young men of the experimental group, which is confirmed by a high degree of statistical confidence ($p < 0.001$). In our opinion, this indicates that the mental capacity of the young men in the control group at the beginning of the experiment was higher than that of the young men in the experimental group.

It should also be noted that the decline in mental capacity of young men in both groups of research occurred in waves: in the second pair, in both groups of research there was a tendency to improve the sensory-motor responses ($p > 0.05$), and on the third pair there was a rapid deterioration in sensory-motor responses in both the experimental and control groups ($p < 0.01$). The difference was only in dynamics. So, if in the experimental group the decrease occurred by 6 conventional units, in the control group - by 3.2. The deterioration of the indicators of the tapping test suggests that as a result of the development of fatigue processes during the school day, the functional activity of the afferent and efferent pathways of the students' autonomic nervous system deteriorates. And this in turn affects the efficiency of students' mental capacity.

Table 4. *Analysis of the study of indicators of sensory-motor reactions (tapping test) of young men of the 1st year of SUT during the academic year*

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	**M**	68.9	78.7	70.7	85.7	62.9	87.5
	± m	2.21	2.15	2.03	1.83	1.98	1.78
	t		4.49		7.77		13.0
	p		< 0.001		< 0.001		< 0.001
Control group	M	80.1	77.1	81.2	78.2	76.9	75.3
	± m	2.18	2.13	2.35	1.60	1.72	1.53
	t		1.86		1.52		0.98
	p		> 0.01		> 0.05		> 0.05
Comparative statistical probability between study groups	t	5.11	0.74	4.79	4.38	7.56	7.39
	p	< 0.001	> 0.05	< 0.001	> 0.001	< 0.001	> 0.001

By the end of the school year, the young men of the experimental group had a noticeable increase in the indices of the sensory-motor responses throughout the school day, while the young men in the control group had a decrease in their numbers, which indicates a steady trend towards an increase in fatigue processes, and this in turn influenced the decrease in students' mental activity, although this was not confirmed by statistical probability, but only a tendency was observed. At the same time, in the young men of the experimental group, the indicators of sensory-motor responses increased throughout the school day. In our opinion, this is an action of small forms of active leisure (physical culture pause, physical training break), which is more effective than passive rest, which was used by students of the control group.

In particular, comparing the study groups at the end of the school year show the following: if the average pair of young people in the experimental group was 78.7 ± 2.15 movements in 10 seconds in the first pair of classes, in the second pair - 85.7 ± 1.83, then already in the third pair of classes, this figure was already 87.5 ± 1.78 movements in 10 seconds. In the young control group, the average rate was 77.7 ± 2.13 movements in 10 seconds in the first pair of classes, 78.2 ± 1.60 in the second pair, and the third pair experienced a sharp decrease to 75.3 ± 1.53 movements in 10 seconds.

If we compare the results of the study of sensory-motor reactions during the school year between the experimental and control groups, then at the beginning of the experiment there was a significant advantage of the young men of the control group, which is confirmed by the statistical confidence ($p < 0.001$), and already at the end of the school year, the indicators of the young men of the control group were significantly worse than those of the young group of the experimental group, as evidenced by a high degree of statistical confidence ($p > 0.001$).

5. Discussion and Conclusion

Health should be one of the top priorities among the many values of today's youth. Any work performed without interruption to rest contributes to the development of fatigue and a decrease in the functional capabilities of the body. If, despite fatigue, a person continues to work, an overstrain of the body may develop, it is not always safe for human health. Mental work is also associated with significant loads on the higher parts of the central nervous system and mental functions of the human body.

Forced limitation of motor activity during mental activity reduces the flow of impulses from the muscles to the motor centers of the cerebral cortex. This reduces the excitability of the nerve centers, as a result, and mental capacity.

The absence of muscle tension and mechanical compression of the blood vessels of the posterior thigh surface while in a sitting position decreases the blood circulation intensity, and the blood supply to the brain deteriorates, thus making it more difficult to function. There is a feeling of fatigue caused by intense mental work and a long stay in a monotonous working posture that occur in the body [1; 2; 17].

To eliminate them, you need a rest. Therefore, the alternation of periods of work and rest - a necessary condition for increasing productivity. It is known that the most effective recovery occurs during active leisure. You can activate it with the help of specially selected physical exercises [3; 13].

The most deeply developed mechanism, the stimulating influence of one of the forms of motor switching, was first recreated by I.M. Sechenov (1903-1904) and hereinafter referred to as the Sechenov's phenomenon of active leisure. It is known that in special experimental conditions, under the influence of such a switch, the recovery process of muscular working capacity can be significantly accelerated.

The facts of high efficiency of active leisure as a method of accelerated rehabilitation in many types of mental activity are known to date. In particular, E.G. Bulich, Yu.V. Boyko and E.K. Redko (1973) proved that under the influence of a short physical activity pause during hard work, different sides of mental performance change differently: the ability to respond quickly with a motor response to the appearance of a simple stimulus in the field of view is significantly increased, the ability to perform complex operations related to information retrieval requiring attention is somewhat less improved.

Active leisure is important for increasing mental performance, increasing neuro-psychic stability to emotional stress during the whole academic year, and in particular, during the session.

Analysis of literary sources showed that coverage of the issues of using metered physical loads during the school day and during extracurricular time of students and their impact on physical and mental performance is insufficient and requires additional scientific and pedagogical research.

In the course of the research conducted during the studies of first-year students of the SUT, it was found that by changing the content of active leisure, that is, specially selected for physical training break and physical culture micro-pause of exercise, you can purposefully influence the increase in the functional activity of the central nervous system and the whole organism, and thus influence the mental performance of students in accordance with the specific requirements of educational activities.

Comparing the performance of both groups of the study, a statistically significant advantage of the proposed method was observed using small forms of active leisure during the school day (physical micro-pause, physical training break) in relation to the passive rest of students in the control group.

So, the educational process in a higher educational institution must be built in such a way as not only to provide students with a certain amount of knowledge, but also to form their health preserving competence. Formation of the health preserving competencies of students of higher professional education is considered by us as a complex integral process characterized by the presence of knowledge and skills, health preserving activities necessary for the implementation of health, contributes to the self-development, self-education of students, their adaptation in a changing external environment and the effective acquisition of professional skills in a holistic educational process of higher educational institutions of information technologies.

Indicators of functional capabilities of the body, performance, physical qualities and motor abilities of young people in Ukraine compared with developed countries are at an insufficient level, which is characterized by a tendency to accelerate the pace of aging of their body [3; 10; 13; 17], an increase in various kinds of deviations in their state of health, poor physical fitness, an increase in the number of missed training sessions for the disease, an increase in the number of young men who, due to their state of health, cannot be recruited into the ranks of the Armed Forces of Ukraine, etc. [11; 13; 15].

Thus, the obtained results of the study testify to the unconditional positive influence of small forms of active leisure (physical training break and physical micro-pause) during the school day on the functional activity of the higher nervous system of the young men of the experimental group, as a result it contributes to improving the mental performance of the young men of the experimental group.

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Exploring Facilitators of Getting a Vocation in People with Substance-Related Disorders: A Qualitative Study

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Abstract

Introduction: Employment in people with substance abuse disorders, as well as in the general population, is important and is a major part of the recovery process in these patients. However, gaining and retaining jobs in these people is a challenge and few of them succeed in this process.

Methods: This was a qualitative study conducted on 13 Iranian patients with a Substance-Related Disorders, using semi-structured, in-depth interviews, and content analysis in 2018.A purposive sampling method was used until reaching data saturation, and then the collected data were analyzed using a content analysis method.

Results: The results of the study indicated the facilitating factors for obtaining a job in people with drug-related disorders. The extracted concepts include seven categories of key concepts of job facilitator, such as Documents and permissions, Background and previous job skills, family and community support, social organizations support, Incentives to earn a job, Increase self-awareness and transparency of job values.

Conclusion: The results of the study showed that the use of substances for individuals would result in different occupational outcomes, and the person will be faced with a challenge in the context of facilitating the acquisition of a job. Understanding the facilitators of finding a job can help educate and support these individuals and their families.

Keywords: Vocation, Facilitator, Drug Related Disorders

1. Introduction

Addiction is a complex mental disorder (Degenhardt et al., 2008), Recurrent, and chronic with significant complications and mortality (Jacobsen, Hutchinson, & Mustafa, 2016), Which is defined by preserving the search habits of the substance in spite of undesirable consequences and having a compulsory nature in substance use (Koob, 2009), The physiological pathology of addiction is still unknown and is characterized as a set of behavioral symptoms (Belin-Rauscent, Fouyssac, Bonci, & Belin, 2016), And like any other disorder, you need to manage the treatment over time (Termorshuizen et al., 2005).

Relationship between vocation and the treatment of addiction is a reciprocal relationship in which both vocation can affect the reduction of drug use and its treatment, and successful treatment leads to the person being employed after treatment. In this regard, a background review suggests that unemployment leads to poor treatment outcomes such as abandonment of treatment, more drug use during treatment, and higher recurrence rates (Ginexi, Foss, & Scott, 2003). Webster, Staton-Tindall, Dickson, Wilson, & Leukefeld (2014) In their study, there was a significant positive correlation between job status and survival in treatment. In another study by Ti & et al., (2015), the results showed that the first and most significant factor associated with leaving the treatment was the lack of fixed occupation. Unfortunately, standard drug treatment has little effect on the outcomes of occupational patients (Melvin, Davis, & Koch, 2012); in other words, employment is not a priority in most drug treatments, which leads to instability of treatment in this crowd.

On the other hand, although employment is positively correlated with other indicators of treatment, drug abusers often face barriers to finding and maintaining jobs. In other words, people who have a history of drug use, often after months, and sometimes years, avoid substance abuse (Laudet, & White, 2010). Regarding the relationship between occupation and the treatment of addiction, it is necessary to pay special attention to the occupational status of people with substance abuse disorders and to identify the factors that help a person to acquire and maintain a job; this helps them Staying in a state of health and returning to major tasks related to occupational, educational, or family roles. On the other hand, because employment is a phenomenon that occurs within a cultural and social context, and in this environment, social, economic, and business beliefs interact with one another, so doing a qualitative study based on the experiences of people with drug-related disorders Identifying obstacles and facilitators of obtaining and retaining a job is necessary.

2. Tools and research methods

2-1. Research design

The present study is a qualitative study using content analysis method and the research data were obtained using a semi-structured interview with 13 Iranian patients with substance abuse disorders. Given that the purpose of the study was to extract barriers and facilitate the acquisition and preservation of occupations in people with drug-related disorders, the qualitative approach was a suitable method for this study because this approach can provide a deep insight into the experiences and perceptions of individuals and It also helps clarify the hidden aspects of the subject and is, in fact, a way of observing and understanding reality from the perspective of others. Content analysis is a qualitative approach for linking data to a main topic, and its final product includes concepts and classes that describe the subject under study. Therefore, content analysis was appropriate for this study, which sought to provide descriptive classes of facilitators of the acquisition and preservation of occupations in people with drug-related disorders (Pope, van Royen, & Baker, 2002).

2-2. Sampling

The participants in this study were selected using purposeful sampling from different age and educational groups and had different experiences and jobs in their life. Despite the history of drug use, they were successful in their lives and were considered as successful members of the community; based on clear evidence, they had different achievements, including returning to the family, full-time, success in the workplace and Life, or permanent voluntary activities. The reason for choosing a targeted sampling was to select items that have a rich experience in the process of obtaining and retaining a job. Sampling continued until data saturation.

2-3. Data collection and analysis

A semi-structured interview was used to collect data. Data were also collected directly and without any presupposition. Codes and classes were obtained using a deductive process and concepts were developed based on their features and dimensions (Corbin, & Strauss, 2008). Before the interview, the study's purpose was explained to the participants and their written or oral consent was obtained for participation in the study. All interviews were fully recorded and rewritten word by word. Interviews lasted between 30 and 90 minutes, and an interview was held with each participant. If necessary, interviews were conducted to complete the information and eliminate the doubts, and a total of 15 interviews were conducted. Interviews began with general questions such as "Your Life After Drug Dependence" or "What Factors Help You Dispose of Drugs". The following questions were developed based on previous questions and gradually became more in-depth. Purposive sampling continued until saturation in any sense, so that more data did not lead to new information about concepts. In this qualitative study, a qualitative content analysis was used as a research method for data analysis and a systematic classification was used for identifying and encoding concepts. The process of interviewing and analyzing data was done simultaneously. Before the data was encoded, the content of the interview was read several times in order to understand its general meaning, then the content was divided into the hidden meaning units, after which the abstract meaning units and codes were assigned to them, the main codes Connected to underlying classes and classes based on similarities and differences, finally, after encoding and ensuring accuracy in their encoding and classification, concepts were identified.

2-4. Validity and Reliability

To increase reliability and reliability, the following measures are taken:

- The researcher has worked with data for a long time to achieve data saturation
- The members of the research team independently examine the data and then collate, classify, and finally compare each other (peer review)
- A summary of the preliminary results of the study was given to the participants to ensure that the results of the research are consistent with their experience (reviewed by the member)
- The coding and classification processes are controlled by the specialists who have led the study (reviewed by the specialist)
- All steps are documented for other researchers to be applicable to research.

2-5. Moral considerations

The present study is adapted from the researcher's doctoral dissertation and approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences. In the interviews, the purpose and methodology of the research were explained to the participants and received written or oral consent, and they were assured that their personal information remained confidential and the quotes were selected in such a way that the identity Do not disclose them. In addition, participants were allowed to leave the study at any time they wanted.

2-6. data analysis

Qualitative content analysis method was used to analyze the data. For data analysis, the interviews were first recorded and rewritten in word, then the content of the interviews was carefully read in order to understand the general meaning, and then the content was divided into semantic units. The codes were extracted by an arbitrary process through open coding by reading the line-to-line semantic units and assigning related codes to them. Then they came up with constant comparison of codes, subclasses, and classes. To achieve an agreement on coding, a consistent comparison and review was used by the research fellow. Finally, different concepts were identified by completing the coding and ensuring the correctness of their coding and classification.

3. Results

The participants included 13 patients (11 males and 2 females) with drug-related disorders, which were successful in obtaining and retaining their jobs after leaving the drug. They were between the ages of 31 and 58, with an average age of 42. Participants differed according to the time of drug withdrawal, and the mean time of non-consumption was 3 years. Table 1 shows the details of the demographic profile of the sample. The results of data analysis on the obstacles and facilitators of obtaining a job in people with drug-related disorders revealed seven main concepts, these concepts and other related concepts are shown in Table 2. The concepts are as follows are:

3-1. Documents and permissions

According to the opinion of the participants in this study, one of the most important issues in the process of obtaining a job and promoting the job, the amount and type of documents and permits received by the individual. Frequently asked questions from the person asking for the job, the degree of education, the type of skill, the certificate of service, or the certificate of his certificate. It can be said that the documents and permits received by the individual somehow make it possible to display the person's abilities in the eyes of others. In this regard, the participants were able to be recruited on the basis of evidence of completion of service or a degree and skill. According to the opinion of the participants in this study, one of the most important issues in the process of obtaining a job and promoting the job, the amount and type of documents and permits received by the individual. Frequently asked questions from the person asking for the job, the degree of education, the type of skill, the certificate of service, or the certificate of his certificate. It can be said that the documents and permits received by the individual somehow make it possible to display the person's abilities in the eyes of others. In this regard, the participants were able to be recruited on the basis of evidence of completion of service or a degree and skill. In this regard, one of the participants who has been able to hire a job in his favorite job due to a degree, stated “Most companies wanted a resume to hire me, and I wrote a resume, and I was interviewed in some places, or I did not continue to work because of the form of work or benefits, until I thought of a company that was looking for an electrician, it was so special

that my first entry was to have a degree in Bachelor". Therefore, it can be admitted that having a degree and a license to do business activity is one of the most important facilitators of obtaining a job in people with substance abuse disorders after their improvement.

3-2. Background and previous job skills

When a patient is looking for a job with a job experience, the chances of finding a job are higher. In cases where the job was not related to a person's work experience, the work practices learned in previous jobs have partly facilitated the process of obtaining a job. On the other hand, previous experiences of the person with regard to the sex, work hours, labor rights and benefits, and the atmosphere of the work environment have created experiences that have influenced the shaping of the next steps in the patient. For example, the sex of some occupations is such that it does not require much responsibility or is not matched with the physical capacity of patients. On the contrary, some physical and mental tasks were easy to accomplish, but the person was discontented from having such a job, so they included these experiences and work experience in the next job. One of the contributors said that "I used to be a mechanic before I was in high school, and then I saw a car training course for a year. This educational experience led me to get the job done after completing my job license and start the work with our friend who we had trained with and shop".

3-3. Having family and community support

One of the most important facilitators for obtaining a job and promoting a job in people with substance abuse disorders is the feeling of support from the family and the people around them. Providing the right support from the family and people around them, and helping with the individual, has greatly affected the passage from the unemployment crisis, social acceptance, taking on the role of the job and moving toward job growth. The findings indicated that in the Iranian context, family members were often closely interlocutor and had a supportive atmosphere on the lives of and on the patient. The family's supportive atmosphere appears in a variety of ways, such as financial, emotional and even psychological support. In this regard, a participant who was supported by his father said about his experience "Because my situation was very bad and my dad wanted to help me, I offered you a job. I was in a storehouse, then I trusted me. I sent the market to buy and sell my work. It was a huge help, which made me feel proud and self-confident".

3-4. Social Organizations Support

According to the findings, government-sponsored treatment and rehabilitation organizations such as the Welfare Organization, the Headquarters for Combating Substances, the Ministry of Health and other organizations involved in employment such as the Ministry of Welfare and Social Security with financial support, the expansion of employment and legislation to improve the employment of these patients Have tried. Regarding the support of organizations, one of the participants said, "When I was fired due to irregularities and inability to work in my company because I did not have any shelter, I went back to the labor office and filed a case where I worked with them until finally I had a long I get unemployment insurance".

3-5. Incentives to earn a job

One of the most important facilitators emerging from the participation of individuals in the research was the individual's motivation to work and have a job. These motivations for work, in fact, were the perception that patients had inferred from having a job. Understanding these motivations depended on what roles and responsibilities the participants had in their personal lives. Individuals with comparative financial security and family support emphasized most of the non-financial resources. On the other hand, for financiers who were considered to be breadwinners or family members, the financial dimension was more visible, while for some contributors, social incentives were more significant. One of the contributors expressed his motivation for employment as "We are constructive, committed and responsible in the workplace, working for us as a social identity because we take on a role and enter the community".

3-6. Increase self-awareness

Awareness is a basic concept in gaining a job and career advancement, and it is defined as a relatively correct and complete perception of individuals of their characteristics and their environmental

characteristics. Some contributors highlighted how to access and use self-knowledge to select jobs and shape their career progression. In their view, one of the important principles for correct encounter with the challenge of employment or lack of career development is to have a proper knowledge and understanding of their abilities and weaknesses. One of the participants in the experience described the need to increase self-awareness to facilitate the job, "In fact, the first help I can afford is to know what I have to know, to know myself, I decided on my own self-knowledge. Whatever job I choose, I need to know how the progress will be, so I tried to get to know myself as soon as possible".

3-7. Transparency of job values

One of the most important facilitators of choosing the right occupation and progress in that job is to find out what their job values are. They believed that they could compensate for their lack of skills in the new job or, in order to advance their jobs, to give them the opportunity to experience the desired job, but if they had different values with the organization or company they were employed, In that environment, it is very difficult and annoying; and since the organizational values of the organization form the core of organizational culture, it is necessary to balance the values of individuals with the organizational values they are engaged in. Convergence of values helps an organization in its entirety to fulfill its mission, and individuals in that organization will excel and experience career advancement. One contributor was quoted in this regard, "I had to know my career goals to resolve the issues and the various situations that I encountered. Identifying my country would determine my course of action, and I came up with the issues ahead of me. I should know what my values for life and work are, what do I believe?".

Table 1: Demographics of participants

code	Sex	Age	education	Status Employment	Marital status
1	male	57	Diploma	Employed	Married
2	male	43	Diploma	Employed	divorced
3	male	36	Diploma	Unemployed	Married
4	male	40	Associate	Employed	Married
5	male	58	Diploma	Unemployed	divorced
6	male	31	Diploma	Employed	Married
7	male	33	Diploma	Employed	Single
8	male	35	Bachelor	Employed	Married
9	female	55	Diploma	Employed	divorced
10	female	40	Diploma	Employed	divorced
11	male	38	Bachelor	Employed	Married
12	male	42	Bachelor	Employed	Married
13	male	38	Bachelor	Employed	Married

Table 2. Outline of the identified facilitators and their subcategories

Extracted concepts (classes)	Related concepts (subclasses)
Documents and permissions	1) Proof of military service 2) Driver's license 3) Education degree 4) Skills degree 5) Employment license
Background and previous job skills	1) Successful business experiences 2) Professional training 3) Previously acquired skills
Having family and community support	1) Psychological support 2) Financial support 3) Social support 4) Job support
Social Organizations Support	1) Assist in earning a job 2) Supporting a job 3) Granting self-employed facilities 4) Receiving unemployment insurance
Incentives to earn a job	1) Earning money 2) Earning independence 3) Formation of family 4) Obtaining identity and social acceptance 5) Feeling helpful 6) Earning social status 7) Changing negative attitudes of others 8) Remaining in the recovery path
Increase self-	1) Self-knowledge to identify the path of career progression 2) Identify the

awareness	strengths and weaknesses 3) Understand your characteristics to help control communication and success in the workplace 4) Know your needs
Transparency of job values	1) Identify the priorities of working and working 2) Identify the red line for work 3) Identify the beliefs and beliefs associated with employment 4) Review the job values of successful people 5) Explore the differences and similarities of their job values with the group Something

4. Discussion and Conclusion

The purpose of the present study was to investigate the facilitators of occupation in Iranian people with drug-related disorders. Employment for the majority of people in the community has two main motivating factors: the obvious motivators pointing to the financial benefits of employment, and the hidden motivators that relate to social participation, mental health, and the growth of individual identity (Gill, 1999). The two groups are interconnected so that their separation is unreasonable, because the identity of the non-worker can affect his or her employment (D'Abate, 2005). Our findings showed that people with drug-related disorders also have the same motivators.

Many contributors to the study pointed to financial and employment income. Studies show that having more financial means can better balance their activities (Leufstadius, Eklund, & Erlandsson, 2009), as well as by upgrading their quality of life and meeting their own and family needs (Ellison, Russinova, Lyass, & Rogers, 2008). From non-financial point of view, contributors insist on gaining identity and social acceptance, gaining independence, gaining social status, changing the negative attitudes of others, feeling of being helpful, and forming a family, and that they do not want to be humiliated, accused of being overcrowded and dependent These findings are consistent with other studies (Borg, & Kristiansen, 2008).

Patients also looked at employment as a way to deal with the disease. Undoubtedly, as the studies show, employment for people with substance-related disorders helps to overcome their emotional problems (Provencher, Gregg, Mead, & Mueser, 2002), or some of their psychiatric symptoms (Kennedy-Jones, Cooper, & Fossey, 2005); the acquisition of such an ability in turn acts like an internal force and speeds up recovery (Auerbach, & Richardson, 2005). Also, the level of education, skills, and work experience of the participants sometimes gave them a job pathway and sometimes led to the entry of the patients into the job market. These findings are in line with the results of previous findings; for example, Ellison et al. (2008) states that work experience is a guarantee of having a subsequent occupation for the patient, since it helps to increase the work capacity, behaviors and interventions associated with high employment and subsequently, one has the chance to enter the next job.

Also, the element of the family and surrounding people is the first steps in the process of obtaining a job. In the process of acquiring a job, it was seen that the family also meant different forms of patient employment, and this concept forms the next steps in the family. This finding, in contrast to Corbiere et al., longitudinal study (2005), found that patients who received more family allowances had less time to work because, in this context, patients looked at their family as a solution to their problems and subsequently grow Social and their independence have been reduced. In contrast, other studies, similar to the findings of the present study, show that when a family provides a relaxing and supportive environment for a person and mentions his efforts to work with admiration and respect, the stress associated with work in a person has fallen, For the sake of having a better sense of performance and higher performance, he cares for his job (Rosso, Dekas, & Wrzesniewski, 2010).

Participants aligned their needs through their self-knowledge and organization's expectations, interdisciplinary between their capabilities, self-awareness and understanding of the organization's environment. Horton-Deutsch, & Sherwood (2008) consider self-awareness and understanding of the organization's environment as the basis of all competencies in the performance of individuals in the workplace. Participants in Halfer Research (2009) found that after a career change, they started a new career that was associated with a new sense of self and organization as a professional.

Another concept that emerged in the process of obtaining jobs was the clarification of work values. In other words, it can be said that by gaining experience and expanding the job opportunities of the participants, their dependence and value creation towards the organization increased. These job values led to a duplicate effort to increase the occupational capabilities of people with drug-related disorders. Participants engaged in engagement with work and self-streaming in the process, designing the foundation for success and discovering capabilities for the development of job opportunities. In fact, contributors during the clarification of job values provided conditions that could assess the benefits and limitations of different

practices and beliefs about work; their belief was that if realistic understanding of work was achieved, acceptance of responsibility and value It would be easier to put things in perspective, they would have realized that people who have certain occupational values and practices would be more likely to be attracted to some of their work than others, and their success in the chosen job would be more likely.

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Conflict of Interest
There is no conflict of interest to be declared.

Authors' contributions
All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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The Hildebrant Index in Adolescent Students While Studying at Various Universities

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Abstract

The article is aimed at giving the assessment of the inter-relationship of the cardio-respiratory sphere of the adolescent students while studying at various universities of Tyumen on the values of the Hildebrant index. A survey was carried out in 105 adolescent students (18-22 years old) studying at three universities in the city of Tyumen. The study of heart rate (beats/min) and the number of breaths (once a minute) in the state of physiological rest by means of palpation method allowed calculating the Hildebrant index. Studies have shown that the values of the Hildebrant index testified to normal intersystem ratios, because its value in young men of different ages ranged between 2.8 and 4.9. No evidence of the mismatch in the activities of visceral systems of adolescent students was found. Students were assigned to the main medical group, which allowed them to attend various sports sections.

Keywords: universities, young men of 18-22 years old, the cardiorespiratory system, the Hildebrant index.

Introduction

The problem of studying the health of various contingents of the population of our country, including students, as well as rational approaches to its assessment, remains relevant for several decades [1, 8]. An exercise tolerance marker is the cardiovascular system [9], in particular the heart rate [3, 14].

In recent decades, a decrease in the state of students' health is marked [2, 7, 13]. At present, it is proved that already at the beginning of studying at the university functional changes in the body of students at different levels of organization, from cellular to organismal, arise. At the same time, violations in the activity of the cardiovascular system are revealed, indicating a change in the adaptation mechanisms of the human organism to the increased both psychological and physical loadings [4, 10, 11].

There is no doubt that an objective indicator of intersystem relations in the human organism is the Hildebrant index [5, 6, 12, 15].

In this regard, the study of the functional state of the cardiorespiratory system and the features of its regulation in healthy young people studying in various specialized universities is of great scientific and practical interest.

The aim of the research was to give the assessment of the inter-relationship of the cardio-respiratory sphere of the adolescent students while studying at various universities of Tyumen on the values of the Hildebrant index.

Methods of research

The study of the Hildebrant index was conducted in 105 young students studying at three universities. 41 people were examined in the Northern Trans-Ural State Agriculturl University (NTUSAU), 26 – in Tyumen State University (TSU), 38 – in Tyumen State Medical University (TSMU) of the Ministry of Health of the Russian Federation.

When allocating age groups, the "Scheme of age periodization of human ontogenesis" was used, adopted at the VII All-Union Conference on the problems of age morphology, physiology and biochemistry of the USSR Academy of Pedagogical Sciences of the USSR (Moscow, 1965). Two weeks before the examination, none of the boys smoked or consumed strong drinks.

The heart rate was calculated by the palpation method on the radial artery for one minute while sitting in a chair for 5 minutes. Calculation of the number of breaths was carried out in such a way that the subject did not know about it. The calculation of the Hildebrant index is carried out according to the

formula: Hildebrant index = heart rate: number of breaths.

The value of the index ranging from 2.8 to 4.9 testifies to the normal intersystem relations, the deviation from which expresses the degree of mismatch in the activity of visceral systems [6].

The results of the study were processed on a personal computer using modern electronic programs (STATISTIKA). The analysis of the material was carried out on the basis of mathematical calculations with the calculation of the arithmetic mean, the error of the arithmetic mean, the mean square deviation. The assessment of the significance of differences was carried out using t – criterion of Student.

The study complied with the Order of the Ministry of Health of the Russian Federation No. 226 of June 19, 2003, "On Approving the Rules of Clinical Practice in the Russian Federation". The principles of voluntariness, individual rights and freedoms guaranteed by Articles 21 and 22 of the Constitution of the Russian Federation, as well as the Order of the Ministry of Health and Social Development of Russia No. 774n of August 31, 2010 "On the Ethics Council" were observed. The study was conducted in compliance with the ethical standards set out in the Helsinki Declaration and the European Community Directives (8/609 EC) and was approved by the local Ethics Committee of the Northern Trans-Ural State Agricultural University.

Results and discussion

The study of heart rate and the number of breaths in young men between 18-22 years old of various universities in a state of physiological rest in a sitting position (Table 1) indicated that they do not go beyond the age-normative physiological values.

Table 1. Indicators of heart rate, number of breaths and the Hildebrant index of young men between 18-22 years old of various universities in Tyumen (M±m)

University	Indicator		
	heart rate	number of breaths	Hildebrant index
18 years old			
NTUSAU	76,6±1,8	18,4±1,7	4,1630
TSU	75,2±1,7	18,3±1,6	4,1093
TSMU	79,2±2,0	19,0±1,7	4,1684
19 years old			
NTUSAU	76,2±1,8	17,7±1,6	4,3051
TSU	75,0±1,7	17,6±1,5	4,2373
TSMU	78,6±1,9	18,2±1,6	4,3187
20 years old			
NTUSAU	75,4±1,7	16,9±1,4	4,4615
TSU	74,8±1,8	17,1±1,5	4,3743
TSMU	77,5±1,9	17,8±1,6	4,3539
21 years old			
NTUSAU	74,6±1,7	16,3±1,3	4,5767
TSU	73,9±1,8	16,2±1,3	4,5617
TSMU	77,2±1,9	17,4±1,5	4,4368
22 years old			
NTUSAU	73,7±1,8	16,1±1,2	4,5776
TSU	73,1±1,7	16,1±1,2	4,5404
TSMU	76,9±1,8	17,2±1,3	4,4709

Any significant age differences in heart rate between students of different specialized universities were not found ($p>0.05$). It is noteworthy that only students of TSMU have more frequent heart rate in comparison with their peers studying at other universities. So, in particular, the heart rate of students of TSMU at the age of 18 years old was 2.6 beats per minute more frequent in comparison with students of NTUSAU, 4 beats per minute higher compared with the peers from TSU.

It is noted that as the passport age increases, the heart rate becomes less frequent. So, for the period from 18 to 22 years old the heart rate of students of NTUSAU became less frequent by 2.9 beats/min, among students of TSU by 2.1 beats/min, among students of TSMU by 2.3 beats/min (Fig. 1).

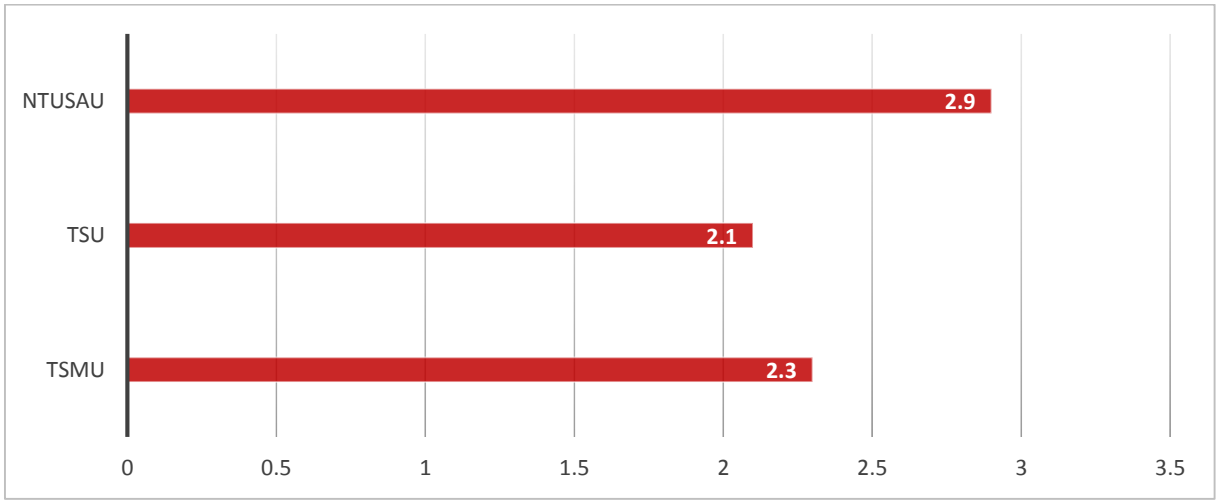


Fig. 1. Age-related changes in heart rate of students of different universities for the period from 18 to 22 years old

During the period from 18 to 22 years old the number of breaths of all students tended to decrease. Thus, the number of breaths in absolute values of the students of NTUSAU became less by 2.3 times, among the students of TSU by 2.2 times, among the students of TSMU by 1.8 times (Fig. 2).

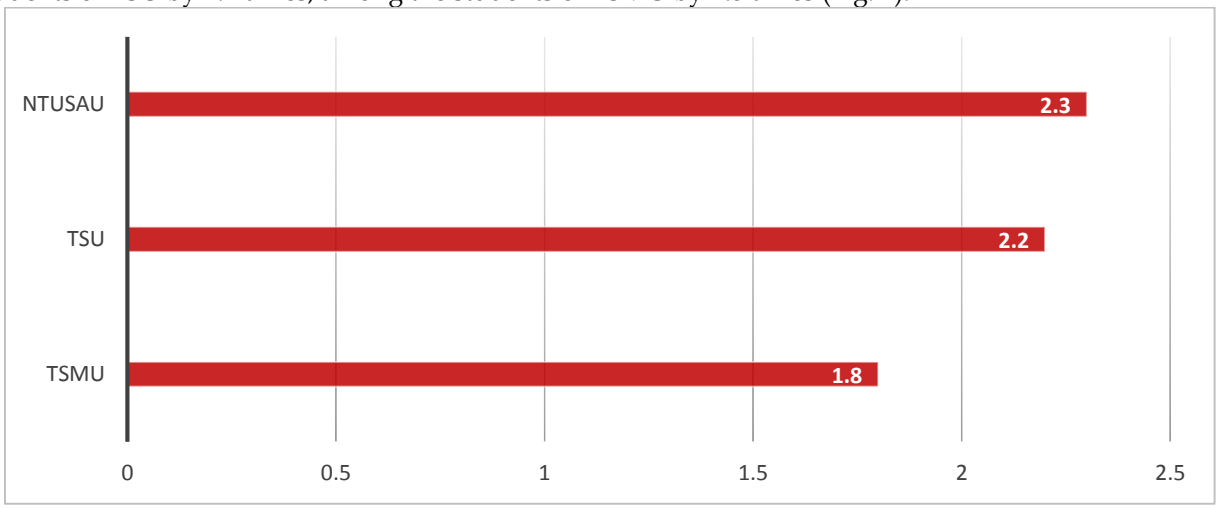


Fig. 2. Age-related changes in number of breaths of students of different universities for the period from 18 to 22 years old

Studies have shown that the calculated values of the Hildebrant index testified, firstly, to the normal intersystem relations, because the value of the index was within 2.8-4.9. Secondly, there are no signs indicating a mismatch in the activity of the visceral systems in adolescents aged 18 to 22 years old. Third, as the passport age of all students increased, the Hildebrant index tended to increase in numerical values (Fig. 3), which also testified to the good functionality of the cardiovascular and respiratory systems.

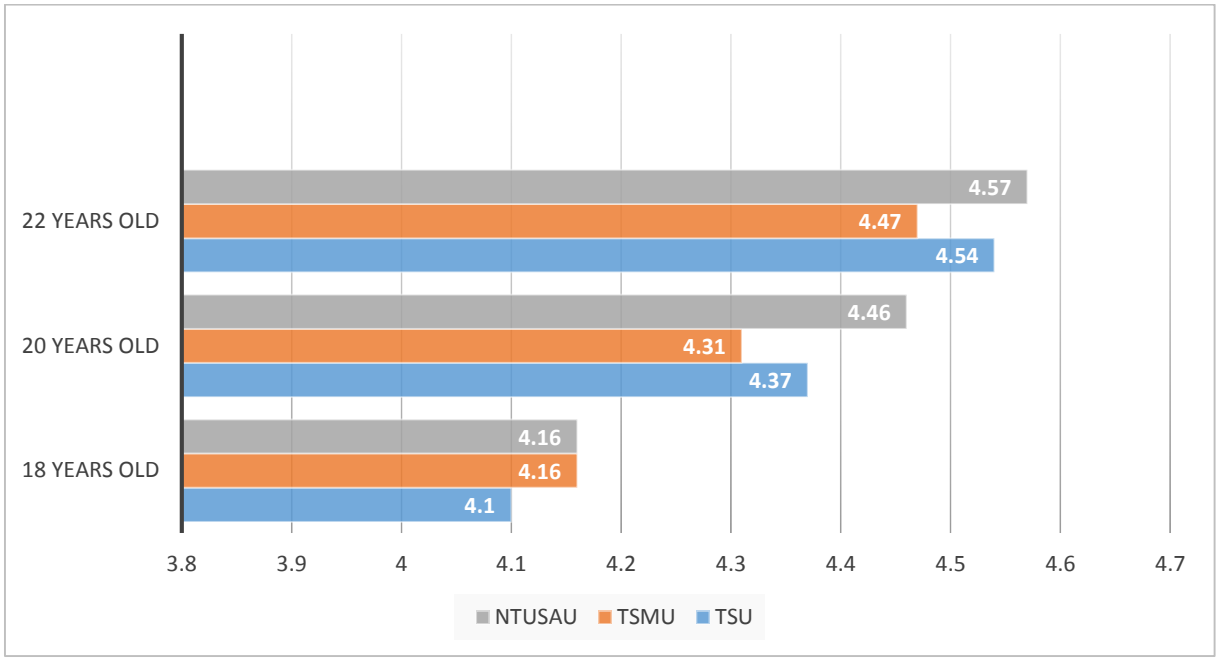


Fig. 3. Age-related values of the Hildebrant index of students of different universities

Discussion and conclusion

Thus, on the basis of the completed study, it can be concluded that the calculated values of the Hildebrant index in male adolescents studying at various Tyumen universities, studied in a state of physiological rest, indicate normal intersystem relations, because its value is within 2.8-4,9. None of the young men showed signs of a mismatch in the activity of his visceral systems, which allowed them to be included for health reasons in the main medical group with the opportunity to engage in various sports sections.

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The Effect of Eccentric Strength and Depth Jump Training on Strength, Vertical Jump, and Modified Y Balance on Male Basketball Players

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Abstract

Aim; The aim of this research is to examine the effect of eccentric strength and depth jump training on strength, vertical jump and dynamic balance levels of male basketball players.

Material and Method; 32 voluntary participants, 15 experimental and 17 control, were included in the research. A training program which includes eccentric strength program (between 70-85% of 1 RM and 3 sets x 8-12 repeat, 1 sec concentric-3 sec eccentric contraction in each repeat) and depth jump (depth jump over boxes of 20 cm, 40 cm, 60 cm between the 2nd and 8th weeks) were included to the preseason basketball training of participants in the experimental group for 8 weeks and as three times a week. Participants in the control group continued their in-season basketball training. Before and after the training period, the balance (Modified Y Balance Test), vertical jump and isometric leg strength of both groups were recorded. Repeated Measure ANOVA was used in the statistical analysis of the obtained data.

Findings; When the interaction level between the measurement and group x measurement of the experimental and control group was examined, a statistically significant increase was observed in favor of the experimental group in the right leg modified Y balance test, leg strength, and vertical jump values. According to the simple effect test of the experimental and control group, the qualitative difference in leg strength, vertical jump and right leg modified Y balance test values were statistically significant. While the left leg modified Y balance test was significant in favor of the experimental group, the improvement of the control group was not significant.

Result; The obtained results indicate that the eccentric strength training that is included in the preseason training of participants positively affects their performance.

Keywords: Dynamic balance, eccentric strength, basketball

1. Introduction

When a muscle is activated to create a force, the muscle length may shorten, stretch, remain stable or resist against stretching. During the eccentric contraction, the stress on the muscle is higher than the strength that the muscle can produce and thus it provides a controlled stretching. At this point, eccentric strength has the meaning of the strength that can be produced during the eccentric muscle movement (Kraemer, Fleck, & Deschenes, 2012). Eccentric contractions or commonly known as negative contractions are the negative form of a concentric movement, that is, the opposite of the process. While performing an eccentric action the joint and the location of the extremity usually get back the starting point (Bompa, Pasquale, & Cornacchia, 2013).

Eccentric muscle contractions play an important role in most of the sports branches. It was determined that the concentric phase improves the performance in sports branches in which shortening-stretching routine plays an important role (Michael Vogt, 2014). Today, with new methodical approaches, there is an increasing interest towards the eccentric training methods. Eccentric training which is preferred to increase the muscle strength has been useful in the medical and rehabilitation processes (Isner-Horobeti et al., 2013).

Today, eccentric training is included in the resistance training as a method. In an eccentric movement, stress is put on the muscle which is higher than it can endure. As a result of this training, hypertrophy is observed in muscle sarcomere. Eccentric training can be conducted under the title of resistance as a negative resistance training while considering this principle (Baechle,earle 2008). Another method in which the eccentric training is used is plyometric training which includes intense training program (Kijowski, 2015). In studies which were conducted on eccentric contractions, it was observed that the plyometric training

positively affected the vertical jump, quick strength and resistance parameters of athletes (Behrens, 2016).

Balance is an important component of athletic activity. The prominence of balance can be beneficial for decreasing sportive injuries and increasing motor control and sportive performance (McLeod et al., 2009). Sustaining the head and body stance and providing the static and dynamic balance control are possible through an appropriate motor output from the sensor center of the brain to the muscle groups (Jones, 2009). Since postural control is an essential part of all the motor skills, improvements in the postural control enable improvements in the function (Triolo, et al., 1993). Balance is a concept that consists of two aspects, dynamic and static. While the static balance is a motor skill in which athletes protect their base support with minimum movement, the dynamic balance can be evaluated as reactions against the external resistors that include the recovery of balance and protecting the established balance (Hrysomallis, 2011).

Basketball has the feature of presenting several motor skills at the same time. While basketball players are demonstrating their passing, shooting and dribbling abilities with their upper torso, their shoes are in contact with the ground. Landing after jumping and sharp turns are also included in the basketball skills (McClay, 1994). In sports branches in which jumping is important such as basketball and volleyball, balanced landing after jumping increases the performance of individuals and provides an increase in the prevention of lower extremity injuries (Kean et al., 2006).

In the findings of certain studies, it was stated that high-intensity plyometric training that includes eccentric contractions has positive effects on male basketball players (Balakrishnan, 2016). Huges et al. (1995) state that ankle plantar flexors, knee flexors, hip extensors, and shoulder flexors are important in postural muscles for postural balance. Furthermore, it was stated that soleus, medial gastrocnemius, and tibialis anterior muscle have important roles in providing postural control (Bloem et al., 2000). In their study which was conducted with 20 males who perform recreational sports, Ahn et al. (2011) stated that dynamic balance exercises performed on the lower leg positively affect the functional foot balance (Ahn et al., 2011). Gribble and Hertel introduced the Star Excursion Balance Test protocol (SEBT) in order to evaluate the dynamic balance (Gribble and Hertel, 2003).

Era et al. (1996) state that muscular strength has a positive effect on balance control (Era, 1996). The increase of lower extremity strength may positively affect the balance. The volume, intensity, and frequency of efficient strength training should be considered. The type of the exercise, resting between sets, type of contraction, speed of contraction and nutrition accelerates the adaptation to strength training (Pereira and Gomes, 2003; Esmark et al., 2001). Hortobagyi et al. (1996a) state that neural adaptation and muscular hypertrophy depending on the maximal eccentric contractions are higher than the concentric exercises (Hortobagyi et al., 1996a). In the study of Lastayo et al., (2000) which was conducted on eccentric bicycle training protocol, higher muscle strength and hypertrophy increase were observed compared to concentric training in same intensity (Lastayo et al., 2000). In certain studies which were conducted on hypertrophy, a higher increase was observed with eccentric training in lateral muscle areas compared to concentric training (Norrbrand et al., 2008; Horobagyii et al., 1996b). In leg extension exercises that are performed as an eccentric and concentric combination, a significant improvement was observed in the lateral areas of quadriceps femoris muscle (Ahtiainen et al., 2003; Narici et al., 1996)

In this research, the effect of eccentric strength and depth jump training on strength, vertical jump and dynamic balance levels of male basketball players are examined.

2. Method

2.1. Participants

A total of 32 voluntary participants, 15 experimental (Age; 22.4 ± 1.29, Length; 193.07 ±8.88 cm, Body mass; 90.46 ± 9.71) and 17 control (Age; 22.59 ± 2.15, Length; 188 ± 7.98 cm, Body mass; 86.7 ± 13.9 kg) were included in the study who are actively playing basketball.

2.2. Materials

The age, height and body masses of voluntary participants were determined. The voluntary participants in the experimental and control group jumped from the ground with all of their strength without taking steps and bouncing and the distance they jumped was determined in centimeters by using Vertical Jump Test Jump Meter. The best value of the participants was recorded as vertical jump value after they jumped for 2 times.

Isometric leg strength of the participants was evaluated with leg dynamometer. The best value of the participants was recorded as leg strength value after 2 trials.

The Modified Y-Balance test was applied towards three directions with bare foot. The participants were asked to touch the longest distance with their tiptoes while their hands on the iliac and standing on their right barefoot with heel on the central area of Y balance platform which have 120 degree angle between them as they reach with their left foot towards front (anterior=ANT), inner-back (posteromedial=PM) and rear side (posterolateral=PL). ANT reach was tested as the furthest distance that the participants could reach with their tiptoes and PL and PM was tested as the furthest distance that they can reach with their heels. Then the same protocol was conducted with their right feet while their left leg is steady. The test was applied for three times for each foot. The manner of the application was demonstrated to the participants before the test (Robinson and Gribble, 2008; Wilkerson, 2012).

23. Procedure

A training program which includes eccentric strength program and depth jump for 8 weeks and three times a week were included in the weekly training planning of participants in the experimental group. A training program which includes eccentric strength program and depth jump was not included in the usual training plan of participants in the control group.

Before the eccentric strength and depth jump training program, 1, 6 and 10 repetition maximal strength values were determined with leg press, shoulder press, right leg extension, left leg extension, lat pull down, calf raises, bench press, rowing machine, triceps push down and biceps curl movements. Personal training cards were created based on the 1 repetition maximal strength values with the obtained results. In Eccentric Strength stations, it was preferred to conduct maximal 1 RM to be between 70-85% and 3 sets x 8-12 repetition, rest for 45-60 seconds between the sets. (Lorenz et al., 2010; Stand, 2009). 1 second concentric-3 second eccentric contraction procedure was applied while performing each repetition (Hackney et al., 2008). Drop jump program was applied as depth jumps over boxes of 20, 40 and 60 cm between the 2nd and 8th weeks. Drop jump program was applied as 20 cm between the 2nd and 4th weeks (3 sets x 20 repetitions) 40 cm between the 5th and 7th weeks (3 sets x 20 repetitions) and 60 cm in the 8th week (3 sets x 20 repetitions) on Mondays and Fridays. At the end of the 8-week program, 840 drop jump repetitions were conducted. In this process, drop jump and eccentric training were conducted together on Mondays and Fridays (de Villarreal et al., 2008). At the end of the 8th week, the tests that were carried out on the participants in the experimental and control group were repeated and the results were recorded.

3. Results

According to the descriptive statistical evaluation of the participants, the age average of the experimental group was determined as 22.4 ± 1.29 and the age average of the control group was determined as 22.59 ± 2.15. According to this evaluation, the height average of the experimental group was determined as 193.07 ± 8.88 cm and the height average of the control group was determined as 188 ± 7.98 cm. The body mass averages of the experimental group were determined as 90.46 ± 9.71 kg and the body mass averages of the control group was determined as 86.76 ± 13.9 kg.

Table 1. *Variance analysis of leg strength repetitive measurements*

			Pre-Test		Post-test		Group * measurement	
	Group	N	Mean	SD	Mean	SD	F	Sig.
Leg Strength	Experimental	15	199.167	33.621	221.200	33.839	56.780	**0.000***
	Control	17	184.882	36.639	189.147	36.166		

When the changes that took place in the leg strength of both groups before and after the 8-week training period, a statistically significant difference was determined in favor of experimental group ($F_{1.30}$;56.780; $p<0.05$) (Table.1). According to the results of simple effect test, both the difference between the pre-test and post-test of the experimental group (MD: 22.033; SE: 1.719; $p<0.05$) and the difference between the pre-test and post-test of control group (MD: 4.265; SE: 1.614; $p<0.05$) were significant.

Table 2. *Variance analysis of vertical jump repetitive measurements*

	Pre-Test	Post-test	Group	*

							measurement	
	Group	N	Mean	SD	Mean	SD	F	Sig.
Vertical Jump	Experimental	15	53.067	5.007	62.533	3.681	50.168	0.000*
	Control	17	56.706	7.606	59.353	7.541		

When the changes that took place in the vertical jump levels of both groups before and after the 8-week training period, a statistically significant difference was determined in favor of experimental group ($F_{1.30}$;50.168; $p<0.05$) (Table.2). According to the results of simple effect test, both the difference between the pre-test and post-test of the experimental group (MD: 9.467; SE: 0.702; $p<0.05$) and the difference between the pretest and post-test of control group (MD: 2.647; SE: 0.659; $p<0.05$) were significant.

Table 3. *Variance Analysis of Star Excursion Balance Test repetitive measurements*

			Pre-Test		Post-test		Group * measurement	
	Group	N	Mean	SD	Mean	SD	F	Sig.
Right Y Balance	Experimental	15	88.240	5.506	96.561	5.284	22.569	0.000*
	Control		93.874	7.279	96.570	8.388		
Right Y Balance	Experimental	15	85.120	4.552	91.560	10.099	3.855	0.059
	Control	17	91.592	7.380	94.063	7.715		

When the Y balance test results of the right foot were evaluated, an improvement was observed in the comparison of the pre-test and post-test values of control and experimental groups, however, the improvement in the experimental group was higher than the control group. The improvement in both of the groups were statistically significant when they were compared to each other ($F_{1.30;}$ 22.569; $p<0.05$) (Table.3). According to the results of simple effect test, both the difference between the pre-test and post-test of the experimental group (MD: 8.320; SE: 0.863; $p<0.05$) and the difference between the pretest and post-test of control group (MD: 2.696; SE: 0.811; $p<0.05$) were significant.

When the Y balance test results of the left foot were evaluated, an improvement was observed in the comparison of the pre-test and post-test values of control and experimental groups as it was also observed in the right foot and it was determined that the improvement in the experimental group was higher than the control group. However, this difference was not statistically significant ($F_{1.30;}$ 3.855; $p>0.05$) (Table.3). When the simple effect results were examined, while the change that took place in the experimental group (MD: 6.439; SE: 1.473; $p<0.05$) was significant, the difference that took place in the control group (MD: 2.471; SE: 1.384; $p>0.05$) was not significant.

4. Discussion and Conclusion

In the study of Brasilerio et al. (2011) which was conducted with individuals who received anterior cruciate ligament reconstruction, a high hypertrophy was determined in the isokinetic torque (from 199±51 to 240±63, $p<0.05$) and quadriceps muscle group of participants at the end of the 12-week eccentric training (Brasileiro et al., 2011). Thomas et al. (2009) stated that 6-week drop jump and countermovement jump training significantly affected vertical jump of young football players (n=20) (Thomas et al., 2009). Mike et al. (2017) determined a significant increase in the vertical jump values as a result of the 4-week eccentric strength training in their research which was conducted with 30 male athletes (Mike et al., 2017). In their study which was conducted with volleyball players between the age group of 15-18, Çağlayan et al. (2018) determined a significant difference in the vertical jump values of players who participated in the eccentric and concentric strength training program (Çağlayan et al., 2018). In their study which was conducted with male handball players in the age group of 15-17 (n=14), Kılınç and Ürer (2014) determined a significant increase in the vertical jump heights as a result of the plyometric training program that was conducted on lower and upper extremity (Kılınç and Ürer, 2014). In their study which was conducted with 12 elite male

handball players, Carvalho et al. (2014) determined that combined strength and specific plyometric training created a significant difference in vertical jump and lower extremity strength (Carvalho, Mourão, & Abader, 2014). In our research, a significant change was determined in the vertical jump and lower extremity strength values when the group x measurement relationship based on the eccentric strength training is considered. The obtained results support the results in the literature.

When eccentric strength training is examined in terms of measurement, group x measurement, it was observed that the improvement was significant. The results of our research show parallelisms with the literature stated below. The effect of resistance training on muscle strength and size was demonstrated. However, it was stated that strength training in which balance training is not included, does not cause a positive effect on balance (Häkkinen et al., 1998; Hortobaágyi & DeVita, 2000). In similar research, it can be observed that the balance scores of participants who performed only balance training increased by 146% and the balance scores of participants who performed strength training in which balance training is not included increased by 34% (Heitkamp et al., 2001). In their research which was conducted with female basketball players, McLeod et al. (2009) observed an increase in the lateral, anteromedial, medial and posterior values of the experimental group at the end of the 6-week neuromuscular training program (McLeod et al., 2009). Asadi et al. applied plyometric training on basketball players (n=16) for 6 weeks and twice a week. The training was applied to two groups by separating them as the group which performs plyometric and basketball training (BT+PT, n=8) and the group which only performs basketball training (BT, n=8). While a significant improvement was observed in the star excursion balance test values of the group which performed PT+BT at the end of the 6th week ($p<0.05$), there wasn't a significant change in the BT group (Asadi et al., 2015). Filipa et al. (2010) applied a neuromuscular training program for eight weeks on 20 female football player as 13 of them in experimental and 7 of them in the control group. As a result, a significant improvement was obtained in the SEBT combined score values (Filipa et al., 2010). In their research which was conducted with recreational athletes and female college student football players, Thorpe and Ebersole (2008) stated that there wasn't a significant difference between the isokinetic strength values and SEBT scores of the groups although football player group reached further than the recreational group in SEBT test (Thorpe and Ebersole, 2008). In the research of Lockie et al. (2013) which was conducted with 16 male team athletes, it was stated that while there wasn't a significant relationship between the SEBT performance level and eccentric leg flexor strength (Hamstring etc.), it was determined that knee extensor strength is more effective on dynamic balance (Lockie et al., 2013). In the research of Booysen which was conducted with 50 male football players (n=27 University group, n=23 professional group), a significant relationship was determined between the knee extensor eccentric strength of football players in the university group (YBT reach modified test) and composite reach performance. Furthermore, a significant relationship was determined between the non-dominant leg extensor eccentric strength and the reach performance of non-dominant leg (Booysen et al., 2015).

As a result of the eccentric training, a significant increase was observed in the vertical jump, lower extremity, and star excursion balance test values when it is evaluated as group x measurement

It would be provided to contribute to the muscular development and thus to vertical jump and coordinative balance by increasing the activity of eccentric strength training in the annual training periodization of individual and team sports.

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The Effects of Training and Achivement Motivation on Vertical Jumping Ability

MUSLIMIN
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Abstract

Based on the field observations, it shows that jumping ability of male volleyball player in BinaDarma University Palembang still low.This research is purposed to find out the effects of training and achivement motivation on vertical jumping ability of male volleyball player at Bina Darma University. The type of this research is Quasy experiment. Population in this research is male student of Bina Darma University whose entering volleyball extracurricular and it is amounted to 84 persons. While, samples in this research, after divided into two groups that are high achievement motivation category (27%) and lower achievement motivation category (27%), are amounted to 44 persons. Instrument in this research is vertical leap test. Data were analyzed by two ways variant analysis technique. Results from the analysis indicating: (1) different result on vertical jumping ability between group with plyometric training method and weight training method, (2) interaction between training methods and achievement motivation on jumping ability, (3) in high achievement motivation category, groups with plyometric training method (A1B1) have better result than groups with weight training method (A2B1), and (4) in lower achievement motivation category, groups with weight training method (A2B2) have better result than groups with plyometric training method (A1B2).
Keywords: Training, Achievement Motivation, AbilitySkipVertical.

Introduction

Sport is a human activity that can not be left out in everyday life . Sport has the goal of maintaining and improving health and fitness , achievement , human qualities , inculcate moral values and noble character , sportsmanship , discipline , strengthen and nurture national unity , strengthen national resilience , as well as lifting the dignity and honor of the nation (Undang-undang No. 3 tahun 2005 tentang Sistem Keolahragaan Nasional). One sport that is very popular in the community is a game of volleyball . Volleyball game was played the ball to the opponent through a barrier in the form of a rope or net and trying to win the game by turning the ball in the opponent (M. Yunus , 1992:1) . Means playing a volleyball game / bouncing the ball before the ball falls or before the ball hits the floor . This game is a team game (team) . At the volleyball game , there are some basic techniques that must be mastered by people who would do this game is service , passing , bait , smash , weir / block . Of several techniques that volleyball game , to be able to execute it properly would have to be supported by good physical condition by the player .

Ideally , a volleyball player should have good basic technical ability , physical and mental condition in order to perform well . One is the physical condition of the players must have the ability to jump vertically . Players who have a good vertical jump ability , it will affect the smash technique or a good block . Due to smash that with perfect technique then it should be supported with a high vertical leap . Good physical condition is a key requirement for mastering technique and develop a skill sport . A speaker (smasher) in a volleyball game will not be able to hit the ball well and hard at the top of the net when the player does not yet have a high stepping strength , speed , and flexibility of the body is good . Likewise when doing a jumping service technique , a player must have the ability to skip vertical jump good to grab the ball from the highest point it throws then hit the ball towards the opponent's field , so it will be difficult for opposing players to do well passing . As the development of the current techniques , the player who has the ability to be profitable jumping service good for the team , because the service is the initial attack of the game .

Based on data from field observations , researchers found problems faced by volleyball players Universitas Bina Darma male Palembang is still low ability of vertical jump volleyball players Universitas Bina Darma 's son when doing a smash , jumping and block service . As a result of the lack of good players in performing the vertical jump , it will be able to affect the smash , jumping block. Someone service and volleyball players are required to have good vertical jumpto smash , block and jump serve . However, men's volleyball player of Bina Darma University Palembang not have the ability to jump high current smash , jumping service and block , because the volleyball game volleyball player , especially a player should be able to son over the net height of 2.43 m from the ground .

Based on the vertical jump test data volleyball player son of Bina Darma University Palembang is still a lot of players who have low. To vertical jump can do smash , and a good block and directional a player must be able to perform a high vertical leap , in order to pass through the net and passed block is performed by an opposing player . But in fact men's volleyball players in the field of Bina Darma Palembang frequent failure to smash . The failure is caused by the low ability vertical yang jump owned . Therefore, it will lead to a defeat for the team alone . Besides training program provided by the coach less than the maximum as well as the methods given too monotonous , so the players feel tired and less motivated to follow the training program given by the coach . So that will have an impact on the outcome of the exercise was not optimal .

One of the factors that support successful vertical jump is explosive leg muscle power . Explosive leg muscle power is one of the important components in activity sport biomotoric , because the explosive power will determine how hard the person is hit , how far throw , how high jumps , and how fast to run and is one of the important aspects of the physical condition of doing leap in doing vertical will jump smash or jumping service in volley ball games . To get the good exercise , proper training methods are needed . The ability of the coach becomes very important , knowledge and skills to be possessed , to the detailed things about the sport he coached . Heavy duty coach lies in the ability to design and develop appropriate strategies , how to spur his players to be totally involved in the preparation period training with the best .

To improve vertical jump can be done by using some form of exercise , which include plyometrics exercises and training burden . Practicing with plyometrics exercises is tantamount to a form of exercise plyometrics sports that require a high explosive movement . Many forms of plyometrics exercises are often used by coaches to improve vertical jump . Because plyometrics exercise is very effective for improving vertical jump ability players . Then, almost all movements in plyometrics exercises lead to movement in the vertical jump vertical jump ability to measure leg muscle which is owned by the player . Because in almost plyometrics training involves muscle movements of the body, and explosive movements are coordinated stepping movements with the arm swing both legs were very helpful to speed up the movement of the stepping motion that got explosive speed .Load-bearing exercises are exercises that use loads other than their own body weight as a tool to improve strength and speed .

Weight training exercise is any form of demands and characteristics of stimuli , both stimuli from inside or outside stimuli given to the athlete in a training process that can lead to the effect of exercise . Demands and stimuli are referred to in the form of demands and physical stimuli and may also be in the form of psychological stimulation (mental) . In addition to using the proper training , volleyball games can also be affected from the psychological aspect , because in a game that competed , psychological readiness factors also play an important role for the implementation of engineering skills in the game of volleyball . One of these is askpec achievement motivation . Achievement motivation is an athlete impetus owned in following sports volleyball training activities to achieve the feat . In this case the motivation is associated with seriousness and determination of athletes to exercise with diligence and passion . Conceptually berprestai athletes who have high motivation to have success in doing a better workout .Conversely , if a low motivation to training is feared to affect the results of the exercise are difficult to achieve.

Skip Essence Vertical

Vertical jump is an act of the central body lift stand to gain up using leg muscle strength , which is a measure of how high a person is able to lift itself growing from the floor in a standing position . Skip vertical motion could also be interpreted as high jump with a focus on leg muscle strength to achieve stepping straight up to the maximum . Vertical jump is what is one of the critical success factors in the block and smash or jumping service . If a player can perform a high jump vertical, then the player will be able to smash when the ball is above the net , and can drive the ball as desired in order to pass block performed by opponent players. Faktor - factor that determines the vertical jump by Markworth in Syafruddin (2006:40) vertical jump ability depends on (1) muscle strength , (2) the role of muscle contraction speed , (3) the magnitude of the driven load , (4) inter-and intra- muscular coordination , (5) muscle length on when contraction and (6) the joint angle .

The Nature of PlyometricsTraining

According to Chu (1996:81) defines plyometrics are specific exercises that train your muscles to produce maximum force more quickly . Maximum power is generated in a time that is unbelievably fast called explosive power or explosive power .Plyometrics exercises are exercises used to train the muscles to produce maximum power (explosive power) very quickly with the specific characteristics of muscle

contraction which is very strong response of dynamic loading which is an important component for performance athletes . Most movements resulting from the reaction preceded by concentric and eccentric contractions of the opposite movement consetric can produce a high -speed movement . All training is done with the cycle pliomterik muscle lengthening (eccentric) and shortening (concentric) . The purpose of plyometrics exercise is one method to train in order to increase the explosive power that trained muscle . As is the case with other forms of exercise are other , plyometrics exercise also has the purpose of helping players to be able to develop the skills required at each power branch olahraga.Bentuk - form plyometrics exercises used in this study are as follows : 1) . Quick leap , 2) . Jump to box , 3) . Double leg stairbound , 4) . Single leg hops , 5) . Duble leg hops , and 6) . Lateral cone hops .

The Nature of Weight Training

Weight training exercise is generally known as a form of exercise that uses external loads other than their own body weight like a barbell , dumbbell etc . According Harsono(1988:185-186) method is overloaded training exercises in which the load is only used systematically as a tool to increase muscle strength achieve to certain destinations . The load-bearing exercise , if done right unless it can fix the overall physical condition , will also be able to develop speed , power , strength , and durability . The physical conditions are needed by an athlete to improve the interpretation of exercise .Various load-bearing exercises used in this study are : 1) Half Squat , 2) . Inverted leg presses , 3) . Dumble leg presses , 4) . Leg extension , 5) . Leg flexion and , 6) . Split squats .

The Nature of Achievement Motivation

Achievement motivation is an encouragement that is owned by someone , either boost that comes from within the person as well as encouragement from outside the person to be able to achieve the desired achievement . According Setyobroto (2001:24) revealed that achievement motivation is the desire , the desire , the will , and the driver to be able to excel , surpass that achievement ever achieved alone or achievements of others . Meanwhile, according Setiadarma (2000:73) " achievement motivation (achievement motivation) is the orientation of a person to keep trying to get the best results as possible with the basic ability to survive even fail and keep trying to do their best work , because he felt proud to be properly finish.

ResearchMethods

This research is a quasi experimental (quasi -experimental 2x2 factorial with study design).

Table 2 x 2 factorial design

Achievement motivation	Training	
	Plyometric	Weight training
Hiegt	A_1B_1	A_2B_1
Low	A_1B_2	A_2B_2

The population in this study is that students who take part in coaching achievements totaling 127 sons and daughters . Sampling technique in this study is the use of purposive sampling technique that is based on sampling a particular consideration of the researcher . Based on this, the researchers determined the sample in this study group of 84 men's volleyball players . Based on the percentage techniques that total sample result of 44 people were divided into 4 groups of cells .After the division of the sample then the sample was treated as 16 sessions . Further tests carried out after the end of treatment was given to four groups , two groups of plyometrics exercises on high achievement motivation category (A1B1) and low (A1B2) , then the two groups for the training burden on high achievement motivation category (A2B1) and low (A2b2) given training in accordance with the designed program . The data obtained will be processed by analysis of variance (ANOVA) followed by two lines and if found Tuckey test the interaction between variables training method with variable achievement motivation . Therefore, this study used a 2x2 factorial design , the data analysis using ANOVA technique two lanes , with a confidence level $\alpha = 0.05$. Before the data were processed using Analysis of Variance techniques , first tested the requirements of ANOVA , namely the normality test using the Test and Test of Homogeneity of Variances Liliefors using Bartlet test with significance level $\alpha = 0.05$.

Results and Discussion

Based on the results of the normality test calculations to eight groups over the study design was found that the price L obesrvasi (Lo) earned less than the price L tabel on the real level of 0.05 . It can be concluded that all groups of data in this study were drawn from a population that is normally distributed so that it can be used hypothesis testing research .Hypothesis testing of this research was done by using ANOVA two lanes . Further testing was then performed using Tuckey test . The use of two lanes ANOVA technique aims to determine the individual contribution of the independent variables on the experimental results (main effect) and to determine the effect of the interaction (interaction effect) . The main effect in this study were (1) differences in the effect of plyometrics training methods and training methods berbeban terhadap vertical jump ability , and (2) the effect of the interaction is a combination of training methods and achievement motivation on vertical jump ability .

Based on the summary of the ANOVA calculations above two lines can be stated that : 1) the alternative hypothesis (Ha) states that there are differences in the effect of training methods between groups with plyometrics training methods and training methods acceptable burden , because the results of the calculations show that the F value = 4.84 > F = 4:05 . 2) the alternative hypothesis (Ha) states that there is an interaction between training method and achievement motivation with the ability to jump vertically received , as the result of the calculation shows that F value = 41.33 > F = 4.05 .

With demonstrated research hypothesis which states that there are significant interactions and achievement motivation training methods need to proceed with the analysis Tuckey test . Summary Tuckey test results are presented in the table below:

Table Results of ANOVA with Test Tuckey Next Phase

Group compared	Dk	Q_h	Q_t (α = 0.05)	Ket
A_1dan A_2	1.05	3.11	2.92	significantly
A_1B_1dan A_2B_1	1.49	8.63	3.77	significantly
A_1B_2dan A_2B_2	1.49	4.23	3.77	significantly

Based on the results of further trials using the Tuckey test can be stated that :

1) . The first research hypothesis stating that plyometrics training methods (A1) results are more effective than the method of load-bearing exercise (A2) is received . The mean score of group training methods A1 = 116.05 higher than the mean score training methods A2 = 112.77 (Qh = 3:11 >Qt = 2.92).

2) . The third research hypothesis which states that the high achievement motivation training methods plyometrics (A1B1) the result is more effective than exercise burden (A2B1) is received . The mean score of the sample training methods A1B1 = 122.08 group was significantly higher than the mean score of group training methods A2B1 = 109.24 (Qh = 8.63 > Qt = 3.77) .

3) . The fourth research hypothesis which states that the low achievement motivation , methods of group exercise training methods plyometrics (A1B2) is lower than the results using the method of load-bearing exercise (a2b2) is received . The mean score of the sample group training methods a2b2 = 116.30 higher than the mean score of group training methods A1B2 = 112.77 (Qh = 4.23 > Qt = 3.77) .

Based on the data analysis of the first research hypothesis suggests that exercise pliomterik results are better than burden the exercise . The mean score of group training methods A1 = 116.05 higher than the mean score training methods A2 = 112.77 (Qh = 3:11 > Qt = 2.92) .

The test results showed that exercise plyometrics hypothesis gives better results in improving vertical jump ability than weight training. Coz plyometrics movement characterized by the implementation of identical vertical jump .Where movements performed at high speed and maximum strength and muscle coordination arm contributed to skip to accelerate the movement of two legs. While the load-bearing exercises are exercises that are used to increase the strength and speed , if trained properly will produce endurance , and explosive power . Exercise dominant overloaded muscles locally trained , and the load used is external load other than its own body weight .Based on the data analysis of the second research hypothesis alternative hypothesis (Ha) states that there is an interaction between training method and achievement motivation with the ability to jump vertically received , as the result of the calculation shows that F value = 41.33 > F = 4:05 .

The results of hypothesis testing to show that there are two methods of training and interaction between achievement motivation in improving vertical jump ability . Due to the implementation of the

exercise requires good level achievement motivation . So that when the players practice implementation , the player can perform tasks with the spirit of the exercise movement . So from the results of the training process can players improve and achieve the desired achievement .
The third research hypothesis which states that the high achievement motivation training methods plyometrics (A1B1) the result is more effective than exercise burden (A2B1) is received . The mean score of the sample training methods A1B1 = 122.08 group was significantly higher than the mean score of group training methods A2B1 = 109.24 (Qh = 8.63 > Qt = 3.77) .

Results of testing the third hypothesis states that the high achievement motivation category using plyometrics workout results are better than burden the exercise . Achievement motivation a player then the player will be able to carry a maximum plyometrics exercises, plyometrics exercise because the movements require high-speed and powerful . Thus a player who has high achievement motivation given category will receive training plyometrics training and obtain better results than the training burden .
The fourth research hypothesis which states that the low achievement motivation , methods of group exercise training methods plyometrics (A1B2) is lower than the results using the method of load-bearing exercise (a2b2) is received . The mean score of the sample group training methods a2b2 = 116.30 higher than the mean score of group training methods A1B2 = 112.77 (Qh = 4.23 > Qt = 3.77) .

From the results of the fourth hypothesis states that the opposite occurs , the low achievement motivation category loaded exercise group were given a better result than the group given plyometrics exercises . Because the entire load-bearing exercises are not done with explosive movements , there is no coordination of all the muscles of the body , muscles trained local muscles , as well as the load applied external load other than its own body weight . So at the low achievement motivation fit berban use the exercise .Because it does not require a high motivation to perform exercise movements loading.

Conclusion

Based on the research findings and discussion of the research results can be summarized as follows :
1 . Influences of an increase in vertical jump ability between groups were given training and plyometrics exercise group given burden .
2 . There is interaction between training method and achievement motivation to increased vertical jump ability .
3 . At high achievement motivation category , exercise is more effective than exercise pliomterik burden to increase vertical jump ability .
4 . At low achievement motivation category , laden exercise is more effective than plyometrics exercises to increase vertical jump ability .

Suggestion

Based on the conclusions and implications of the above , are expected to :
1 .Trainer , in an effort to improve the ability vertikalpemain indispensable jump in volleyball game better , you should use a more precise method of exercise and good . In an effort to improve the vertical jump , the trainer can use plyometrics exercises and training burden .
2 . Player who has a high level of achievement motivation , using plyometrics exercises will provide improved vertical jump ability is very effective .
3 . Player who has a lower level of achievement motivation , using the training burden will have an effective impact on improving vertical jump ability .

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The Relationship between Hand/Arm and Leg Strengths with Hand/Foot Reaction Time

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Abstract

The aim of this study is to determine whether there is a relationship between hand/arm and leg flexion and extension strengths of elite athletes as well as back and general leg strengths and reaction times. From various branches, 29 healthy elite male athletes between 18-25 years old participated in the study. Flexion and extension strengths in hand/arm and leg, back and general leg strengths were measured with Lafayette Manuel muscle test device, while back and general leg strengths were measured with TAKKEI (brand) dynamometer, and reaction times were measured with the device developed by Agirbas et. al. (2019). The relationship between the values of the athletes was examined with "Bivarite - Pearson Corelattion" test. The results were interpreted at the significance level of .05. Statistically, significant relationships were determined between right-hand extension strengths and right-hand visual reaction times of the athletes while sitting, between left-hand flexion strengths and left-hand auditory reaction times while sitting, and between general leg strengths and all reaction times. In the study, it was concluded that flexion and extension strengths do not affect reaction time but there is a negative-sided strong relationship between general leg strengths considered as the resultant Strengths and all the leg reaction times.

Keywords: Flexion Strength, Extension Strength, Hand Reaction Time, Foot Reaction Time

1. Introduction

Strength, one of the motoric characteristics affecting success in athletes, has been an important fundamental study subject examined deeply by sports sciences. Strengths means the ability of muscle or muscle groups to tighten when faced with resistance or its ability to bear this resistance at a certain level (1). When the performance test results obtained from the athletes were examined, it was determined that the strengths feature affected the performance in some sports branches directly or indirectly (2). In especially weight sports, the quality and quantity of strengths have great importance. When comparing the heavyweight and the lightweight, it was revealed that lightweights are stronger and more successful than heavyweights according to the measures and results obtained from the competitions. It was stated that this situation is also valid for individuals who do individual and team sports (3).

Time and performance factor have always caught the attention of scientists, trainers, and athletes and been a research subject. It has been stated with various researches that reaction time is effective in the speed measure of various movements in general sportive performance (4). Response time called reaction time is the ability to show a response as soon as possible against a stimulation (5). To give a quick and right response for the stimulus forms the basic factors which influence achievement in athletes (6). Reaction time is one of the factors influenced by a superior performance and its importance increases day by day. Among the athletes who have the same conditional and technical limitations, the athletes whose reaction time is less is more successful and the importance of reaction time changes from one branch to another (7). It was observed that active athletes have stronger reaction time compared to sedantaries. This situation is related to the exercise increasing the stimulation and accelerating the reaction time (8, 9).

Although many researchers have revealed the importance of both strengths and reaction times in terms of sportive performance, no research has been found revealing the relationship between strengths and reaction times (especially the foot reaction times) directly in literature. For this reason, the main purpose of this study is to determine the relationship between hand/arm and leg strengths and hand/foot visual/auditory reaction times of the active athletes which are formed in different anatomical directions.

2. Method

2.1. Research Group

In total, 29 healthy male athletes between 18-25 years of age, who do sports at elite levels in the branches such as football (n= 8), voleyball (n= 6), basketball (n= 4), handball (n= 1), athleticism (n= 2), wrestling (n= 6) and boxing (n= 2) participated in the research voluntarily.

2.2. Limitations of the study

The research is limited to;
29 Men sportsmen,
Hand/ leg flexion, extension strengths also to back and general leg strengths,
Visual and auditory reaction times of hand and leg.

2.3. Flexion and Extension Strengths Measures

The flexion and extension strengths measures in hand/arm and leg of the sportsmen were conducted by using Lafayette Manuel Muscle Test System (Lafayette Instruments, Lafayette 01163), flexion and extension movements were performed sitting, facedown and supine positions as right hand, left hand, right leg and left leg separately (10).



Figure 1. Arm/leg flexion-extension measures (Lafayette Manuel Muscle Tester)

2.4. Back and Leg Strengths Measures



Figure 2. Back and leg Strengthsmeasures

Back and leg strengths were measured by using dynamometer (Takei Scientific Instruments). In back strengths measurement, knees are in stiff position; after legs are put on the coffee table of the dynamometer, the dynamometer bar which is held with hands is pulled upwards at maximum while the arms are stiff, back is flat and the body leans slightly to the front. In the leg strengths measurement, after legs are put on the dynamometer coffee table while knees are bent, the dynamometer bar held with hands using legs is pulled upwards at maximum rate while arms are tense, back is flat and the body tends to lean forward slightly (11).

2.5. Reaction Time Measures



Figure 3. Reaction time measurement

The device developed by Agirbas et. al. (2019) was used in order to measure visual and auditory reactions in hand and foot. In this device which has a software operating in Windows© (Microsoft Co.) operation system, there is a measurement table consisting of buttons which aim to measure hand and foot reactions separately. The time between the reaction given by the subject to the stimulus sent to the subject in various periods is determined as milliseconds (msec). For each parameter, 5 repetitive measurements were performed. Subtracting the best and the worst values, the means of the remaining values were accepted as reaction times (12).

2.6. Statistical Analysis

The data obtained were analyzed in SPSS 22.0 for Windows package program. After the means and standard deviations of the values belonging to male athletes were calculated, the normality analyses of the distribution were conducted. Although there are views which state that example number being below or above 30 should be considered in the parametric and non-parametric test choices (13,14); in literature it was

emphasized that just taking the number into account is not sufficient and normality should be examined as well (15). Normality should be determined not just according to the number; but with analyzing methods such as histogram, q-q plot graphics, box-plot graphics together (16). In this research, it low-level that the distribution is normal by examining graphics as well as using Kolmogorow-Smirnov and Shapiro-Wilk tests. Therefore, in order to determine the relationship between the values belonging to the sportsmen "Bivarite - Pearson Corelattion" test was applied. The results were interpreted at .05 significance level.

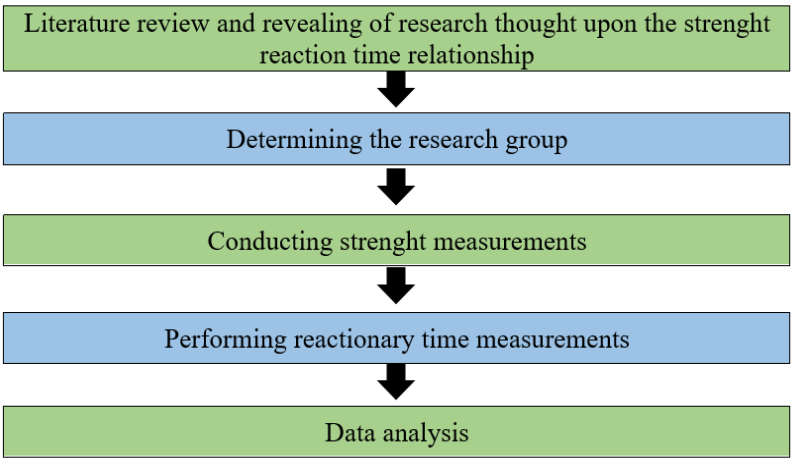


Figure 4. Showing research design in flow chart

3. Results

Table 1. *The relationship of male athletes' motoric characteristics (Pearson correlation)*

	Flexibility	Back Strength	Leg Strength	Speed	Agility	Vertical Jump
Back Strength	.195 (.311)					
Leg Strength	.139(.473)	.798 (.000)				
Speed	-.105 (.586)	-.145 (.454)	-.026 (.894)			
Agility	-.408 (.028)	.089 (.646)	.200 (.299)	.328 (.083)		
Vertical Jump	.474 (.009)	.286 (.132)	.133 (.491)	-.371 (.047)	-.375 (.045)	
Anaerobic Power	.255 (.181)	.528 (.003)	.458 (.013)	.036 (.851)	.185 (.336)	.743 (.000)

*p<.05

When Table 1 is examined, positive and significant relationships were found between back and leg strength, between anaerobic power and vertical jump, between anaerobic power and back strength, between anaerobic power and leg strength, and between flexibility and vertical jump, while negative and significant relationships were found between flexibility and agility, between speed and vertical jump, between agility and vertical jump.

Table 2. *The relationship between hand-arm strengths and hand reaction times of the sportsmen*

STRENGTHS	**N**	**REACTION TIMES**			
		Right Hand Visual	**Left Hand Visual**	**Right Hand Auditory**	**Left Hand Auditory**
Sitting right hand flexion strength	29	-.019(.921)	-.028(.885)	-.226(.240)	-.255(.181)
Sitting right hand extension strength	29	.426(.021*)	.176(.361)	.180(.350)	.231(.228)
Sitting left hand flexion strength	29	-.143(.460)	-.088(.651)	-.194(.314)	-.443(.016*)
Sitting left hand extension strength	29	.209(.278)	.087(.652)	.020(.919)	.083(.668)
Sitting right arm flexion strength	29	-.095(.626)	-.201(.297)	-.233(.224)	-.135(.487)
Sitting right arm extension strength	29	.168(.383)	.088(.649)	-.048(.803)	.085(.661)
Sitting left arm flexion strength	29	-.041(.833)	-.222(.247)	-.200(.298)	-.269(.159)

Sitting left arm extension strength	29	.215(.262)	-.045(.816)	-.048(.807)	.053(.786)
Prone right arm extension strength	29	.257(.179)	-.012(.949)	.106(.586)	.282(.139)
Prone left arm extension strength	29	.121(.532)	-.042(.828)	.101(.602)	.333(.077)
Supine right arm flexion strength	29	-.050(.797)	-.060(.758)	-.020(.919)	-.004(.985)
Supine left arm flexion strength	29	-.163(.397)	-.226(.238)	-.149(.441)	-.136(.481)
Back strength	29	-.132(.496)	-.136(.483)	-.191(.322)	-.251(.190)

* p<.05

When Table 2 is examined, significant relationships are seen between right-hand extension strengths and right-hand visual reaction times of the sportsmen sitting, also left-hand flexion strengths and left-hand auditory reaction times sitting and except these, no kind of reaction time is seen with flexion or extension strengths and also back strengths.

Table 3. *The reaction times relationship between leg strengths and foot strengths of the sportsmen*

STRENGTHS	**N**	**REACTION TIMES**			
		Right Hand Visual	**Left Hand Visual**	**Right Hand Auditory**	**Left Hand Auditory**
Sitting right leg flexion strength	29	-.117(.545)	.154(.426)	.092(.634)	.074(.703)
Sitting left leg flexion strength	29	-.242(.205)	.061(.752)	.010(.958)	-.025(.896)
Prone right leg extension strength	29	-.118(.541)	-.029(.883)	-.044(.820)	-.059(.761)
Abdominal left leg extension strength	29	-.006(.977)	.046(.812)	-.033(.865)	.040(.836)
Supine right leg flexion strength	29	-.232(.227)	-.063(.747)	-.138(.475)	-.292(.125)
Supine left leg flexion strength	29	-.244(.202)	-.087(.652)	-.031(.873)	.002(.993)
General leg strengths	29	-.550(.002*)	-.412(.026*)	-.450(.014*)	-.536(.003*)

p<.05

When Table 3 is examined, it is seen that there is no kind of reaction time relationship between leg flexion or extension strengths of the sportsmen but there are statistically significant and negative-sided strong relationships between general leg strengths and all reaction time types.

4. Discussion and Conclusion

In this research which aims to examine the relationship between hand/arm/leg strengths, back Strengthsand general leg Strengthsrevealed by various anatomical movements and visual and auditory reaction times, a negative-sided relationship was found between left-hand flexion Strengthsand left-hand auditory reaction time while sitting (Table 2). Gurkan (2018) stated that there is a negative-sided low-level relationship between left elbow supination isokinetic strengths in different speeds and visual and auditory reaction speed. The research supports our findings in this respect (17).

Coordination skill in basic motoric features plays a key role in the success of the sportsmen (18). The researchers have also the same opinion about the importance of the reaction duration in order to be successful in combat sports (19,20). In our research, a positive relationship was observed between the right-hand extension strengths and right-hand visual reaction time while sitting (Table 2). Johne et al. (2013) stated that the reaction times of elite fencers change in accordance with the dominant and non-dominant arm Strengths(21). In the same research, it was determined that the best reaction durations were from the left-handed, while the sportsmen who are successful and above the training age have the shortest reaction duration. Efimova and Kupriyanov (1995) stated that the left-handed have lower reaction duration compared to the right-handed in combat sports and that reaction duration can be shortened by improving the technique (22).

Hukkanen and Häkkinen (2017) stated in their study examining strengths and reaction durations of elite boxers that the shortest reaction duration was obtained at the first round and as the number of rounds increases, the reaction durations of the boxers lengthens. However, the best score in arm strengths parameter was obtained in the third round (23). It is considered that technical features peculiar to the sports branch which sportsmen perform, individual styles of the sportsmen, the left-handedness or the right-handedness, training durations, physical and spiritual readiness during match or training and the training model they perform influence reaction durations and strengths parameters.

Although no significant relationship was observed in our study between the strengths produced in the

form of flexion and extension in leg and reaction time, negative-sided and significant relationships were found between general leg strengths and all reaction durations (Table 3). This situation indicates that general leg strengths influences reaction time rather than different strengths. Therefore, the increase in general leg strengths leads to a decrease in reaction time. No research conducted on this subject was found in the literature. However, there are certain studies examining the relationship between strengths and duration and duration with reaction time. Ozdemir (2013) stated that there are significant relationships between speed and knee extension and flexion strengths in young football players (24). Kunitsõn, Rannama and Port (2013) stated in their study that knee extensor strengths is related to swimming time (25). Also, dynamic strengths is stated to be one of the most effective components in the development of speed (26). Senel and Eroglu (2006) could not find a significant relationship between reaction duration and speed in elite football players (27). Paradis et al. (2004) stated that there is no significant relationship between the reaction times of 209 male and female athletes and 60 and 200 meters competition completion durations. Considering these studies which examine the relationship between strengths with speed and speed with reduction time, it is seen that knee flexion and extension strengths do not affect speed reaction time even though they affect the speed (28). Therefore, it might be thought that these kinds of strengths will not affect reaction time. In fact, the result of this study also indicates that there is no significant relationship between flexion and extension strengths with reaction time.

As a result of this study, it was found that,

- ✓ There is a positive-sided significant relationship between left-hand extension strengths and right-hand visual reaction times while sitting,
- ✓ There is a negative-sided significant relationship between left-hand flexion strengths and left-hand auditıry reaction times while sitting,
- ✓ There is no relationship between back strengths and any kind of reaction time,
- ✓ There is no relationship between leg flexion or extension strengths with any kind of reaction time
- ✓ There are significant negative-sided relationships between general leg strengths and all kinds of reaction time.

Considering the results of the research in general, we can state that there is no significant relationship between hand/arm flexion and extension strengths also back strengths and visual or auditory reaction times. Although there is no significant relationship between leg flexion and extension strengths with visual or auditory reaction times, there is a strong negative-sided relationship between general leg strengths which we can consider as resultant strengths and all the reaction times.

It is suggested to find the relationship between the strengths measurements which can be determined in more different anatomical movements and reaction time and also to conduct new researches with female athletes or sedentaries.

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Getting The Experience of Culture: From Theory of Activity to Synergy Anthropology

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Abstract

The article shows that anthropological dynamics becomes the decisive (in comparison with the social, historical) factor in understanding the changes taking place in the modern world. It is emphasized that the escalating problem of preserving a person's integrity requires for its solution an understanding of the specifics of a person's appropriation of sociocultural experience. The purpose of the article is to study the factors anticipating a person's actions, aimed at appropriating to them the experience of culture as a means of self-development and personal development. The necessity of an interdisciplinary approach to address the issues of attributing socio-cultural experience, using the principles of the activity approach and synergistic anthropology is shown. The concept of "synergistic anthropology", its connection with the term synergy is investigated. Synergy is comprehended as harmonic co-formation of two (or more) energies, which we understand as actions aimed at self-realization. It is noted that the principles of synergistic anthropology make it possible to emphasize the presence in the human constitution of a pattern of his aspirations to the outside, contributing to an understanding of the genesis of the processes of achieving one's identity and becoming an integral being in the process of attributing sociocultural experience. The constitutive nature of the energy principle made it possible to describe a person and his manifestations with the help of the concepts of being-action, potency and act, which receive a new sound in the discourse of synergistic anthropology. It is proved that the principles of synergistic anthropology contribute to the rationale for the interpretation of man as a topical (spatial) being with heterogeneous energies, and not always consistent and consistent with each other. The context of the study of the specificity of a person's appropriation of sociocultural experience is proposed, which contributes to its understanding as a process affecting all levels of a person as a whole being - emotional, sensual, thinking and acting.

Keywords: holistic person, appropriation of experience, activity, synergy, synergetic anthropology

1 .Introduction

Crisis processes taking place in modern culture, indicate a change in the ways of human nature. The most significant problem within the centre of philosophical studies, issue I, of human identity, the problem of the Other, etc. (Berdyaev, 1989; Buber, 1992; Deleuze, Guattari, 2008; Derrida, 1999; Shemanov, 2001). Classic concepts which put at the centre of research attention, the subject does not fully contribute to the understanding of the peculiarities of manifestation of human nature, in particular extreme, transgressive (aimed at the destruction of norms) and virtual practices, phenomena of suicide terrorism, new manifestations of addiction, the massive recourse to psychotropic drugs that manipulate the mind and destroy the person, loss of sense of self-preservation when using new chemical compounds, deforming its genetic program and the basic mechanisms of procreation. Controversial are the approaches aimed at overcoming the difficulties that have arisen at the present time, analyzing only isolated aspects of the manifestation of the human being: a person as a moral, legal, economic or any other entity. This concept did not reach a changed understanding of the ways of actualization of a person, resulting in the spread of the ideologies of the death of the subject, on the death of a man (Bart, 1989; Ilyin, 2010; Lectorsky, 2004).

The acuteness of the emerging problems is enhanced by the fact that anthropological dynamics becomes the ' determining factor in understanding the changes in the modern world. Dominant dimension of culture factors social, historical sidelined (Horuzhy, 2005). Requires further study the problem of preserving the man's integrity, which in turn is largely due to the peculiarities of the assignment of human social and cultural experience. Questions of development of his ability to inherit cultural experience, ensuring the continuity of cultural forms associated with the understanding of the processes of transition

imprinted in the artifacts of the culture of experience in the heritage of the inner world of man, remain relevant, which determined the purpose of the article – the study of the factors that precede the acts and actions of man, aimed at assigning them the experience of culture as a means of development and formation.

Research methodology

The interdisciplinary approach, application of the principles of the activity approach and synergetic anthropology contributed to the achievement of this goal. Based on Marx's ideas (Marx, 1974), developed in the works of Russian and foreign thinkers (Ilyenkov, 1984; Leontiev, 1985; Beckhurst, 2006), the necessity of using the concept of activity to explain the mechanism of assigning socio-cultural experience is shown. This concept contributes to the understanding of a person's place in the world, the nature of his consciousness, personal formation. As a fundamental theoretical and methodological concept, the concept of activity reveals the essential side of man, allows us to justify the possibility of his thinking, to identify the specifics of his attitude to the world. Describing the method of active interaction with reality, the concept of activity contributes to the understanding of the processes of appropriation of the experience of people in the course of the transformation of nature, opens up a world of meanings and values, the sense of his actions. Activity theory promotes awareness of the Foundation on which new needs grow. The emergence of the latter supports the creative activity of man: the results of activity form the world of culture, which in turn encourages new creative efforts. As man assimilates truly human forms of activity, forms in which intelligence is manifested, he becomes a being able to be guided by reason, a man in the full sense of the word, a truly social being, for the status of a rational being is achieved by man only in the process of personal formation, involving the appropriation of the experience of culture.

However, the activity approach as a whole is aimed at studying the existing results of human activity. The activity paradigm is connected with initially normative or rational attitude of a person to the world. As the main, it considers the ability of a person to think, allowing people to act, learn and navigate in the world. In other words, this methodology does not fully contribute to the understanding of the factors that determine human activity itself, including the activity of appropriation of cultural experience and its prerequisites. What motivates people in addition to the conditionality of their actions mind, motives, goals? To achieve the stated goal of the article, to clarify the understanding of the processes of transition of externally imprinted in the forms of culture experience in the heritage of the inner world of man, the principles of synergistic anthropology were used. The concept of "synergistic anthropology" is associated with the term synergy, which carries the meaning of harmonic co-formation-cooperation of two (or more) energies belonging to different orders of existence. The principles of synergistic anthropology based on the concept of synergy allow us to emphasize the presence in the human Constitution of the pattern of his aspiration to the outside and to explain with its help the process of finding a person's identity, its formation as an integral being as a result of the assignment of socio-cultural experience and the definition of cultural and historical landmarks (Heidegger, 1997; Horuzhy, 2005), the Constitutive nature of the principle of energy allowed to describe a person and his manifestations with the concepts of being-action, potency and act, receiving a new sound in the discourse of synergistic anthropology. The principles of synergistic anthropology contribute to the justification of the interpretation of man as a topical (spatial) being, having heterogeneous energies, and not always co-formed and consistent with each other. The proposed context of the study of the assignment of human socio-cultural experience contributes to its understanding as a process affecting all levels of human beings as a whole – emotional, sensory, thinking and acting.

Results

The undertaken research has allowed to formulate the thesis about the person as the energetic being possessing heterogeneous energies. Digested methodological foundations of the understanding of experience that is interpreted as the accumulated experiences. Determined the origins of the conceptualization of the notion of energy, their connection with the philosophy of Aristotle (Aristotle, 1976; Bibikhin, 2005). The ancient philosopher considered energy as one of three ontological concepts. The triad includes the concepts of dynamis (possibility, potentiality, potency), energeia (energy, activity, action, actualization, realization), entelechy (reality, actualization, realization). In unity, the three concepts describe the transition of any being from its possibility to reality, where energy is considered as a force or action, actualizing and formalizing the beginning. The unity of these concepts characterizes the implementation of the event in its ontic structure (in the terminology of Heidegger, relating to the order of things) and allow us to identify the relationship of energy and essence, to establish that in the above-mentioned triad energy is

the determining principle. Thus, given the meaning of the root of the word entelechy (in Greek it is both the end and the goal), following Aristotle, entelechy can be interpreted as the achievement of a predetermined goal, the implementation of the pre-existing form. Here the energy is extremely close to entelechy. It is understood as the beginning in which the essence was realized. In this version, energy is presented as the final element of realization. The variant of the interpretation of energy as the manifestation of the essence was called the essential, essential discourse, examples of which were the various systems of European thought. The convergence of energy and entelechy, the definition of these two principles as equal give the name to the essential-energy discourse (Plotinos, 1995; Heidegger, 1997). By treating energy as an intermediary link in an ontic (relating to the order of things as opposed to an ontological_as relating to an order of being) event, it is possible to discern its convergence not only with entelechy but also with potency. In such a perspective, the energy acquires the value of the initial impulse, the effort directed to the actualization of some potency. Energy in this case – the initial effort, anticipating the actualization of the hidden, potential, contributing to its detection, ensuring the transition of the implicit in the sphere of the actual. Actually, the event is not always associated with a given goal, entelechy, some final moment. The latter may be something else, some transcendence (the transition from the subjective to the objective, the exit from the sphere of consciousness into the sphere of the objective world, committed in the course of human practice). In such a case, the event indicates an actual existential transformation, the possibility of the event completion, but in a remote perspective. In actual reality, it is manifested as free, as if having no purpose, falling out of the laws, the variety of forms, goals, entities and laws (Bibihin, 2005; Horuzhy, 2005).

Such an event is called open, as well as the reality emerging from similar events. The specific feature of these events as ways of human activity – the desire of man outside, dynamism, which are determined by the determining role of energy, which is the main element in the structure of the event. Energy, approaching the dynamis, is already interpreted as the beginning and the principle characterizing the pure dynamism of reality. In this consideration, we are not talking about the formation of reality in the system of forms. Energy is considered as a generating principle. Anthropology is no longer engaged in the study of the essential structure of man (as, for example, in M. Scheler), but switches to the study of the energy structure of man. The latter appears as a carrier of a variety of heterogeneous energies, differentiated on many grounds: physical, mental, emotional and sensual, associated with experiences, spiritual energies. They are characterized by different directions – to God, neighbor, material or mental object, inside or outside the personality, provide repulsion or attraction, etc. The energy image of the person which research assumes consideration of an energy structure of the personality in its continuous change develops. The proposed level of research requires an interdisciplinary approach, which is provided by the discourse of synergetic anthropology as related to the principles of activity theory. Energy permeate the relationship of man (accompanied by the activity of the emotional-sensual sphere) to himself, other people, culture, the world as a whole. Various manifestations of human change and significant features of its existence, including the attitude of Man and Other, understood as a sphere of culture, as that up to a certain stage can not yet be identified by man within the space of human existence. (Nesmeyanov, Kharlamova, Isaeva, et al., 2019). This raises questions related to the boundaries of human existence, due to the meeting of human-owned energies with other energies, "other energies", the fact that up to a certain time has not yet become the property of the inner world of man, is not constituted as a space of his existence. The study proposes a new methodological basis for the analysis of the processes of appropriation (simultaneously providing inheritance) of the experience of culture, which determines the formation and improvement of man as a person, on the basis of complementarity of the theory of activity and synergistic anthropology. The study allowed us to formulate the thesis that different manifestations of human change and significant features of its existence. Man is characterized as a spatial being (Kharlamova, 2016). Their appropriation of the experience of culture is connected with its energies, aspirations to approach the ultimate foundations of Existence. Taken the understanding of the processes of appropriation of the experience allowed to identify the place of spiritual practices in the process of personal improvement, to interpret them as ways of deploying their own capabilities. The study suggests that the processes of appropriation of human experience of culture associated with its willingness and ability to respond to the challenges of culture (Other). The assignment of cultural experience is accompanied by spiritual practices that perform the function of translating the impressions of the outside world into the property of the inner world of a person, contributing to the accumulation of experience, including in the field of experiences. Being a certain anthropological phenomenon, spiritual practices, firstly, aim a person at the ultimate manifestations, and secondly, give them a determining value, contribute to the movement to the highest ideals and values. The grounds for

understanding that a person acts as a carrier of energies as those factors that precede his openness, determine the readiness for the assignment of new experience, improve the ability to approach the ultimate horizons of Existence.

Discussion

Classical European philosophy underestimated the role of the concept of energy and its importance in describing the events of the world and man as a whole. At present, the refusal to recognize that what is happening with the energies of man determines the ways of his perfection, prevents an in-depth understanding of the processes of formation of his spirituality and integrity. The interpretation of energy as a constructive principle was prepared by the research of Aristotle, neo-Platonic thinkers (Aristotle, 1976; Plotinos, 1995). His absence in Western European philosophy is partly due to the peculiarities of the translation of Aristotle's texts, in which the meaning of the concept of energy was transferred to the concept of an act having the following connotations: activity, business, movement, action, facial expressions of the actor, prodding cattle. The use of the concept of an act as an action, a matter in terms of content, was not equivalent to the Greek term energeia, which led to the loss of its specific meaning, which it has in the concept of Aristotle (Philosophical encyclopedic dictionary, 1983).

In the West, the concept of energy has become popular in the framework of natural science and natural philosophy. Thus, Leibniz has such concepts related to the concept of energy as will, aspiration, desire, activity. Interest in the topic of energy increases in European philosophy of the XX century, largely due to the work of Heidegger, dedicated to the ancient style of thinking (Mikhailov, 1993). In Russia, interest in this topic is due to Orthodox dogma and Hesychast practice associated with the spiritual improvement of man (Palama, 1995; Palama, 2007; Meyendorf, 1997; Florensky, 1999; Florovsky, 1992).

The use of analysis of spiritual practices, including Orthodox Hesychasm, allows us to take into account the principles of human understanding, different from the accepted anthropological models of Aristotle, Descartes and Kant. Understanding the semantic aspect of this concept is consistent with the current conditions reinforces the necessity of addressing the roots of development of the concept of energy (Horuzhy, 1995). Human energy is now regarded as a collective term that characterizes all the various manifestations of man, including any simple, the most elementary. Arbitrary aspect of being human consists of many different energies, constitutes it energy configuration (Bibikhin, 2005; Horuzhy, 2005).

Conceptualization of the sphere of human manifestations is the first necessary task of synergistic anthropology. The latter is now formed as an independent scientific direction, recognizing the specifics of such practices as yoga, tantric Buddhism, etc. at the Same time, synergistic anthropology distances itself from the discourses of Eastern thought, which include basic concepts, their connections, the principles of reasoning, significantly different from the European tradition. It is based on the practice of Hesychasm expressed in European discourse (Palama, 2007). The existing synergetic paradigm is recognized as fruitful in understanding the essence of spiritual practice and its role in the process of assigning socio-cultural experience that determines the formation of a person as a person.

Thanks to synergistic anthropology, the General collective term "human energies" has taken root. Energy is called any simple, elementary manifestation, the totality of which forms the energy configuration of man. Thanks to energy as a basic term, the discourse of human manifestations is immediately associated with the language of European philosophy, but this connection is initially only non-strict, intuitively-suggestive. The adoption of the language of energies to describe a person, including the understanding of the mechanisms of transition of impressions of the outside world into the property of the inner world of people, which later determine their ultimate manifestations, contribute to the understanding of the processes that constitute the space of his existence, the understanding of the features of the assignment of socio-cultural experience that determines the formation of spiritual reality.

Conclusion

Within the framework of synergistic anthropology, the appropriation of a person's experience of culture, contributing to his self-development, becoming as a person can be considered in connection with the factors that precede the acts and actions of a person. Synergistic anthropology characterizes the theoretical approach in which a person appears as a topic person (i.e. spatial), constituted by different areas (topics) of their manifestations. Synergistic anthropology is based on the constitutive principles of energy and limit of human manifestations. Among its principles is the rejection of the essential discourse of classical European anthropology, the rejection of the definition of man through abstract entities. The appropriation of the

experience of culture is interpreted in connection with the manifestations of man, accompanied by his energies, being-action, which does not contradict the activity discourse. The result of the manifestations of man is an anthropological reality. Such anthropological discourse is best suited for the representation of man as an active (activity) being with the ability of self-discovery, self-realization, generation and subsequent expansion of cognitive (and cognized) space. The development of synergistic anthropology is associated with attempts to explain the ways of human manifestation: the results of the actions performed and the energies preceding them (motives, thoughts, internal movements). The need to include in the analysis the study of what precedes human actions, to trace the hard-to-grasp prerequisites of human actions, is due to the fact that applying the categories of act and activity, it is possible to characterize a person superficially, missing those arbitrary human manifestations, without which the spiritual life itself and attempts to explain it become impossible. The methodological approach based on the General concept of human manifestations, in our opinion, surpasses the approaches developed by pragmatic, behavioral, activity currents of European thought. The analysis of the "pre-act" under the synergetic anthropology is, in fact, microanalysis of anthropological reality. The assignment of experience, meaningful in the framework of a synergistic approach, appears as a process affecting the emotional and sensual sphere of man, accompanied by his energies, due to the meeting of two factors – the human aspiration to the highest ideals and values, as well as the available everyday culture.

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The Effect of Burnout Fatigue After Static and Dynamic Squat Exercises to Isokinetic Leg Strength

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Abstract

The aim of this study was to determine the change in isokinetic leg strength after static and dynamic squat burnout fatigues. Fifty four (37 male, 17 female) voluntary university students aged of 18-26 years (22.09±2.08) participated in this study. Two different burnout fatigue of static and dynamic squat exercise protocols were induced over an interval of 3 days. Strength measurements: After warm-up exercises, strength of the knee extensor and flexor muscles of the dominant leg was tested with 5 maximal repetitons at 60^{o}/sec using an isokinetic dynamometer. The decrease of the quadriceps muscle strength were -5.53% and -15.62% ($p<0.00$) respectively after static and dynamic squat fatigue exercises. Unlike this result, following static and dynamic burnout exercise fatigue, an increase in hamstring muscle strength were obtained significantly +3,31% ve +2,90% respectively ($p<0.02$). Furthermore, there were low negative relations between static exhaustion times with body weight (-.28) and thigh circumference (-.34), while there was no significant relationship between dynamic exhaustion times and any anthropometric measurements. The acute effect of the burnout fatigue in isokinetic strength were found surprising. There is a need to examine why muscles are activated more with acute response of burnout fatigue by the function of the working muscle. After burnout fatigue formed by static and dynamic exercises, isokinetic muscle strength of quadriceps muscle decreased and that of hamstring muscles increased. The possible reason of unexpected increase in the hamstring muscle strength after both of the fatigue types might be the increase in the participation of the total number of fibrils.

Keywords: Fatigue, Isokinetic strength, Static squat, Dynamic squat.

1. Introduction

In daily life, the muscles contract less, while the main contractions also vary according to the degree of movement ate [1]. Muscle fatigue is a temporary reducing in the strength and power capacity of skeletal muscle resulting from muscle activity [2, 3]. Furthermore, muscle fatigue is also defined as a decline in the maximum voluntary force produced by a muscle. Although most of the fatigue is caused by changes in muscle fibers, some power loss occurs due to insufficient activation of motor neurons [4, 5]. For example, muscle fatigue during submaximal aerobic exercise is not necessarily occured by a sensation of tiredness, but seen a decreased ability to develop force and power [3]. Many variables affect human muscle strength and fatigue. Researchers have identified a large number of physiological, biomechanical, psychological and methodological variables that contribute to the difference between subjects [6, 7, 8]. Fatigue in different types of activities occurs as a result of different mechanisms. Intense muscle work causes fatigue that may be caused by central or peripheral origin. For example in central fatigue the recruitment of the new motor units or firing frequency of the active fibrils lower. On the other hand, the fatigue that occurs when the force is produced depends on the duration of contractions and rest periods. These factors are based on the use of substrates for energy, and cutting the blood flow [1]. The reason for the fatigue in the dynamic resistance exercises that involve few repetetions is the depletion of phosphocreatine (PC) in fast twich (FT) fibrils. If the resistance exercise is high repetitive or high-volume, fatigue occurs with the accumulation of H^{+} in fast-oxidative-glycolytic (FOG) fibers. On the other hand, the causes of fatigue in static exercises are depletion of PC in FT fibers, accumulation of H, inhibition of central nervous system (CNS) by afferent fibrils, decrease of calcium (Ca) release from sarcoplasmic reticulum (SR), slowing in blood flow, and inhibition of glycolysis [1, 7, 9]. An important factor for continuity during static contraction is muscle blood flow, which can limit the conduction of 0^{2} and therefore limit the capacity of oxidative metabolism. Reducing muscle blood flow prevent the supply of nutrients and removal of waste products. Therefore, the energy demand must be based on an increasingly non-oxidative process. Continuous fatigue during continuous voluntary static contraction is also characterized by high muscle lactate and depleted PCr stores, which are observed during intensive dynamic exercise [10]. On the other hand, a reduction in force production during exercise can be

considered a safety mechanism. If fatigue is absent or delayed, structural damage occurs in muscle tissue and supporting tissues during exercise [3] . Many studies have been found in the literature related to muscular fatigue. These studies usually have examined fatigue after isokinetic exercise [11] or fatigue observed after isometric and isotonic strength exercises. Furthermore, it is seen that EMG study is used especially in the determination of fatigue [8, 12, 13, 14, 15].

The aim of this study is to investigate the change in strength of quadriceps femoris and hamstring muscles after burnout fatigue of static and dynamic squat exercises.

2. Materials and Methods

2.1.Participants

Between the ages 18-26 (22.09 ± 2.08 years), 54 (37 male and 17 female) university students, without any health problems and injuries participated in this study. Participants were volunteers and signed an institutionally approved informed consent statement. The research study is carried out with respect to ethical standards of latest revision of The World Medical Association (WMA) that promote and ensure respect for all human subjects and protect subjects health and rights.

2.2.Data collection:

Anthropometric measurements: Height (SECA®, France), body composition; (Tanita BC-418MA, Segmental Body Composition Analyser Tanita Corporation, Tokyo, Japan) were used to measure body composition. Body Mass Index (BMI) was calculated by using formula body weight/(height)^2.

Strength measurements: Before the measurements start, participants warmed-up by 10 minutes of bicycle and then stretching exercises. A Biodex System III Isokinetic Dynamometer (Shirley, New York) was used to determine the isokinetic strength of the quadriceps and hamstring muscle groups. Strength measurements were performed with five maximal efforts at 60°/sec to subject's dominant leg. Before the measurements, all the instrument adjustments prepared for the test protocol starting immediatelly after exhaustion of the subjects' fatigue. Following fatigue, the protocol started immediately in 30 sec. to measure the isokinetic muscle strength. Between the two isokinetic strength measurements, static wall squat exercise was applied at the first day, and dynamic wall squat exercise was applied after three days.

Fatigue Exercises

Static wall squat exercise: The participants who support their back against the wall slowly bended their knees and brought them to about 90-100°. They waited in this position staticly until they were exhausted and their position was distorted and the duration of stay in this position was recorded.

Dynamic squat exercise: The participants continuously flexed their knees about 90-100° and then extented knees. The metronome was used to make this movement rhythmic. This dynamic squat exercise made until the subjects were exhausted, and both time and squat number were recorded.

2.3.Statistical Analysis

SPSS 16.0 statistical software was used to perform all the analysis. Each parameters were calculated as mean ± standart deviation (SD). The normality of distributions and the homogeneity of variances were evaluated by Shapiro–Wilk and Levene tests. Differences among the two exercises were investigated by Paired-Samples T test. Bivariate correlation test is used for relationship between variables. $p<0.05$ was considered significant.

3. Results

The means and standard deviations for physical characteristics and anthropometric measurements of the participants were represented in Table 1. Body weight were 64.92 ± 8.89 kg and height were 171.19±8.04 cm, body fat percentage were 12.29±5.01 determined.

Table 1. *Physical characteristics of the participants.*

	Female	**Male**	**Total**
N	17	37	57
Physical Parameters	**Mean ±.Sd**	**Mean ±.Sd**	**Mean ±.Sd**
Age (Yr)	21.11 ±2.11	22.54 ±1.93	22.09 ±2.08
Height (cm)	163.21± 5.26	174.96± 6.14	171.19± 8.04

Body weight (kg)	55.65 ± 5.82	69.17 ± 6.50	64.92 ± 8.89
Body Fat Percentage (%)	17.54 ±4.38	9.81 ± 2.96	12.29 ±5.01
Fat mass (kg)	9.65.±3.37	6.68.±2.26	7.63.±2.98
Lean Body Mass (kg)	44.23.±3.76	60.84.±5.72	55.51.±9.36
Thigh skinfold (mm)	26.11.±6.86	12.13.±4.91	16.62.±8.60
Thigh circumference (cm)	48.27.±2.70	50.31.±2.96	49.66±3.01

There was exhaustion duration at two different exercises in Table 2. As shown, dynamic exhaustion duration (261 sec) was almost two times than static exhaustion duration (121 sec) and this differance was statistical significant (p<0.00). As shown in Table 3, the decrease of the quadriceps muscle strength were -5.53% and -15.62% (p<0.00) respectively after dynamic and static squat fatigue exercises and these diffearent were statistically significant. Unlike this result, following static and dynamic burnout exercise fatigue, an increase in hamstring muscle strength were obtained significantly +3,31% ve +2,90% respectively (p<0.02).

Table 2. *The exhaustion duration at two different exercises of the participants.*

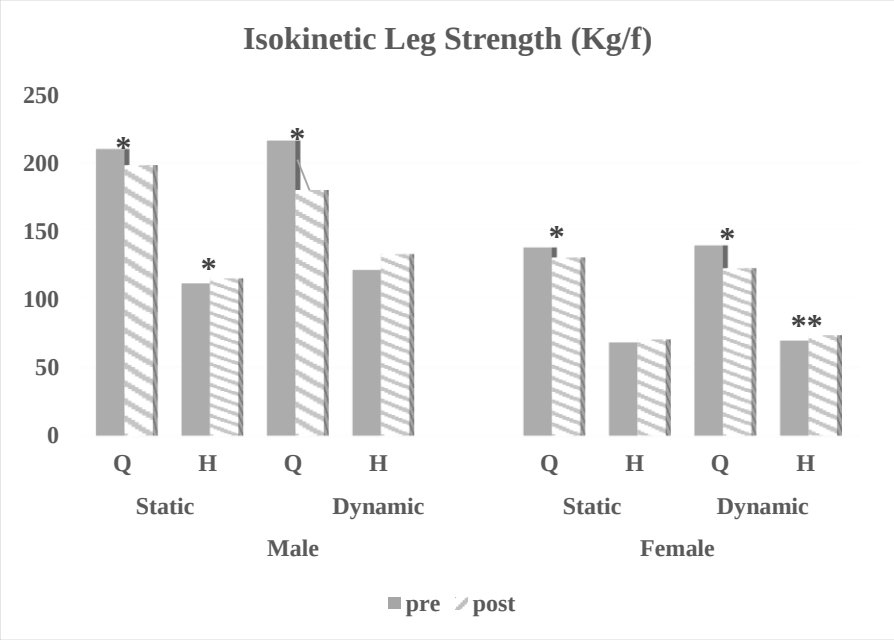
	Female	**Male**	**Total**
N	17	37	57
Exhaustion Duration	**Mean ±.Sd**	**Mean ±.Sd**	**Mean ±.Sd**
Static Squat (sec)	119.06±30.64	122.78±48.01	121.16±43.35
Dynamic Squat (Sec)	210.81±76.97	283.68±184.52	261.68±162.54
p	***0.00***	***0.00***	***0.00***

Table 3. *Strength parameters of the participants pre- and post fatigue.*

Muscle Strength (N=54)	**Static Squat**				**Dynamic Squat**			
	Pre	**Post**	**Change**	**p**	**Pre**	**Post**	**Change**	**p**
	Mean ±.Sd	**Mean ±.Sd**	**%**		**Mean ±.Sd**	**Mean ±.Sd**	**%**	
Quadriceps Femoris (Kg/f)	187.19±45.32	176.83±44.20	-5.53%	***0.000***	191.43±46.20	161.52±45.22	-15.62%	***0.000***
Hamstring (Kg/f)	97.87±27.02	101.11±26.98	+3.31 %	***0.002***	104.74±29.85	107.78±30.13	+2.90 %	***0.017***

Isokinetic strength parameters of the male and female participants pre and post fatigue were represented in Figure 1. There were significant decreased quadriceps femoris muscle strength after both static and dynamic burnout exercise for both genders (p<0.00). In addition, hamstring muscle strength increase was observed in males (p<0.00) after static exercise fatigue and after dynamic exercise fatigue in females (p<0.02).

Figure 1. *Strength parameters of the male and female participants pre- and post fatigue.*



*P<0.00, **p<0.02 (Q: Quadriceps femoris. H: Hamstring)

Table 4. *Relationship between body structure and ısokinetic leg muscle strength and exhaustion times.*

	Quadriceps Strength	Hamstring Strength	Static Exhaustion Time (sec)	Dynamic Exhaustion Time (sec)
Height (cm)	.69	.65		
Body weight (kg)	.77	.80	-.28	
Body Fat Percentage (%)	-.54	-.53		
Fat mass (kg)				
Lean Body Mass (kg)	.84	.84		
Thigh skinfold (mm)	-.55	-.51		
Thigh circumference (cm)	.54	.58	-.34	

Statistical significant relationships between body structure and isokinetic strength and exhaustion times were represented Table 4. Positive relation between isometric leg strength with some anthropometric values such as height (.69), body weight (.77), lean body mass (.84) and thigh circumference (.54) was found, while negative relation with body fat percentage (-.54) and thigh skinfold (-.55). There were low negative relations between static exhaustion times with only body weight (-.28) and thigh circumference (-.34), while there was no relationship between dynamic exhaustion times and any anthropometric measurements.

4. Discussion and Conclusion

A decrease in muscle contraction rate and strength is an indicator of muscular fatigue [3, 7]. In this study, it was aimed to determine how much strength decrease would occur after static and dynamic burnout exercises fatigue. The most important factor that caused the difference between the static and dynamic contractions is the blood flow in the contracting muscle. The intramuscular pressure during the static contraction prevents the blood flow, and the metabolic by products, such as lactic acid, accumulate in the muscle. Moreover, the dynamic contraction, which includes the stretching and shortening of the muscle, protects the blood flow by increased venous return from the contracting muscle, and the blood flow removes the metabolic by products [16].

In this study, the decrease of the quadriceps muscle strength was -15.62 % and -5.53% ($p<0.00$) respectively after dynamic and static squat fatigue exercise, and these decreases were found statistically significant for both exercises (Table 3). The reason for more reduction at strength in after dynamic exercise may be exercise duration. As shown in Table 2, dynamic exhaustion duration was almost two times more than static exhaustion duration. These durations were measured as 121.16 sec and 261.68 sec respectively, and a significant difference was found between the two exercise exhaustion durations ($p<0.00$). Unlike these results, following static and dynamic fatigue exercise, a significant increase in hamstring muscle strength was obtained +3,31% and +2,90% respectively ($p<0.02$). Rothmuller et al. have shown that while extensor activity decreases in parallel to the decrease in torque during maximal isometric fatigue tests, antagonist activity remains constant [17]. Unlike these results, Sangnier et al. indicated that the decrease in the hamstring muscle strength was higher than quadriceps femoris muscle strength in the isokinetic fatigue test in university soccer players [18]. Weir at al. (1998) studied that coactivation of leg muscles during different isokinetic speeds and found out that the EMG amplitude of hamstring decreased with fatigue of the leg extensors. But, when normalized to the decrease in extension force output, these hamstring EMG amplitude increased at both speeds during fatigue [15].

As shown in Figure 1, the significant decrease in quadriceps femoris muscle strength after both static and dynamic leg exercise was observed in both genders. Furthermore, the increase in hamstring muscle strength after static exercise fatigue was only seen in male subjects, contrary, the increase in hamstring muscle strength after dynamic exercise was seen in female subjects. Russ and Kent-Braun (2003) studied sex differences in muscle fatigue under conditions of free-flow circulation and ischemia. And they determined that females fatigued less than males in free-flow conditions. Furthermore, it was observed that males exhibited greater declines in pH in submaximal isometric protocol [19].

Furthermore, in this study correlations was determined between some body structure values and isokinetic strength and exhaustion times. It was found out that, when height, body weight, lean body mass and thigh circumference increase, also isokinetic leg strength values increase (Table 4). There are a lot of studies in the literature that support these results [20, 21]. Nevertheless, it was found that, while there were few and low negative relations between static exhaustion times with body weight (-.28) and thigh circumference (-.34), there was no relationship between dynamic exhaustion times and any anthropometric measurements. Based on the results of the study, it can be said that body structure does not affect dynamic exhaustion exercise duration. The aim of this study was not to determine the physiological and psychological factors causing fatigue, but to determine the amount of decrease in isokinetic leg strength after fatigue induced by different exercise.

In conclusion, after fatigue (exhaustion) formed by static and dynamic exercises, quadriceps isokinetic muscle strength decreased. The reason of the decrease could be active muscle fibers participation of the quadriceps. The reason of the increase in the hamstring muscles for both of the fatigue types might be increased in the total number of fibrils involved for the isokinetic muscle contraction after fatigue. In additon to that when fatigue time periods compared, dynamic squat exercise were longer then static squat exercise. The decrease in the isokinetic muscle strength after fatigue might be the longer exercise period and fibrils involved for the exercising muscles contraction. Due to the longer exercising period, the result could be evaluated as expected. For the future studies, neuromuscular electrical stimulation of the quadriceps and hamstring muscle should be evaluated.

Conflict of interest

None

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The Relationship between Body Composition and Physical Fitness Performance in Handball Players

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Abstract

The aim of this study was to analyze the relationship between body composition and physical fitness performance of female handball players aged 15-17. 103 female athletes who play handball in various schools in the city of Ankara in the star and youth categories volunteered to participate in the study. The athletes' body height, body weight, Body Mass Index (BMI), body fat percentage, upper body fat percentage were measured with the Tanita (BC-418) body analysis device. The right-left hand grip strength test was carried out with Takei grip-D strength dynamometer, vertical jump and standing long jump tests were carried out with Takei jump meter and throwing medicine ball with both hands test was carried out with a 5 kg. medicine ball and the 30 m speed test were carried out with photocell (New Test 2000). The data were evaluated with the SPSS 16 statistics software, Pearson Correlation Test was carried out in the statistical analysis and the significance level was determined as $p<0,05$. Statistically, a positive relationship was determined between the body composition of the athletes and their right-left hand grip strength and body muscle mass and all physical fitness performances and a negative relationship was determined between body fat percentage and all physical fitness parameters ($p<0.05$). As a result, it was determined that body composition of handball players in this age group affects physical fitness performance.
Keywords: Body composition, body fat percentage, hand grip strength, vertical jump.

Introduction

Physiological and morphological parameters are important components of performance in many branches of sports. Different sports disciplines require different body parameters and body structure for maximum performance (1). Body composition (body fat, body mass, muscle mass), physical characteristics and technical tactics significantly affect capacity, success and performance (2,3,4). In addition, anthropometric and physical properties are accepted as basic factors in skill selection (5,6). Numerous studies have shown that the ideal body composition in athletes is related to the increase in aerobic and anaerobic performance (7,8) and muscle strength. In general, it is considered that a lower body fat percentage is desirable to be successful in most sports (9,10). Handball is a team sport played with six field players and a goal keeper which requires body contact and high intensity (11). The players perform various activities such as running (speeding up, slowing down, changing direction and sprint), jumping (jumping and throwing and blocking), throwing balls (giving passes and pitching) and reciprocal physical struggle during the game (11,12). In handball, anthropometric characteristics such as height, weight and composition (13,14) and physical capacities such as speed, change of direction (COD), power, strength, jumping and endurance (15,16) in all age groups are prerequisites which should be carried out (11,17). In handball, motor, morphological and physiological characteristics play an important role in achieving success in sports. The primary motor characteristics for handball are mobility, speed, jumping, throwing strength, endurance and coordination (18,19). It can be stated that anthropometric characteristics, in particular height and fat free body mass are the basic physical determinants to play higher level handball (13,20). In general, more successful teams have players who are taller and have less body fat compared to less successful teams (21). Elite handball players should be taller and have high body mass and high anaerobic strength (16).

Height, arm span, ball speed, maximum oxygen intake and running speed are the most important components for choosing skillful young players. Physical and anthropometric characteristics need to be included in the selection of skillful handball players and performance tests, however this selection should not be limited with anthropometry in particular at early ages during which maturation takes place. The evaluation of the physical fitness and anthropometric characteristics of handball players is quite important for the future of team handball (22).

It has been seen that player teams in different game positions are significantly different from each other in terms of morphological parameters (19,23). It is clear that there is a relationship between body composition of the players and their game positions in handball. This is the result of different technical and tactical tasks players in different game positions need to do (24).
The purpose of this study is to analyze the relationship between body compositions of female handball players aged 15-17 and some physical fitness parameters.

METHOD

Participants

This study involved 103 female athletes aged 15-17 who play handball in various schools in the city of Ankara. The average height of the athletes included in the study was determined as 171.7 ± 5.9 (cm), their average body weight as 65.6 ± 7.9 (kg), their average body mass index as 21.4 ± 2.3 (kg.m^2) and their average body fat percentage as 22.9 ± 3.6 (%). The students' families and their school administrations were given detailed information about the study and their consent was taken. Prior to the physical fitness tests, the students did warming up exercises for 10 minutes. Each test was applied twice and the best value was recorded.

Materials

The athletes' height was measured with a height scale with a 0.01 m. sensitivity through a body composition body analysis device (Tanita (BC-418). The grip strength measurement: It was done with the Takei grip-D strength dynamometer. The dynamometer was set in line with the hand measurements of the athletes and by applying grip strength not bending their elbows. This was performed twice and the best value was recorded. Throwing a health ball (both hands): The athletes were asked to throw a 5 kg. health ball from a determined line upon command to the farthest distance by holding the ball with both hands behind the head and taking strength from the arms and the knees. This was performed twice and the best value was recorded. Standing long jump: The athletes were asked to jump from a determined line upon command to the farthest distance with both feet and by taking strength from the arms and knees. This was performed twice and the best value was recorded in centimeters. Vertical jump test: The Takei jump meter was attached to the abdomen area of the athletes and they were asked to do a vertical jump from a specific area with both feet leaving their arms free and land on a specific area. This was performed twice and the best value was recorded in centimeters. 30 meter speed test: The athletes were asked to run with maximal speed for 30 meters from the start line with the start command. The duration between the start and the finish was determined with photocell (New Test 2000). This was performed twice, the athletes were given sufficient rest time between the two tries and the best result was recorded.

Statistical Analysis

In the analysis of the data, the correlation coefficients and statistical significance of the variables were determined with the Pearson Correlation Test. The data were evaluated with the SPSS 16 statistics software.

RESULTSIn the table 1 and table 2 shows anthropometric characteristics and physical fitness performance for handball players. .

Table 1. The body composition values of the handball players

n-103	Min.	Max.	Mean	SD
Height (cm)	155,0	184,0	171.7	5.9
Body weights (kg)	42,4	81,8	65.6	7.9
BMI (kg.m^2)	16,6	26,7	21.4	2.3
Body fat percentage (%)	11,7	31,6	22.9	3.6
Body fat weight (kg)	6,6	25,0	14.3	3.9
Fat free body weight	32,8	56,8	46.1	5.8
Upper body fat percentage (%)	10,7	17.1	18.2	4.4
Upper body fat weight (kg)	2,6	5.9	5.8	1.9
Upper body muscle mass (kg)	16,6	26.1	23.6	2.3

Table 2. The physical fitness performance values of handball players

n-103	Min.	Max.	Mean	SD
Right hand grip strength (kg)	19,6	38,4	31.3	4.1
Left hand grip strength (kg)	18,9	35,6	30.6	4.3
Vertical jump (cm)	24,1	41,4	34.8	4.2
Throwing a medicine ball (both hands) (m)	2,91	5,9	4.9	0.9
Long jump (cm)	128	219	181.0	16.9
30 m. speed (sec)	4,3	5,9	5.0	0.3

*p<0.05; **p<0.01

In this study, a positive relationship was determined between the heights of young female handball players and their right hand grip-left hand grip and 30 m. speed performances; a negative relationship was determined between their standing long jump performance; a positive relationship between their body weight and right-left hand grip performances; a negative relationship was determined between their standing long jump performance; a positive relationship between their BMI and right-left hand grip performances; a positive relationship between their body fat percentage and right-left hand grip and 30 meter speed performance; a negative relationship between their vertical jump and standing long jump performances; a positive relationship between their fat free body weight and right-left hand grip, vertical jump performances and a negative relationship with their 30 meter speed and standing long jump performances; a positive relationship between their upper body fat percentage and right hand grip performance; and a positive relationship between their upper body muscle mass and right-left hand grip, vertical jump, standing long jump and throwing a medicine ball with both hands (Table 3).

Table 3. The relationship between the body compositions of the handball players and their physical fitness performances

Variables	Right hand grip strength (kg)	Left hand grip strength (kg)	Vertical jump (cm)	Throwing a medicine ball (both hands) (m)	Long jump (cm)	30 m speed (sec)
Height (cm)	**0.419***	**0.467***	-0.030	0.507	**-0.305***	**0.234***
Body weight (kg)	**0.453***	**0.534***	-0.051	0.615	**-0.242***	0.481
BMI (kg/m²)	**0.285***	**0.361***	-0.570	0.447	-0.307	0.112
Body fat percentage (%)	**0.045***	**0.145***	**-0.275***	-0.091	**-0.472***	**0.282***
Body fat weight (kg)	0.266	0.361	**-0.188***	0.388	**-0.403***	**0.219***
Fat free body weight(kg)	**0.514***	**0.751***	**0.354***	0.680	**-0.298***	**-0.231***
Upper body fat percentage (%)	**0.154***	0.155	-0.293	0.081	-0.337	0.186
Upper body fat weight(kg)	0.219	0.321	-0.179	0.307	-0.357	0.194
Upper body muscle mass (kg)	**0.456***	**0.517***	**0.337***	**0.619****	0.122	-0.186

Discussion

Body size, body structure and composition are important factors which affect strength and performance (25). Player selection in handball should be based on the morphological characteristics of the athletes. In addition, athletes should be suitable in terms of morphological body structure to be able to perform the tasks required by their individual game positions (with the highest efficiency); however, the tallest players need to be guided towards supporting their player positions. For instance, coaches need to take power and strength characteristics as well besides height in terms of pivots. Height is very important

for goalkeepers. For wing players, height is not a determining factor; however, speed and jumps are important (24). In handball, when pitch speed and pitch height are taken into consideration in goal post pitches, being tall is a significant advantage. However, when athletes are above the ideal height averages, then the quick strength characteristic needed for handball will be negatively affected (26). Astrand, & Rodahl, (27) stated that, when pitch speed, pitch height and angle are taken into consideration in handball, the athletes being tall will bring an advantage. Zapartidis et. al., (22) determined in their study that, height and arm span in handball players who were chosen to play in the national team and not chosen displayed significant differences and that this difference was in favor of the chosen players. Grip strength is a physiological variable which is affected by a series of factors such as age, gender and body size. There is a strong relationship between grip strength and various anthropometric characteristics (weight, height, hand length, etc.) (28,29,30). In handball, high hand grip strength requires the ball to be higher and controlled more; thus, it allows the athlete to apply better defense and attack techniques (31,26). Yıldırım, & Özdemir, (26) determined in his study that, anthropometric characteristics have significant effects on vertical and horizontal jump distances and that there is a statistically significant relationship between height, body fat percentage and body weight and vertical jump, and between body fat percentage and horizontal jump. He determined that as body weight increases, vertical and horizontal jump distances decrease and that as body fat percentage increases, vertical and horizontal jump distances decrease. Falk, & Weinstein, (32) express the high amount of fatty tissues in the body and the low amount of fat free muscle mass as a condition which negatively affects performance in all sports branches which involve anaerobic and aerobic exercise. Granados et al., (33) stated that high fat free mass value involves higher performance due in particular to the increase in muscle power and strength. High fat free body mass and the lowest possible body fat percentage are the ideal body properties for the specific demands of sports such as handball (4). High body fat rate causes strength, agility and flexibility to decrease and energy loss which have a negative effect on performance (26). For an activity in which body fat is desired to be high, the amount of calories burned and oxygen spent would remain insufficient. This would cause lower cardiovascular endurance and thus, decreased performance (25). Moncef et. al., (2) determined that speed and acceleration capacity in handball get affected from body mass and that there is a negative correlation between body weight and jumping performance in male handball players. Singh, (34) determined a high and negative relationship between body composition (BMI and body fat mass) and performance in various activities. Aouichaoui et al., (35) in their study on athletes in the puberty period determined that there is a negative correlation between vertical jump performance and body weight, and height and body mass index. Almuzaini, (36) stated that there is a correlation between height and body weight and vertical jump skill. Günay, et al., (37) stated that body weight is correlated with power, vertical jump, flexibility and anaerobic strength. Markovic, & Jaric, (38) stated as a result of their study with 159 participants that, while body weight positively affects strength and anaerobic power, it negatively affects vertical jump height. Copić et al., (39) determined in their study on athletes that, the higher body fat rate is, the lower the vertical jump height is. Nikolaidis, (40) determined that high BMI has a negative effect on physical fitness and sports performances. Matthys, et al., (41) determined a significant positive relationship between arm strength and pitch speed and weight, fat free body mass and arm span. As a result, this study supports these findings. In the study, it was determined that body composition (height, body weight, BMI, body fat percentage, fat free body weight, and upper body muscle mass) affect physical fitness performance. As a result, it was determined that body composition of handball players in this age group affects physical fitness performance. In order to be able to identify and increase skill in young handball players, it is suggested for coaches and trainers to follow athletes by doing the body composition and performance measurements at early ages and within certain intervals, and therefore future research should be directed in this.

Conflicts of Interest

The authors declare no conflict of interest.

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The Investigation of the Acute Effect of Sparring Training on Some biochemical parameters in Elite Boxers

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Abstract

In this study, it was aimed to investigate the acute effect of sub-region sparring training on some blood biochemical parameters in elite male boxers. 22 male elite boxers (XAge:18,36±6,18 years, XB.W.:65,23±11,75 kg, XHeight:174,18±8,67 cm) in the national team participated voluntarily in the investigation. These boxers had no health problems. Blood samples were taken from the boxers before and after the sub-region sparring training. Blood samples were transferred to the laboratory within 1 hour. Blood samples taken for biochemical analyzes were centrifuged at 4000 rpm for 10 minutes. Analysis of the serum was carried out using an autoanalyzer. Analysis of the data obtained from the study was made using the SPSS statistical program. The normal distribution of the data was determined by the Shapiro-Wilk test. Statistical analysis of the data used descriptive statistics and Paired t test from paramedical tests. A statistically significant decrease in the high-density lipoprotein-cholesterol (HDL), Direct Bilirubin and Total Bilirubin values of the elite boxers was found after the sparring training ($p<0.05$). There was no statistically significant difference between triglyceride (TG), very low density lipoprotein (VLDL), Albumin and Indirect Bilirubin values ($p>0.05$).As a result of the study, we obtained similar results from the other studies in the literature and we can say that there is no excessive change in the parameters we examined with the impact of the punches taken to the lower region, and that the sub-region sparring study does not have a separate effect on these parameters.

Keywords: Boxing, Sparring, Lipid, Bilirubin

Introduction

Exercise and sport can prevent future health problems as well as leading to a healthy life by improving physical capacity (1, 2). Nowadays, extreme sports that may harm human health or even result in death are also performed in addition to health-related physical activities. It can be stated that some sports branches may cause different health problems along with physical and mental benefits (3). Boxing is a sports competition in which two people wearing special gloves do the sports with their fists mutually within a predetermined period of time (4,5). Martial sports can always potentially cause health problems. Throughout history, many athletes have lost their lives especially due to the injuries taken in the boxing matches (6). Sparring training can be defined as the action of fighting with the opponent in a certain area. In other words, it is a very important exercise for the training of professional fighters, aiming at technical and tactical development, not done with full force (7). Many studies have identified changes in numerous biochemical parameters of blood due to the effect of exercise (8). The present study aims to detect whether some biochemical parameters of blood are more affected by the injuries taken to the liver and kidneys along with the effect of exercise.

Material and Method

This study was carried out with the following research group upon the approval of the Clinical Research Ethics Committee of Faculty of Medicine, Atatürk University, dated 04.10.2018 and numbered B.30.2.ATA.0.01.00 / 279.

22 elite male boxers voluntarily took part in the study. The participants were provided with written and oral explanations regarding the training method to be applied. Upon the approval of the volunteers, the study was initiated.

Sparring (lower body) Training Protocol

Warm-up (introduction) part (25 minutes): In the first and last 5 minutes of the warm-up part, boxers completed aerobic running with 50% severity. Isometric, isotonic, flexibility (mobility) and stretching activities [18-20] were performed for lower-upper extremities, waist and neck joints and muscle groups; and double, triple and quadruple combined punch activities weredone in front of mirror in line with the theme

to be applied in the main training part between the running activities in order to minimize the risk of injury that may occur during the main part of the training.

Main part (30 minutes): A punching exercise with punching bag was carried out 3 times in 3-minute periods and 1-minute breaks were given every 3 minutes. After completion of the punching bag exercise, active recreation time was allocated for 8 minutes. Boxers participating in the active recreation process were matched with each other according to age and weight categories. At the end of this process, sparring training method of free lower-body punch was applied to the liver region, which is the main theme of this study. The sparring on the liver region consisting of 3-minute periods was repeated 3 times with a 1-minute break as in the punching bag exercise.

Cool-down (conclusion) part (5 minutes): In the final part of the training, after 40 minutes of aerobic running with 50% severity, the movements in the warm-up part, mostly stretching activities were performed for the joints and muscle groups.

Blood Samples Collection from the Athletes and Biochemical Analysis

Some blood samples were collected from antecubital regions of each athlete before and after training to determine the levels of some biochemical parameters. The first blood samples were taken after the athletes were allowed to rest in the sitting position for 5 minutes and the second blood samples were also at the end of the main part of the training and put into the biochemistry tube by experienced individuals. The blood samples were centrifuged at 3000 rpm in the laboratoryfor 10 minutes and serum samples were analyzed by the photometric method with ARCHITECT C 16200 TM.

Statistical Analysis

SPSS 22.0 statistical program was used for the analysis of the data obtained. Shapiro-Wilk test was used to determine whether the data showed normal distribution. Descriptive statistics and Paired t-test, a parametric test with a significance level of $\alpha = 0.05$, were used for statistical analysis of the data showing normal distribution.

Results

As shown in Table 1, HDL (High-Density Lipoprotein), total bilirubin and direct bilirubin levels of elite boxers decreased significantly after exercise ($p < 0.05$) compared to the pre-exercise levels. There was no statistically significant difference in other parameters ($p > 0.05$).

Table 1*. Some biochemical values of elite boxers.*

Parameters	N	Mean	S.D	T	P
TG (mg/dl)Pre-Test	22	149.75	76.97	.480	.636
TG (mg/dl)Post-Test	22	145.85	73.03		
HDL (mg/dl)Pre-Test	22	51.40	9.81	2.730	.013*
HDL (mg/dl)Post-Test	22	47.99	12.20		
VLDL (mg/dl)Pre-Test	22	34.55	16.05	.339	.738
VLDL (mg/dl)Post-Test	22	33.86	13.71		
Albumin(g/dl)Pre-Test	22	4.95	0.19	-.197	.846
Albumin(g/dl)Post-Test	22	4.96	0.21		
Bilirubin Direct (mg/dl)Pre-Test	22	0.22	0.09	3.873	.001*
Bilirubin Direct (mg/dl)Post-Test	22	0.17	0.09		
Bilirubin Indirect(mg/dl)Pre-Test	22	0.50	0.33	.822	.420
Bilirubin Indirect(mg/dl)Post-Test	22	0.47	0.30		
Bilirubin Total (mg/dl)Pre-Test	22	0.73	0.40	2.080	.050*
Bilirubin Total (mg/dl)Post-Test	22	0.64	0.36		

*p<0.05

Discussion and Conclusion

The type, intensity, severity, resting-state after exercise, physical and physiological characteristics of theathlete may affect the serum levels of some biochemical parameters in the blood (9). Short-term intensive exercise may cause a temporary increase or decrease in serum levels of lipid parameters or levels may not change (10). Although many studies have reported that serum lipid levels change due to the effects of regular and long-term activities, short-term intensive exercise is also reported to cause a temporary change in lipid levels (11). The studies in the literature reveal different results regarding the changes in lipids and lipoproteins after intensive exercise. These different results may be due to a variety of reasons (10). It is reported that long-term changes in lipid parameters may be possible with the effect of regular exercises (12, 13,14). Lipid parameters may vary depending on the condition of individuals after acute exercise, different basal lipid values, duration and intensity of exercise, and resting-state after exercise (10, 15). According to the data obtained in the present study, a statistically significant decrease was found in high-density lipoprotein-cholesterol (HDL) values of elite boxers following the lower-body sparring training ($p < 0.05$). The present study offers results in parallel with the other studies in the literature. In other words, there was no excessive change in lipid parameters due to the impact of the punches taken to the lower-body region. In this framework, it can be suggested that lower-body sparring training has no effect on the serum lipid level.

Serum albumin and bilirubin concentration decrease following an intensive exercise. Serum albumin levels may show a small increase immediately after severe exercise. Total bilirubin and indirect bilirubin levels were found to be statistically significant in this study.

To conclude, it can be suggested that the results of the present study are similar to those of other studies in the literature. In this scope, we assume that the changes in serum HDL, VLDL, TG, Albumin and Bilirubin levels are completely caused by the effect of exercise and that the punch strikes to liver, stomach, and kidney regions are not effective on the serum levels of these parameters.

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Psychological well-being of prisoners as a factor in penitentiary reform

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Abstract

The classical approach to the analysis of positive social climate follows on the scope of criminal psychology. However, it has a wider perspective. After all, the criteria presented on this scale affect not only the psychological well-being of the convicts but also serve as a benchmark for real change in the conditions of holding the convicts, which is in the focus of attention to penal law and criminology. At the same time, the aim of the paper is to study the development and modern state of implementation of international standards for the treatment of convicted persons. The aim of this paper is to study the development and modern state of implementation of international standards for the treatment of convicted persons. It is also the task of the article to choose the most appropriate scale for assessing the social climate in Ukrainian prisons. This will allow contributing to the improvement of human rights in Ukraine, improve the state statistics, and help to understand the real needs of convicts.

The article explores the importance of an effective prison crime prevention system. In order to assess the condition of detention according to international standards, the PSC scale is proposed. According to this scale, the current situations in Ukrainian prisons, as well as the penitentiary practice of Ukraine, is analyzed.

This paper concludes that the concept of PSC is an effective mechanism that is recommended for implementation in Ukrainian penitentiary practice. PSC system is generally suitable for its application in Ukraine. However, architectural factors should be additionally considered, as the quality of the prisons' buildings is unsatisfactory in Ukraine.

Keywords: psychological well- being, penal practice, prison crime prevention, social climate

1. Introduction

The formation of a concept of prison crime prevention in Ukraine was looked at in isolation from the world trends for a long time.

The impact of a positive social climate on prisoners was not investigated. The classical approach to the analysis of positive social climate follows on the scope of criminal psychology. However, it has a wider perspective. After all, the criteria presented on this scale affect not only the psychological well-being of the convicts, but also serve as a benchmark for real change in the conditions of holding the convicts, which is in the focus of attention to penal law and criminology. This makes such research interdisciplinary.

The aim of this paper is to study the development and modern state of implementation of international standards for the treatment of convicted persons. It is also the task of the article to choose the most appropriate scale for assessing the social climate in Ukrainian prisons. This will allow contributing to the improvement of human rights in Ukraine, improve the state statistics, and help to understand the real needs of convicts. Therefore, in order to determine the priorities of reforming the prisons, changes in the statistical system are required. The PSC system is particularly successful here since it reflects the basic needs of the convicts while taking into account the opinion of the prisoners themselves.

The PSC scale is not currently used in Ukraine. However, we can look at the status quo with PSC parameters in mind. In this, we see the undiscovered potential of the PSC scale, which is much greater than the actual application in criminal psychology. After all, the responses of convicts to issues concerning their own well-being (ie answers to the questions of the PSC questionnaire) will enable us to determine the directions of reforming the penitentiary system from the point of view of penal law. On the basis of the survey it will be possible to propose specific amendments to the Criminal-Executive (Penal) Code of Ukraine in order to improve the conditions for the sentencing prisoners.

On the basis of disparate data it is possible to assess the situation in Ukrainian prisons as generally unfavorable [5, 23, 24, 25]. Although prison reform requires a comprehensive approach, it is necessary to

start from the problems named by most prisoners. It is not physically possible to change all conditions of detention of convicts at the same time. Consequently, if the PSC survey shows that the quality of food for prisoners is a major problem, the development of a new diet will be a priority; if the majority of prisoners determine the poor quality of medical care as a problem, then the reform should start with new standards of medical care, etc. Therefore, it is important for Ukraine to choose the appropriate scale for assessing the well-being of prisoners and to receive high quality statistics on the chosen scale.

For a better understanding of the considerations given in the article, the following structure is proposed. In the introduction, the main attention is paid to describing the national specificity of Ukraine in the field of criminal-law and criminological research and substantiation of the relevance of the issue; the literature review focuses on addressing issues related to PSC and other scales used to measure the well-being of prisoners; the methodology section focuses on the methods of criminal-law and criminological investigations which were used in the article; the next section on assessment of the current situation in Ukraine according to the parameters of the PSC is devoted to the analysis of the situation in Ukraine with the well-being of the prisoners in practice on the basis of existing statistics (at this stage without conducting a questionnaire in prisons);in the conclusions, the results of the research are drawn and recommendations for their possible practical implementation are suggested.

2. Literature Review

Literature review focuses on criminal psychology, but a sociological approach is needed for a broader understanding of the social climate. However, the potential of PSC is not limited to issues of criminal psychology. In Ukraine there is a gap between penal law, criminology, and psychology. The basic and additional parameters included on such a scale have the potential for application in the penal law and criminology, for the purpose of improving the well-being of convicts.

In practice, it should also be noted that PSC has a link to sociology. This is due to the fact that in order to talk about the use of PSC in the state, it is necessary to conduct a survey of the majority of convicts in most of the prisons. The analysis and processing of such a large mass of information is already a sociological measure of this scale (at the methodological level). As part of this study, it was not possible to interview tens of thousands of convicts in Ukraine. However, it provides the basis for conducting such interviews in the future. Taking the above into account, in the literature review, the main focus was on the PSC scale itself. After all, this particular scale is the basis for the next analysis in various aspects.

After The Stanford Prison Experiment (1971) foreign scholars have intensified their attention to research in the field of improving conditions for the holding of convicts. Faced with the same challenges as Soviet scholars (the lack of statistics, the lack of feedback with the convicts, the multifactorial condition of the prisoners, bureaucracy), they went a different way. Scholars began with the formation of the appropriate scale, which initially studied the existing problems, and then helped to solve them. One of the key advances was the introduction of such a scale at the state level in order to produce constant statistics. One of the first and most successful attempts to form such a scale is the PSC. The Prison Social Climate Survey (PSC) has been administered annually at the Federal Bureau of Prisons since its initial administration in 1988 by its developer, William G. Saylor (Saylor, 1984) [19].

Ross et al. have also explored prison climate measurement. They "[c]ompared the factor patterns and stability from three domains of the PSC survey (Environmental quality of life; Personal well-being; and Safety and security). Factors as factor-scored according to the US factor pattern showed significant differences between the USA and England on the Environmental quality of life scales and the Personal well-being scales and significant differences on only two of the six of the Safety and security dimensions" (Ross et al., 2008, p. 447) [18]. The researcher states that "[processed by them d]ata suggest that the PSC is stable within the US sample, and is also stable in its factor pattern between the US and English samples. Prison climate, as measured by the three domains of the PSC selected, appears a stable measure across similar western penal systems and inmate cultures" (Ross et al., 2008, p. 447) [18].

Liebling highlights the following criteria for determining the moral quality of life in prison : «1) Harmony (entry into custody, respect/courtesy, staff-Prisoner relationships, humanity, decency, care for the vulnerable, help and assistance), 2)Professionalism (staff professionalism, bureaucratic legitimacy, fairness, organisation and consistency), 3) Security (security, prisoner safety, prisoner adaptation, drugs and exploitation), 4) Conditions and Family Contact (regime decency, family contact),5)Wellbeing and Development (personal development, personal autonomy, well-being, distress)" (Liebling, 2014) [12].

PSC is a comprehensive concept that includes many parameters. It includes basic parameters - environmental quality of life; personal well-being; and safety and security and important additional factors - accidents, noise, food, crowding, visits, psychological well-being, somatic complaints, safety for staff and inmates, influence of staff on inmate behavior, influence of inmates on inmate behavior, frequency of assaults, freedom of movement around a prison, searches, and shakedowns. It is these parameters that can be considered key to assessing the current situation in the prison and finding ways to improve. Today, this is the leading concept in the world. It takes into account the interaction of factors of a physical and psychological nature, which is important for correcting a really bad situation in Ukrainian prisons.

However, there are other important concepts that need to be taken into account.

Day et al. (2011) [4] also has identified the means by which a prison social climate can be assessed. They suggest using EssenCES:

"[t]he EssenCES measure is routinely used to audit the social climate of a prison or prison unit on an annual basis, such that changes over time can be assessed, standards and targets set, and the need for additional resources or interventions identified and responded to. Further research is required to establish how a social climate might be modified or changed in a way that would enhance rehabilitative outcomes"[4].

Lafferty et al. investigated the social climate of Australian prisons. They were based on the concept of the social climate of the prison, EssenCES. Researchers conclude that "while the EssenCES measure does not directly capture social capital, it measures elements of social capital such as safety, inmates' social cohesion and mutual support (whereby the care expressed between inmates is measured), and hold and support (a measure of the level of support provided by staff to inmates)" (Lafferty et al., 2015) [10]. Scientists pay attention to the fact that "differential coercion and social support within the prison environment evidenced that social capital can be developed between inmates and prison officers in a capacity reliant on mutual trust and reciprocity" (Lafferty et al., 2015) [10].

Milsom et al. are more suited to the study due to the very well known EssenCES scale is used in prisons around the world. It reflects such dimensions: "Patients' Cohesion, Experienced Safety, Therapeutic Hold" (Milsom, 2013, p. 86)[15].However, it should be noted that EssenCES is the 15-item instrument that comprises of three climate dimensions: Patients' Cohesion and Social Support, Safety (vs. threat by aggression and violence) and Therapeutic Hold. It is used both in psychotherapeutic practice and in assessing the condition of convicts in prisons. In scale lanes, physical parameters and other similar parameters are given less attention. However, the link between the conditions of detention and the well-being of prisoners is key to Ukraine. Despite the significant advantages of the scale, for Ukrainian practice, it is not suitable.

According to Milsom, "compared the factor patterns from three domains of the Prison Social Climate survey (PSC) (Environmental quality of life; Personal well-being; and Safety and security) and their stability. There is a commonality of dimensions in the US (PSC) and English Measurement of quality of prison life (MQPL) instruments although they differ in tone" (Milsomal, 2013, p. 86) [15].

MQPL consists of a number of empirical-conceptual dimensions, such as 'respect', 'staff-prisoner relationships', 'humanity', 'fairness', 'staff professionalism, organization and
'consistency', 'security', 'personal development' and 'well-being'. The downside of the MQPL survey is the time that is required for it. For this reason this scale is not very appropriate for countries that are in an active reform phase, such as Ukraine. However, for sustainable democracies, it is optimal.

The comparison of the three most popular scales (PSC, EssenCES, MQPL) shows that PSC is the most relevant for Ukraine. However, the potential of PSC is not limited to issues of criminal psychology. The basic and additional parameters included in such a scale have the potential for application in the penal law and criminology, for the purpose of improving the well-being of convicts.

3. Aim and Methodology

The aim of this paper is to study the development and modern state of implementation of international standards for the treatment of convicted persons. Currently, there are several scales for measuring the well-being of prisoners, which can be considered international standards : PSC, EssenCES, MQPL. It is also the task of the article to suggest the most appropriate scale for assessing the social climate in Ukrainian prisons. This will allow contributing to the improvement of human rights in Ukraine, improve the state statistics, and help to understand the real needs of convicts.

The very logic of constructing all these scales (PSC, EssenCES, MQPL) is based on the opinion of the convicted prisoners on the conditions of their stay. However, only the consideration of prisoners' opinions,

without effective measures for working with prison staff and changes in legislation, will not be enough to change the situation. Therefore, to solve these problems, we need a comprehensive work with the prisoners themselves and with the staff of the prisons.

According to the Correctional Code (Criminal-executive code of Ukraine), there are two types of institutions for punishment in Ukraine: prisons for those convicted and jails for those awaiting their trial or are under investigation [28]. The conditions of detention and the regime in these institutions are not very different. Therefore, in the framework of this study, they will be analyzed together under the term "prisons".

The leading theory of methodology in Ukrainian jurisprudence is normativism. Ukraine, as a post-socialist country, largely uses the Marxist approach to scientific methods. This approach is founded on the orthodox empirical concept. This scientific tradition is particularly noticeable in the field of social and legal sciences. In Ukraine, the methodology of law is studied mainly on the general theoretical level within the theory of state and law. Ukraine has a special approach to formulating legal research methods. At the same time, there are very few works on legal methodology in Ukraine. For Ukrainian legal science, it is characteristic to use references to certain traditional methods, without pointing to the author and not deciphering in detail the essence of such methods. Modern work, in which the author explains such methods as the formal-dogmatic, formal-logical, historical and comparative method, is the work of O. Skakun [20]. The traditional for Ukraine approach to methodology is also used in this study. The following methods are applied:

Formal-logical - for the formation of new concepts, their classification, typology of the studied phenomena, i.e. the division into separate types, subtypes; eliminating inaccuracies and contradictions, etc. This method involves the use of logical laws and rules (they are also called methods-techniques or logical techniques): the ascent from abstract to concrete, abstraction, analysis and synthesis, induction and deduction, modeling, etc. In many respects this method (along with the comparative) is the main one in the study.

Formal-dogmatic, or legal method, based on the use of rules of formal logic for knowledge of law, is a traditional, inherent in legal science, since it proceeds from its nature. Its essence is in the formulation and disclosure of legal concepts, the construction of legal structures, and clarification of the actual content of the law. This method was used in the analysis of legislative provisions on the conditions of convicts' imprisonment.

At all stages of scientific research the dialectical method is used. This method determines the paths of any scientific study. It helps to explore all the phenomena in the relationship, interdependence and historical development.

The historical method is used for understanding of the right-state events, facts, ideas (theories) having time and spatial certainty in the context of their origin, formation and development, revealing of internal and external relations, patterns and contradictions, unity of subjective and objective moments. The purpose of this method is to determine the value of the object under study for the period of functioning, developmental prospects, connection with the present.

Comparative method involves comparing single-order legal concepts, phenomena and processes to establish similarities and account for differences between them. A prerequisite for applying this method is comparability of its objects (belonging to the same kind, type, the presence of similar structures, functions, tasks, goals, etc.). Comparisons are used in the classification of right-wing phenomena, clarification of their historical sequence, genetic links between them, general and specific patterns of development, traditions and innovations.

Unfortunately, the sociological method was used only fragmentarily since in Ukraine it is virtually impossible to conduct large-scale polls of convicts.

4. Results

The issue of prisoners' well-being in places of detention is explored in criminal psychology, sociology, criminal-executive law, and other fields. One of the key issues in this context is prevention of new crimes committed in places of liberty deprivation. A determining factor for prisoners' well-being and preventing them from committing new crimes is proper conditions of detention in places of imprisonment.

The concept of prison crime prevention in Ukraine prison has several tasks. Among them prison crime prevention (prevention so that the prisoners do not violate the prison rules) and rehabilitation (treatment to help them reintegrate into society). But the impact of a positive social climate on prisoners was not investigated. A classical approach is to analyze these questions within the framework of criminal

psychology. However, in Ukraine, these issues are studied by criminology. Therefore, the achievements of psychology and sociology are beyond the attention of scholars and practitioners in this field. One of the problems that are typical for the Ukrainian prison system as a whole is the lack of quality state statistics. However, the Ukrainian system of prison statistics is the successor to the Soviet system. This means that actual indicators that really reflect the current situation with the rights of convicts are not collected at the state level. This does not mean that there are no statistics in prisons in Ukraine at all. Information on the number of convicts, the number of prisons, age and gender of prisoners are regularly collected and freely available. However, modern Ukrainian statistics cannot fulfill their main function of reflecting the real situation in prisons and help in choosing the priority directions for its improvement.

In this, we see the undiscovered potential of the PSC scale, which is much greater than the actual application in criminal psychology. After all, the responses of convicts to issues concerning their own well-being will enable us to determine the directions of reforming the penitentiary system from the point of view of penal law.

The works of modern Ukrainian scholars demonstrate this separation of views. Oleinik looked at the problem of the social life of illegal drug users in prison. According to Oleinik "these convicts are not a part of the traditional criminal milieu, but a product of the perception of certain acts as crimes in particular contexts (e.g., an increasing social distance, the state's control over potentially dangerous groups, etc.)"(Oleinik,2013, p. 185)[16].This view is progressive for the post-Soviet countries, but specific measures on the social climate are not discussed.

Ukrainian researcher Buzalo et al. points to the following types of prison crime prevention measures (that is, additional measures applicable to prisoners) from the perspective of Ukrainian criminology: "socio-economic, legal, ideological, organizational-managerial" (Buzalo, 2007, p. 147-151) [3]. This position is classic. In this system, there is no role for criminal psychology, but rather for ideology. It is within the framework of ideology that some issues of criminal psychology are considered. These fragments include resocialization and psychological assistance.

Such a small number of studies indicate a lack of attention of Ukrainian scholars to the problems of social environment in prison. This approach has a deep historical background. Ukrainian criminology continues the tradition of Soviet Criminology. At the present stage, although the references to Marx and Lenin disappeared from the work of Ukrainian criminologists, the approaches introduced during the Soviet times remained unchanged.

The work of Friday remains relevant for understanding the general situation. Friday found, that "in socialist thought, the individual is collective; the self cannot exist outside of the society" (Friday, 1987, p. 139) [7]."Criminal behavior is rooted, therefore, in the individual's intellectual and emotional world, developed under the influence of social effects and relations. It is in this way that criminal offenses result from a series of causal connections with origins in the structure of society" (Friday,1987, p. 139) [7]. "It is in this essential view of man's relationship to society that socialist criminologists are able to view the process of criminalization both as society's failure and the individual's responsibility and to look at objective social conditions and subjective interpretations. Criminal behavior is not determined by the internal or external, but by the dialectic between them. Determinism is not predestination; it is the determination of awareness through a constellation of causal events"(Friday, 1987, p. 139) [7]. "A criminal act, determined by personality, is proof positive of the failure of the society to adequately socialize and integrate the offender into the collectivity. This requires remediation, resocialization, and re-education. Therefore, the imposition of penal sanctions for anti-social behavior is justified as prevention"(Friday, 1987, p. 139)[7].

Tierney and O'Neill point out the contradictory development of criminology in the 20th century. They conclude that"[i]n the communist countries, there was a specificity of the socialist criminology development. They quote this approach "Structural Marxist approach' (Structuralism)" (Tierney, J. and O'Neill, M., 2013, p. 187) [21].

Zembroski studied the problem of the development of sociological theories of crime and delinquency, which developed in parallel with the Soviet ones. His research begins with the anomie theory and the theories associated with the Chicago School of Sociology (1920s). They are followed by theories of strain, social control, opportunity, conflict, and developmental life course (Zembroski, 2011, p. 240) [29].Even a superficial analysis of these concepts allows them to see their fundamental differences with the Soviet doctrine. Ukrainian scholars should pay more attention to foreign trends in criminology. Foreign scholars can also find interesting ideas in post-Soviet criminology.

First of all, Ukraine needs to pay more attention to the positive social climate and conduct sociological research in prisons; we can bring Ukrainian criminological research closer to our present developments. Harding uses the notion of "validated tools for measuring prison social climate" (Harding, 2014, p. 163). This research identified "regime factors that tend to make the prison experience less negative for prisoners. Experience in other human service areas would suggest that programs delivered in a positive prison social climate should be more effective than those delivered in a negative climate" [8] (Harding, 2014, p. 163).

However, these fragmentary measures are not enough. To build an effective preventive system, we need to use the achievements of psychological and sociological research in this field. Now the social climate in Ukrainian prisons is very unfavorable.

The lack of scientific basis for studying the social climate in prisons at the national level, inadequate statistics and the inability of scientists to access the prisoners make the situation catastrophic. Nowadays, the living conditions are very poor in Ukrainian places of detention. There are significant economic and structural problems in this area. Different methods from a variety of research fields, such as economic, psychological, sociological and others, are used to address those problems. Undoubtedly, it is necessary to comprehensively improve the conditions of detention of convicts. One universal recipe cannot be offered however, in order to improve the situation, it is necessary to explore it. Current prison statistics do not meet contemporary requirements; researchers have no possibility to interview prisoners and there is no possibility for receiving feedback from convicts.

Therefore, there is an urgent need in an effective instrument for a comprehensive analysis of the prisoners' living conditions and for obtaining feedback from them in Ukraine. Such tool would allow solving several issues:

a) contribute to the improvement of human rights in Ukraine;
b) improve the state of the statistics;
c) help understand the real needs of convicts:
d) all of the above will contribute to the formation of a concept of prison crime prevention.

Comprehensive improvement of the situation with prisoners' conditions requires constant evaluation of the current situation and for that an effective scale needs to be chosen. Some widely used scales are the Essen Climate Evaluation Schema (EssenCES), the Prison Social Climate Survey (PSC) and English Measurement of quality of prison life (MQPL) instruments.

Bennett and Shuker have indicated that "more positive social climates can improve safety, psychological well-being, quality of life and contribute to reduce reoffending. It is concluded that understanding and managing social climate is an essential aspect of improving the safety and effectiveness of prisons. Developing practices that "enhance social climate requires looking beyond mainstream prison practices, towards niches such as specialist units and prisons, including D[emocratic] T[herapeutic] C[ommunity]s and other therapeutic communities, and psychologically informed environments, as well as looking at practices in other settings including forensic mental health" (Bennett and Shuker, 2018, p. 44) [2]. Taking this wider perspective can be a source of ideas and practice that could inform a profound culture change.

Ukraine does not have many achievements in this area. This is due to complete isolation of criminology and criminal law in the Soviet times. Therefore, the solution of this problem is crucial in solving three problems:

a) study of the historical aspect of the question;
b) analysis of works on social climate issues for possible application of their provisions in Ukraine.
c) analysis of available statistics (due to the technical impossibility of obtaining other data from prisons);

Lykhova found that "one of the positive moments of globalization is the possibility of the formulation of international standards in the approach of criminal legal protection of human values" (Lykhova, 2016, p. 126) [13]. Globalization processes anticipate the new level of international cooperation. That is why the European choice of Ukraine requires the analysis for state development issues of current importance to domestic legislation in the context of the common European research area.

In Ukraine there is a gap between penal law, criminology, and psychology. There is also a gap between theory and practice. According to Lykhova, the existing penal system and pre-trial detention were created in Soviet times. Ukraine lacks financial resources to fund prisons and colonies adequately. As a result, people often live in inhumane conditions there. Penal system does not correspond to the current level of socio-economic development of society and to the principles of humanism and respect for human rights

and freedoms in the process of punishment execution (Lykhova, 2014) [14].However, the issue of positive social climate is paid very little attention to even on a theoretical level. State policy prioritizes individual work with convicts in Ukrainian prisons; however collective work with convicts should be based on modern developments. Therefore, the question of the prison climate in Ukraine is so relevant.

Ukraine should follow the experience of other countries and implement the concept of measuring the social climate in the population at the state level. However, there is no need in inventing a new scale. It is possible choose the best of existing scales, translate it into Ukrainian, adapt it to national conditions and adopt it for use at the state level. This has not been done yet and the current study is one of the first attempts to encourage this policy development.

There are temporary detention isolators (for those awaiting trial) and correctional colonies (for those convicted of crimes) in Ukraine. Temporary detention facilities are formally segregated and are not prisons. However, under conditions of detention and a very long stay, they are actually prisons. The conditions of detention in both are very similar and unsatisfactory as confirmed by the OSCE reports [17,5], the Ombudsman [23,24] and the State Penitentiary Service [25].

One of the problems that are typical for the Ukrainian prison system as a whole is the lack of quality state statistics. This does not mean that there are no statistics in prisons in Ukraine at all. Information on the number of convicts, the number of prisons, age and gender of prisoners are regularly collected and freely available. Public organizations also conduct relatively regular polls among convicts and prison staff on various issues [5,6].However, the Ukrainian system of prison statistics is the successor to the Soviet system. This means that actual indicators that really reflect the current situation with the rights of convicts are not collected at the state level. At the same time, although the current statistics in Ukraine are very imperfect, we use the available data to illustrate the situation where possible.

Also, in order to determine the priorities of reforming prisons, changes in the statistical system are necessary. After all, without real statistics, there is no way to determine the ways of reforming the prison system. In this case, PSC is a comprehensive tool that allows you to immediately identify the major issues that exist and take immediate measures to improve the situation. The PSC system is particularly successful here since it reflects the basic needs of the convicts while taking into account the opinion of the prisoners themselves. The PSC scale is not currently used in Ukraine. However, even in the current situation, we can talk about the situation as a whole on the basis of the given parameters.

The PSC in the first section highlights the environmental quality of life. The first domain of the PSC relates to physical environment: accidents, noise, food, crowding, visits. However, in the Ukrainian context, it is worth considering physical architecture as an additional dimension (Akers, 1976, p. 624) [1].

A physical architecture of place of imprisonment is a big problem for Ukraine. Lykhova (2016) states that "one of the most critical situations of the Penalty Service in Ukraine – is overloaded penal institution. Most prisons and other institution were built 50 and 100 years ago. They function today" (Lykhova, 2016, p. 127) [14]. The horrible unsanitary, cold or stranglehold, heterogeneous contingent, and brutal guard - all these area usual picture of the life of prisoners. These problems were discussed in reports of the reputable intentional institutions – the UN Committee against Torture, the UN Committee of Human Rights, European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment. The Ukrainian ombudsman paid attention to the discrepancy between detention condition in Ukraine and in Europe for a number of times [14].

The statistics of the penitentiary service are very specific. It does not reflect the real conditions of detention. According to Donetskyi Memorial (2018):

[i]n the prison system in Ukraine system controlled by the Ukrainian authorities, that is, without institutions of Crimea and the occupied part of the Donetsk and Luhansk regions, as of 01.07.2018 there were56,638 people. The number of prisoners per 100 000 of population of Ukraine is 135. As of 01.01.2018, 57295 people were registered on the account of the authorized probation bodies. During 2017, 568 people died in prison institutions, of which 164 were in detention centers (we do not have separate statistics on what caused the death - murder, suicide or illness. However, high mortality indicates serious problems). The number of cases of suicide during the stay of persons in all institutions of deprivation of liberty was 46in 2017, of whichin investigative detention centers – 13 persons [5].

Even without conducting a survey, this quality of the physical environment can be considered unsatisfactory.

Other indicators are actually not available for scientific research. Such high rates of mortality and suicide suggest that the issue of using psychological knowledge to improve the social climate in prisons and prevent recurrences is very relevant. Positive points can be considered to increase the attention of the state to the work of psychologists in prisons and attempts to introduce a probation service. First of all, this reflects the adoption of a number of international conventions in this area. In compliance with the commitments undertaken, the relevant national regulations are issued.

The situation with noise and crowding also needs to be changed. There is not enough beds therefore, prisoners sleep in turn. According to the information of The General Prosecutor Office of Ukraine "European standards for the detention of prisoners, each prisoner should have at least 4.5 square meters area of the camera. General Prosecutor of Ukraine informed that in Ukraine, this standard is at 2.5 square meters, but in fact even 1,5 square meters" (The General Prosecutor Office of Ukraine, 2018) [25]. Under these conditions noise is constant. That is, the situation with noise and crowding can also be considered unsatisfactory.

Romanov et al. have looked at the problem in the same way. However, he gives even more impressive numbers. He notes that "the soap norm is 200 grams per convict per month. At the same time, the norm of soap for a prison dog is 250 grams per month. In this, the scientist sees an image of human dignity" (Romanov et al., 2015, p. 74) [17]. The next indicator is food. Last year Ukraine allocated UAH 250 (USD10) for food per prisoner per month. Maintenance costs covered by the budget are 10 UAH (less than 50 cents) per day. It is clear that such financing cannot provide prisoners with high-quality food. Therefore, the food situation is also unsatisfactory, which is obvious even without a poll.

Consequently, according to the first section of the PSC scale, even without a survey, it can be argued that the situation is unsatisfactory.

The next aspect is personal well-being. It can be divided into two factors - psychological well-being and somatic complaints. In May 2017, a group of four foreign experts and two representatives The Secretariat of the Ombudsperson for Human Rights conducted a tour of the penitentiary establishments of Ukraine in order to assess the quality of psychiatric assistance in the system of punishment execution. In June 2017 a report has published an overview of the prison health services in Ukraine and the development of an action plan [9]. Basically, the system aspects of mental health in the penitentiary system, the prison environment, contacts with the outside world and the content of the day were assessed. No specific method for evaluating the quality of the environment was used. It is pointed out only that "Creation of a better prison system should be linked with the best trained, qualified and paid prison staff. In addition, a less repressive prison system, more aimed at rehabilitation, a correction and an alternative to pre-trial detention may reduce the number convicted" (The report reviews the mental health services in Ukraine and develops a plan of action, 2018).

Psychological well-being is a big problem in Ukraine. According to the staffing schedule, all prison institutions must have a psychologist, but in reality that is not always the case. There are also problems with trust between prisoners and a psychologist. Although among the tasks of the psychologist is the provision of psychological assistance to the convicted and detained persons, the methods of such work and the collection of statistics are not defined. However, the provisions of these acts are often obsolete even before adoption. The Act-On the organization of socio-educational and psychological work with the condemned regulates the activities of the psychological service in detention isolators and correctional colonies. In accordance with the Order of the Ministry of Justice of Ukraine "On Approval of Rules of the Internal Rules of Investigative Insulators of the State Criminal Execution Service of Ukraine" (Ministry of Justice of Ukraine, 2013):

[p]sychologist in prison has his own tasks: providing psychological assistance to the convicted and detained persons, development and implementation in cooperation with the personnel of the institution of individual and group programs of psycho-correction and pedagogical influence on convicts, increasing the psychological skills of the staff of the institution, generalization, and introduction into practice of the institution of modern methods of psychological and pedagogical influence on convicts and persons taken into custody [26].

Therefore, the improvement of the qualifications of psychologists and the definition of clear parameters for determining the psychological state of convicts is important. The next parameter is somatic complaints. Currently, the quality of health care is not adequate in prisons. According to the report that reviews the mental health services in Ukraine (Donetskyi Memorial, 2018) "on average, prisons are provided with doctors by 75 percent. Drug procurement budget is very small and funded by 50%". The procedure for providing medical care to the prisoners is very bureaucratic.

That is, in the second section of the PSC "personal well-being" (which generally includes the quality of medical and psychological care), the situation in Ukraine is also unacceptable basis of available statistical data.

The situation is also threatening with respect to personal safety and security (Safety for staff and inmates, Influence of staff on inmate behavior, Influence of inmates on inmate behavior, Frequency of assaults, Freedom of movement around a prison, Searches, and shakedowns).

Liebling state that "the most important dimensions, which contribute most to variations in levels of personal development among prisoners, are 'humanity', 'staff professionalism', 'help and assistance', 'bureaucratic legitimacy' and organization and consistency" (Liebling, 2004) [11].These included respect, humanity, staff-prisoner relationships, trust, well-being, safety, order and the use of authority by staff.

Donetskyi Memorial provides the following statistics on prison staff:

[t]hey are forbidden to use energy soft drinks, and the beds should be laid according to the established pattern. On the other hand, due to small salaries, there are problems with the number and quality of the prison staff. We have very little empirical material about staff satisfaction with their work. In fact, the only one can be called Analysis of the results of the survey of employees of the SIZO No. 13 in Kyiv. The total number of interviewed SIZO employees is 100 people (48 men and 52 women). The level of satisfaction with the working conditions among the respondents is low. Satisfied by them are 29%, not sure are 9%, dissatisfied are 62% of the respondents. Most respondents indicated that they would have left the job in the penitentiary system if they had a more attractive offer. 57.7% would agree to change the job, 23.7%would not agree, the rest – have not answered. Among the main reasons for changing job the respondents mentioned higher remuneration (33%), better working conditions (8%), some would agree to move to a job with better social guarantees [6].

There is a general dissatisfaction with the level of remuneration among the prison staff. Only three respondents indicated that their salary provides a reasonable standard of living. The rest was "completely dissatisfied with the level of payment (45%) or believes that it does not fully ensure a standard of living (52%). The majority of respondents (70%) supported the need for psychological prevention among prison staff, while 22% denies such need and the rest did not respond" (Donetskyi Memorial,2007).

The main arguments in favor of psychological assistance were the danger of professional deformation (degradation), great psychological stress, and negative emotions. It was also mentioned that it could be an opportunity to improve the skills of staff, in particular, help overcome a problems with alcohol dependence.

There is no social statistics for prison accidents in Ukraine. The community becomes aware of only some of these cases. We know that various accidents occur frequently in Ukraine, but we do not have access to quantitative indicators. For example, in Kherson region, 8 prisoners cut their hands and forearms with a safety razor using the blade [5].

The walk of the prisoners lasts one hour. This happens in the yard, fenced with lattice. With such indicators, we cannot even talk about the opportunity to be satisfied with the conditions. Commissioner of the Supreme Council for Human Rights (2018) emphasized on this problem during every visit to all prisons [23].

The situation with visits, in general, is not bad. Prisoners are allowed short visits with relatives or other persons. To realize this right they need to obtain a written permission from the investigator or the court conducting the criminal proceedings.

Internal Rules of Investigative Insulators of the State Criminal Execution Service of Ukraine regulates that the duration of the visit is one to four hours, taking into account the wishes of the prisoner, his conduct and the capacity of the premises for the provision of visits. In the Criminal-executive code of Ukraine regarding convicted prisoners, the number of visits depends on many factors. On average, the convicted person is given one short appointment per month and one long visit for three months. Taking into account the data, it is very important to study the number and quality of visits, according to the prisoners themselves.

Both of these factors, along with the lack of adequate statistics, generate numerous abuses. For example, according to the information of the Prosecutor's Office of Poltava removed from criminals "in [several] local prisons - hogs and horns, wound barbed wire with sharp metal spikes, snags, and sledgehammers that could be used to torture prisoners" (the Prosecutor's Office of Poltava, 2018) [22].

In 2017 more than 500 people died in Ukrainian penitentiary institutions. The high powers of the staff, low wages and tight restrictions on prisoners without the necessary controls make the situation dangerous. Therefore, the maintenance of the necessary safety statistics is of paramount importance.

Personal security, as we see, is not generally provided either. Despite the good situation with the visits of other parameters (Safety for staff and inmates, Influence of staff on inmate behavior, Influence of inmates on inmate behavior, Frequency of assaults, Freedom of movement around a prison, Searches, and shakedowns) are unsatisfactory, which is generally clear and without an additional poll.

5. Discussion and Conclusion

The comparison of the three most popular scales (PSC, EssenCES, MQPL) shows that PSC is the most optimal for Ukraine. The issue of positive social climate in prisons in Ukraine has not been studied. Therefore, foreign work is used to study this issue. However, the potential of PSC is not limited to issues of criminal psychology. The basic and additional parameters included on such a scale have the potential for application in the penal law and criminology, for the purpose of improving the well-being of convicts. It is the PSC that focuses on issues of concern to the Ukrainian penitentiary system - the physical environment (including food and noise); inappropriate medical care; low quality of work of the personnel and excessive constraints for prisoners.

At the same time, access to the penitentiary system is very obscure, and the quality of such statistics is unsatisfactory. The first step for converting the state policy in this area is the introduction of the PSC at the state level in the system of official prison statistics. The second step would be to conduct a poll on the PSC system in all prisons. The third step, based on the collected data, is to determine the parameters that cause the most dissatisfied prisoners. The fourth and most important step should be the development of concrete measures to improve the lives of convicts in accordance with the data obtained through the survey. That is, reform can begin with the development of a prison repair program; and maybe from the development of a new diet for convicts. All at the same time cannot be changed. The sequence of changes should be determined first and foremost, taking into account the opinion of the convicts. A very good tool for this is the PSC. However, after significant reforms, the PSC will not lose its impetus to assess not only the opinion of the concrete convict but also the situation as a whole. A regular, semi-annual poll of convicts will allow control of the situation. This will help to respond in a timely manner to negative trends, as well as give further recommendations on penitentiary prophylaxis in terms of criminal law and criminology. In general, the concept of PSC is an effective mechanism that should be implemented in Ukraine in the practice of prisons. It is helping to obtain statistics, conduct further research and improve conditions for prisoners. Better conditions for the detention of prisoners will help to prevent crimes.

As was investigated, the indicators proposed by Liebling (Environmental quality of life (food, crowding, noise etc.), personal well-being (psychological well-being and somatic complaints) and personal safety and security) are appropriate for assessing the quality of life of convicts in Ukraine. At the same time, at the moment, as demonstrated by research, the quality of the social climate is unsatisfactory with all indicators. This means that the reform of the penitentiary system should be in all directions specified by the PSC, with priority being determined by interviewing the convicts.

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Training of the Highly Qualified Personnel in the Postgraduate Study in Russia and Tajikistan: Results of the Sociological Poll

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Abstract

The article is dedicated to the topical issues of training of the highly qualified personnel in the postgraduate study in Russia and Tajikistan. The model of training of highly qualified specialists (postgraduate study) in Russia and many foreign countries, including former USSR Republics developed years ago. But now it requires serious changes. Changes in pedagogics, changes in the labour market are considered in the article, It becomes obvious, that the preparation of scientific personnel for various types of research activity, within one programme is getting more difficult. The authors carried out the research within the Erasmus+ project "Capacity building: Improvement of quality of engineering education through training of teachers and new pedagogical approaches in Russia and Tajikistan" / EXTEND. One part of this research was aimed on the analysis of situation of training of highly qualified personnel in the postgraduate schools of Russia and Tajikistan. In particular, the following tasks were formulated: - to determine the directions of career development, which the applicants to the post graduate school plan to realize; - to reveal the opinion of graduate students on the quality of training in the postgraduate school. The specially developed questionnaire, containing 22 items was used for the sociological poll among the graduate students. According to the poll results not all the post-graduate students are satisfied with the process. There is the need of reorganization of the postgraduate study in both countries.

Keywords: graduate students, postgraduate study, labour market inquiries, research activity, sociological poll

1. Introduction

The model of training of highly qualified specialists (postgraduate study) in Russia, and foreign countries as well was developed long ago. First of all, it was the way of training of qualified teachers for the higher school and research institutions of the academic type. It was supposed, that teachers carry out scientific research simultaneously with their pedagogical activity (firstly, acquainting students with them since the first year and secondly, developing and detailing certain scientific directions within their discipline). The only on career way actually outlined for the graduates of the postgraduate schools of the universities and that was the way of the teacher, who is simultaneously engaged in the research activity within the scientific (educational) discipline. Narrow specialization developed and it was encouraged.

By the end of the XX century the quantity of the graduate students, who successfully defended their thesis began to fall in Russian. Various measures were undertaken. Firstly, accents in training of graduate students were changed. Nowadays the aim is training of the researcher, not a teacher. Therefore, the task of graduate students is preparing of thesis. For this purpose, the quantity of studies was reduced, some pedagogical disciplines were excluded and the training term was increased. Thus, the graduate students received extra time for preparing their research. However, the desirable result was not received, and we got back to the previous model. Since 2013 the postgraduate study was given the status of the third level of the higher professional education [1, 2]. Now graduates gain the "Teacher – the researcher" degree; it is not dependent on the fact they defended their thesis or did not. The quantity of the graduate students, who defended their thesis in time, continued to decrease.

The Deputy Minister of science and higher education of the Russian Federation Marina Borovskaya [3], speaking at "Global forum of convergent and nature-like technologies", told: "Today 90 thousand young people study in the postgraduate schools of the universities of our country and the academic institutes. And the percent of the thesis defended makes only 12%. It is inadmissible situation, which requires our special attention …" It should be noted that the indicators of the successfulness of the master's thesis defense considerably varies, depending on the scientific direction, but, in general, the indicators are low.

At the turn of the XX and the XXI centuries the situation strongly changed all over the world, both in the sphere of science, and in the sphere of pedagogics [4].

Research activity of the teacher was focused on the extensive (evolutionary) nature of the research.

Any radical updates of the existing theoretical concepts are not expected from the authors of thesis, prepared in the educational institutions. Such research corresponds to a certain stage of the science development, it is necessary for the specification of the theoretical provisions, their justification and for the explanation as well as for the expansion of the area of the application of theories. And though the implementation of the received results in real practice is demanded from the authors of thesis, actually everything is limited to some minor improvements in the narrow sphere of the practical activity. According to these requirements the training courses developing knowledge, specific to some concrete disciplines, and abilities, concerning tightly specialized research, are created for the graduate students.

Nowadays the research activity in many industries, especially in the field of nanotechnologies, gained the nature of intensive (revolutionary) research. Such research is focused on the industrial production, demanding rapid implementation, ability to adjust scientific research literally "on the run". That in turn led to the quantum leap in the development of methods and means of processing and submission of information, to the offer of other scientific approaches to the process of knowledge, and to receiving of new materials on their basis. For scientists of this type research activity is the main and, moreover, the only one, because its intensity does not allow them "to disperse".

It becomes obvious, that the preparation of scientific personnel for various types of research activity, within one programme is getting more difficult.

There were serious changes in pedagogics too. Traditional disciplinary approach was replaced by the competence-based approach. Teacher of the higher school becomes professional activity, which demands special preparation. Training courses are being created not as the model of a separate scientific discipline, but as the module, including knowledge from various disciplines, and not just closely related. The emphasis is placed on the formations of universal abilities, which do not limit the graduates with the framework of narrow specialization. Such approach corresponds to the current trends in science. Scientific breaks are made on the joints of various sciences, sometimes very unexpected, for example: technical and social sciences, natural-and-science sciences and humanities.

At the same time labour market changes too. Annually dozens of new professions are born and dozens of old, traditional professions die off. The situation about the highly qualified graduates changes radically, the range of jobs, available to them, extends [5-9]. According to foreign researchers, the career of the candidate of Science, becomes branching, not rectilinearly unambiguous [6, 10]. However most of the institutions of higher education continue professional training of graduate students, mainly, with the orientation to the positions of teachers. Such situation develops not only in our country. According to the results of sociological polls, the graduates of the postgraduate schools mainly "settle" on faculties still [11]. Firstly, the lack of information on the changing trends of hiring and on the opening opportunities for employment for the highly qualified people and secondly, the lack of competences, necessary for any other career, seem to be the reasons [12]. Howeverб some works report that, having begun to work in the pedagogical sphere after the termination of the postgraduate study, young candidates of Science leave faculties and settle to other positions [7, 13, 14].

Seeking to correspond to the labour market inquiries, some institutions of higher education, first of all elective courses, offer programmes, which allow graduates to create their career successfully both in the sphere of extensive, and intensive researches (at the expense of constantly updated training courses) [15-17]. However, at the same time efforts on the preparation of pedagogical personnel decrease [18].

An interesting research was carried out among the graduates of the postgraduate study of Harvard University (2004 - 2014) in 2015. More than 8 thousand people, 83% of them being citizens of the USA, participated in the research [15].

Two categories of professional career of graduates of the postgraduate study were allocated: Reserch-Intensive (4 Category: Tenure Track Research, Industry Research, Govermment Research, Non-Tenure Track Academic Research) and Non-Research-Intensive (8 Category: Teaching Intensive Careers, Administrative, Consulting, Business Development, Science Writing and Communication, Science Policy, Intellectual Property and Other).

As the poll proves, 53% of the interviewed graduates make their career in the sphere of intensive scientific research, others (47%) are engaged in some extensive researches within pedagogical activity (17%), or in the administrative work (13%), scientific policy, consultation and so forth.

Naturally, such a wide variety of spheres of action of graduates of the postgraduate schools make them to think about the compliance of their professional training: what competences were demanded, what abilities were not enough, what was insignificant. Sociological polls help to receive answers to these

questions. Thus, according to the American researchers [19], it turned out that nine of fifteen abilities (competences), created during the preparation, had no significant correlation with the career category. These competences include: knowledge of specifics of the scientific branch, ability to collect and interpret information, ability to analyze data, ability to make decisions and to solve problems [20], skills of oral and written communication. It demonstrates the efficiency of the selection of competences, which have universal character, and which are suitable for any category of career, having high qualification.

Differences between those who work in the sphere of intensive scientific research and those who are engaged in the extensive researches were recorded for three competences (abilities).

The abilities to creativity and innovations, planning of career are demanded in the scientifically intensive sphere. Special attention was paid on the ability to work with people out of one's own organization. The reasons are clear. Firstly, the need for cross-disciplinary scientific cooperation increases both in the academic circles and in the branch. Secondly, financing of the research programmes, as a rule, goes through receiving grants; that demands the ability to come into contacts, to demonstrate the progress and future results by the means of the language, clear to those, who are outside the scientific organization.

3. Procedures and Methods

a.Tasks

We carried out the research within the Erasmus+ project "Capacity building: Improvement of quality of engineering education through training of teachers and new pedagogical approaches in Russia and Tajikistan" / EXTEND [29, 30]. One part of this research was aimed on the analysis of situation of training of highly qualified personnel in the postgraduate schools of Russia and Tajikistan. In particular, the following tasks were formulated:

- to determine the directions of career development, which the applicants to the post graduate school plan to realize;
- to reveal the opinion of graduate students on the quality of training in the postgraduate school.

The research was carried out in February – March, 2018.

b. Research technique

The specially developed questionnaire, containing 22 items was used for the sociological poll among the graduate students: Those items include:

- ten statements, demanding to state one' s own agreement or disagreement, using 5-point scale: 1 – resolutely disagree, 2 – disagree, 3 – neutral answer (indifferently, lack of information), 4– agree, 5 – resolutely agree;
- six questions, demanding developed answers;
- one question, supposing the choice of the answer from the offered list.

2.3. Participants

185 graduate students from four Russian universities and four Tajik universities participated in the research:

- Khujand State University of B. Gafurov (KhSU) – 25 people;
- Kulob State University of A. Rudaki (KSU) – 46 people;
- Tajik Technical University (TTU) – 20 people.
- Tajik National University (TNU) – 25 people.
- N.P. Ogarev Mordovia State University (MRSU) – 18 people;
- Nosov Magnitogorsk State Technical University (NMSTU) – 15 people;
- Bauman Moscow State Technical University (BMSTU) – 23 persons.
- National research Moscow State University of Civil Engineering (NRU MGSU) – 44 persons.

3. Results

According to the forms of organization the training course "Social, psychological and legal communications in the professional activity" consists of lectures, practical training and independent work.

This article presents the results of the poll among the graduate students: firstly, on the estimated directions of their career after completion of the postgraduate school and secondly, on their estimates of the

quality of training in the postgraduate study on various parameters.

1. Direction of career development.

As the results of the poll prove (fig. 1), the majority of the applicants to graduate school are focused on their career in the pedagogical sphere.

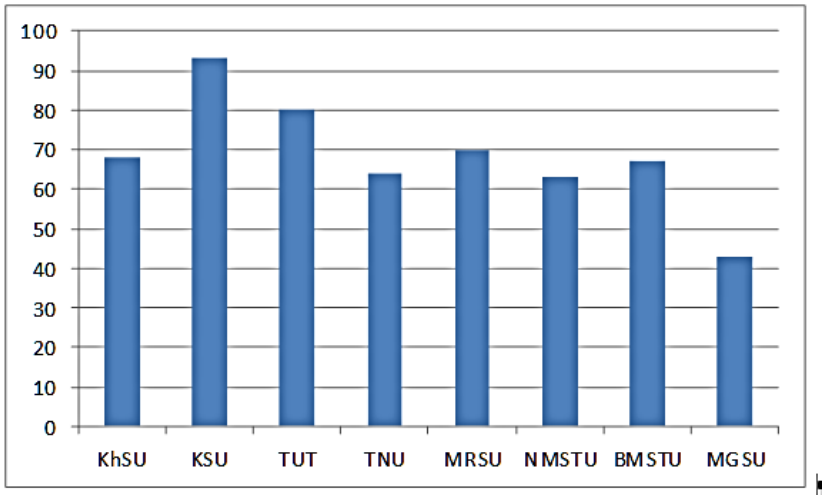


Fig. 1. Orientation to a career in the teaching profession

It should be noted, that a considerable part of the applicants to the graduate school already works at departments and laboratories of different universities, and the candidate thesis defense is the condition of the career development for them. On this background the graduate students of NRU MGSU make the exception. The reason is that the investment-and-construction industry in Russia develops promptly and the experts of high qualification are required for the intensive scientific activity in the production sphere. More than a half of the interviewed graduate students of MGSU intend to make their career in the sphere of business and construction production, financial management, investments, projects. Many of the interviewed students from other universities are ready to go to other spheres of activity, but they do not know where their qualification can be demanded. Some graduate students are carrying out an active search already, considering pedagogical work as a spare option.

At the universities in which the survey took place, special attention is paid to the pedagogical training of the graduate students. The graduate students study such educational technologies as the personal focused training, research methods of training, information-and-communication technologies, technologies of design training within the educational programme. Student teaching is obligatory. During the practical training the graduate student gives lecture, practical and laboratory classes, which are in the profile of the department and connected with the scientific research subject, he or she attends classes of other graduate students and leading teachers of the department, organize teaching-and-educational actions with the students, carry out research of the identity of students and student's collective.

Besides the obligatory training courses, many universities offer disciplines for choice (for example, in Ogarev Mordovia State University the preparation in the field of pedagogics, in the use of educational technologies is carried out within the following disciplines of the curriculum: Information technologies in science and education; Pedagogics of the higher school; Inclusive educational technologies; Psychological-and-pedagogical technologies of teaching at higher school.

2. Assessment of the quality of training within the postgraduate study.

The assessment of quality of training within the postgraduate study was carried out according to several parameters: general satisfaction, satisfaction with the quality of the organization of educational process and the provided training materials, adequacy of balance between the theoretical and a practical part of training, the use of modern educational technologies, in particular information-and-communicative, awareness of teachers on the international experience, acquaintance of students to the real branch of their future profession.

The generalized results of the teachers' answers are presented in the graphic form as three categories:

«No» - disagree (1 and 2 points);

«D/a» - difficult to answer (3 points);

«Yes» - agree (4 and 5 points).

The graduate students of different universities demonstrated various degree of satisfaction with the training (fig. 2).

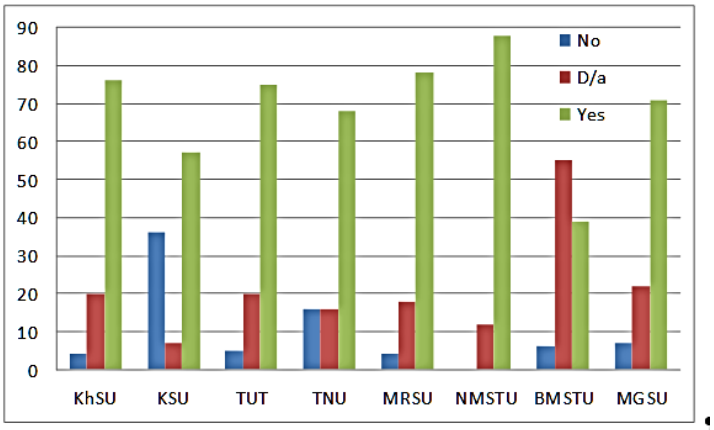


Fig. 2. Degree of satisfaction with training

As Figure 2 shows, the results fluctuate from 39% (BMSTU) to 88% (NMSTU). Considerable percent of the graduate students (up to 56%) found it difficult to estimate the quality of training. The question why the graduate students cannot estimate their satisfaction with the training process, they answer that the result is important for them, and it will be visible only after the defense of thesis. Therefore, they beware hasty conclusions. The graduate students express the discontent with the congestion with the studies demanding constant presence, weak organization of the conditions for independent work, lack of the opportunity to be engaged or consult with the teacher remotely in their comments.

It is known that one of serious problems of the training process is the ratio of the theoretical and practical part of the course. The purposes and problems of disciplines, which are offered for studying in the postgraduate study are various. After adoption of the law on recognition of the postgraduate study as the third step of higher education, the quantity of the training courses, obligatory for students in the postgraduate study, increased considerably. As for the ratio of the theory and practice, teachers of traditional school place the emphasis on the theoretical preparation. According to the modern practice-focused approach, it is necessary to consider the priority of practice to be adequate [31]. As this question often is the subject to discussion in the educational audiences, when teachers prove the need of theoretical knowledge, it is not surprising, that many graduate students also find it difficult to answer unambiguously. They consider that they did not have their own opinion on this question yet. But in general, the ratio of the theoretical and practical part of the graduate students training suits them (fig. 3).

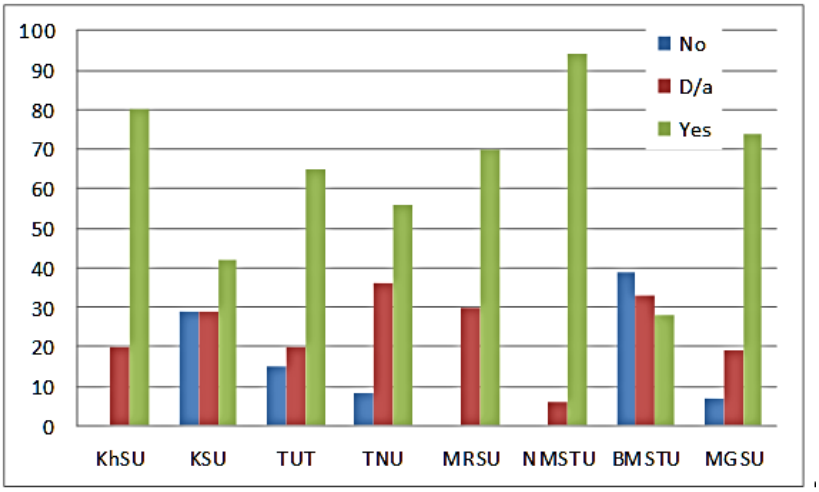


Fig. 3. Satisfaction with the ratio of theoretical and practical parts of training

Nevertheless the graduate students obtain the acquaintance to the real branch of the future profession

during training, though not in that volume in which they would like to obtain (fig. 4). Those, who already work at the university and know their future place of work, their status and opportunities for the career development, are the most satisfied.

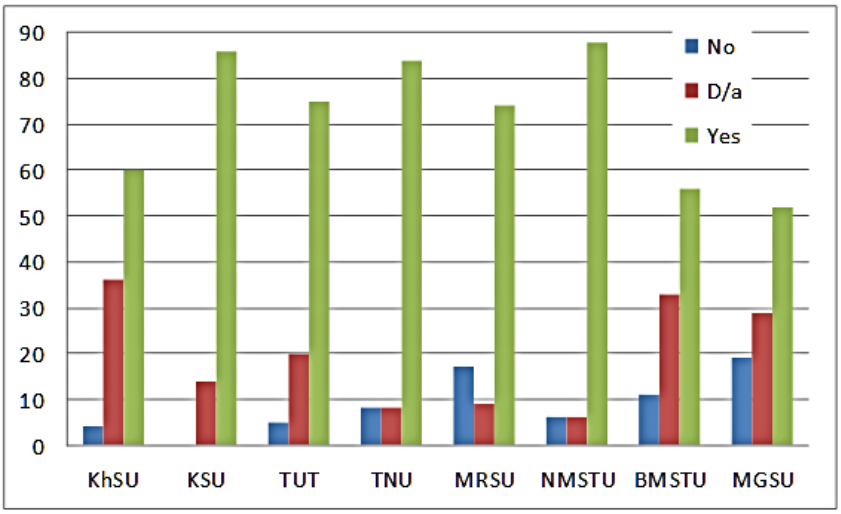


Fig. 4. Satisfaction with the acquaintance to the actual industry of future profession during training

Information-and-communicative technologies (ICT) play the special role among the educational technologies. These are word-processors, spreadsheets, programs of preparation of the presentations, database management systems, organizers, graphic packages. Instant access to electronic libraries, in which electronic training materials are posted, and electronic control systems of knowledge, allowing to hold testing of students online or off-line, the information training systems, etc. become possible with the advent of computer networks. E-mail, chats became generally available. It is possible to carry out audio and videoconferences, to hold consultations, virtual studies in real time by the means of the special equipment. Such matters are regularly discussed in foreign journals [32-35].

Graduate students of the Tajik universities express the need of wide use of information-and-communicative technologies for the educational process almost unanimously (fig. 5). However, the opinion of the Russian graduate students is less unambiguous.

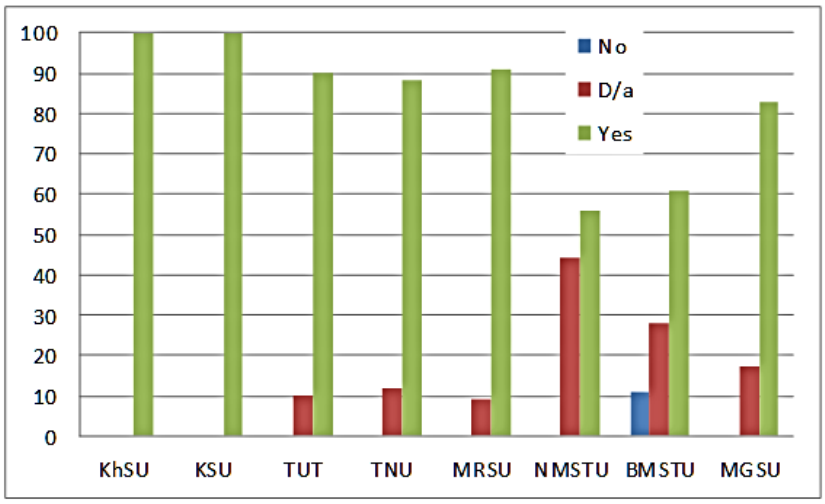


Fig. 5. Satisfaction with the use of information-and-communication technologies in the educational process

On the one hand, the graduate students believe that teachers (especially aged teachers) avoid to use modern technologies which, in their opinion, simplify the training process, promote faster understanding. Teachers, in turn, argue their unwillingness to use the information technologies with the fact that they do not contribute to the development of thinking, to the ability to argue independently, to use imagination, etc. The

argument of this part of teachers makes the graduate students to ponder, someone begins to think about this, and someone accepts the arguments of teachers of the traditional school.

4. Conclusion

Thus, social and humanitarian training courses is the necessary condition of professional education of the person, their presence at any technical university is obligatory. This fact is admitted at the universities by all the participants of the educational process. However, these courses demand special approach, accounting of specifics of humanitarian knowledge. Certainly, subjects have to reflect specifics of professional activity, its social context, but not due to narrowing of own contents. This contents performs the function, form universal values, personal meanings and a civic stand. Social disciplines as separate training courses can have a professional binding and come to the behavioural level, they form the corresponding social-and-professional abilities.

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Game Paradigm of Comparisons as the Stage of the Formation of Cross-Cultural Dialogue Between the Buddhism and Psychoanalysis

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Abstract

This article is devoted to Alan Watts's ideas and the place of its works in the space of the dialogue of Buddhism and psychoanalysis. According to the conducted research Alan Watts was an active participant of the considered cross-cultural interaction the East-West. Nevertheless, despite his great popularity among contemporaries and presence of followers many thinkers criticized Watts's works for allegedly incorrect interpretation of key representations of Zen Buddhism. The author of this article proves that it Watts's works were often understood incorrectly. Besides, they have to be estimated through the prism of the personality and Watts's biography.

Keywords: Comfortable environment, Quality of life, Needs of citizens, Sociological survey

1. Introduction

Alan Watts (1916 - 1973) entered the space of the dialogue of the Buddhism and psychoanalysis as the researcher surveying similarities and distinctions of human mentality in East and West and in the context of psychotherapy. Mainly he was concerned by the matters of prevention of reproduction of the pathological patterns funded in social-and cultural reality. In his research Watts did not apply for a role of the philosopher comparativist. He was satisfied with the level of comparative scanning of psychotherapy in the context of east psychotechnics and cogitative traditions (Vedanta, Buddhism, Taoism) on the one hand, and psychoanalysis on the other hand. Watts gained considerable fame, first of all, as the participant of the public discourse on this perspective, and of the discourse provocative, stimulating dialogue. Such position in the cross-cultural interaction was caused by the resonance of personal and biographic factors: the fundamental intension characterizing both the personality and Watts's activity was connected with the idea of transformation. Watts did not fit into the framework of the Western European culture, native for him, and he sought to expand continuously his own sociocultural horizon due to the expansion on the East. But at the same time in his experience of comparison of psychotherapy of the East and West he appears as a representative of modern euro-american sociocultural situation, is internal conflictness and the system of values, characteristic of it.

Watts became an active participant of the cross-cultural interaction, considered in this article, since his moving from Great Britain to the USA in 1938. Public work within the next ten years led Watts to replacement of a vacancy of the dean of the American Academy of Asian research. By then he already had solid experience of research and teaching activity in Europe, including, at K.G. Jung in Zurich.

His hobby for east philosophy since the teenage age, he published his first brochure on Zen Buddhism, when he was a seventeen-year-old man. Social-and-cultural contrasts in which the life and scientific career of Watts was built are impressing. Having plucked in Cambridge, he went to "free floating" of autodidactics, without having got the higher university education. Its informative experience was originally formed under patronage of the father, in the circle of the people who were interested in the Buddhism, mysticism, psychiatry.

Watts's biography developed as a life of the outsider seeking for public recognition and finding of various, quite often conflict and self-destructive experience. Cross-cultural interaction was presented to Watts's lives and at individual sociocultural level. So, Alan Watts entered his first marriage with Eleonora Fuller, the stepdaughter of Sokey, Sasaki, the teacher of Zen. However that did not mean his practical integration into the activity of his father-in-law as for the sake of material security of family Watts was forced to hold the position of the Anglican priest.

The dissatisfaction, characteristic of his personality, was expressed by reality in aspiration to its transformation. It should be noted characteristic feature in activity and Watts's creativity. The author of this research believes that it roused Watts, a very young man to be engaged in the Buddhism: he looked for a new reality, and not only looked for, but created, conducted by unconscious imagination about omnipotence. And it was not surprising that holding his position, the Anglican priest, he insistently looked for the prospect of reforming of church, its "approach to people". The reformation back as main personal

intension of Watts, his self-destructive experiences was acid and alcohol in search of other satisfying reality. This extreme practice affected in a fatal way durations of his life: Watts died, without having lived up to the sixtieth anniversary. The keen interest in traditional religious ideologies, in comparison of various religious and world outlook traditions was characteristic of Watts. So, reflections about Christianity brought it to the conclusion that in the doctrine of this religion the opposition of the person to the nature which was expressed in the creationistic concept is put. The idea of mutual responsibility of the world and the person was presented to it unacceptable, much closer to Watts the doctrine of Taoism about self-emergence was.

Despite early interest to Zen Buddhism, deeper involvement in the ideas of this school occurred at Watts thanks to a meeting with D.T. Suzuki who inspired him on promoting of the ideas of Zen Buddhism in America. He appered to be a witty, sometimes venomous philosopher, who had a certain force of secret knowledge. However it seems that lifestyle and thinking, the way of social self-positioning of Watts root in the experiences of internal loneliness, external hyper sociability which he tried to overcome by the appeal to the cultural heritage of the East, to aspirations to reorganization of surrounding reality.

2. Literature Review

Watts's thesis was published under the name "Contemplation of Spirit". Watts did not hide his discontent with the traditional religions, including their inert, forcing believers to have sense of guilt, besides aggressively hiring supporters, and was about Judaism, Christianity, Hinduism and Buddhism.

Such Buddhist authorities as Rosy Filip Kaplo, John Dido Luri and D.T. Suzuki, criticized Watts's works for allegedly incorrect interpretation of the key representations of Zen Buddhism.

However, Watts had also adherents in the Zen society: for example, Syunru Suzuki, the founder of the Zen centre in San Francisco. Syunru Suzuki protected Watts from criticism and considered that he was "a great bodkhisattva".

E.G. Balagushkin noted that Watts "was the second most important propagandist of Zen in the West" and together with the teacher D. T. Suzuki he made "a direct impact on the spiritual leaders of beatniks, the prominent representatives of the Californian literary bohemia: G. Snider, A. Ginsberg, Zh. Kerouac"

A.M. Rutkevich (Rutkevich, 1997a) characterizes A. Watts mainly as popular writer of the Indian and Chinese philosophy whose books were best-sellers in the 60-70th of the 20th century. Watts's ideas, his promotional activity coincided with "spirit of the age". But also the fact that time was embodied in his personality is not less important.

What promoted such a high popularity of the discourse activity of Watts? As for the author, it is, first of all, the criticism in relation to the space of the western culture. It was a spokesman of its internal conflict, being internally conflict personality. In his book "Psychotherapy. East and West" he raises the problem of false identity and said that the lie sprouts from the discrepancy of religious beliefs and existing social-and-economic and sociocultural tenors of life.

The image of the propagandist of East in the interpretation Watts is the preacher allocated with the secret knowledge, own spiritual experience. A.M. Rutkevich pulls together this aspect of its presentation in the society with that position which was characteristic of some figures of the culturalogical and religious and philosophical discourse of the Silver Age: "After Berdyaev Watts distinguishes spiritual experience of mysticism from magic and from any naturalistic and psihologizing pseudo-mysticism which confuses Numinous experience with various sincere or even corporal experiences" (Rutkevich, 1997a).

The development of east philosophy happened with Watts under the influence of R. Genon and A. Kumarasvami's ideas. He passed the period of combination and carrying out analogies between Atman "Upanishad" and spirit of Gnostics and the apostle Pavel. Nevertheless, Watts breaks off with Christianity owing to conviction that it cannot be oneself, without applying for the world domination. This idea was also obtained from Genon's works.

In the 1950-1960th the trend of attributing of the Indian philosophy of the advancing progress prevailed in the culturological and philosophical comparative research: researchers found analogies to modern physics (up to the theory of relativity), semiotics, linguistics. Watts also moved ahead in this cogitative course. He tried to use all that "to get rid of the substance ghost, be it material or spiritual." (Rutkevich, 1997a, page 220.) The Buddhist idea of not-substantiell “Me”, which he pulled together with the European scientific paradigm was especially close to Watts.

In his promotional activity Watts, certainly, did not lose a reformatory rush. For example, he sought to reinterpret concepts of release, traditional for the Indian philosophy (Moksha, nirvana), - that is, first of all, the symbolical act for him. According to Watts, functional understanding of everything real came down to a

game, which rules continuously were changing. He did not find time to investigate constants of the Indian religious and philosophical thinking, i.e. the religious axiomatics funded in culture.

A.M. Rutkevich a priori, before carrying out a comparative research, considers the criticism of psychoanalysis offered by Watts, detailed and saw the psychoanalysis reforming attempts made by it as enrichment of the last at the expense of the resources of Zen Buddhism. However it is hardly possible to consider correct in the context of comparative cultural science the reduction of the technology of psychoanalysis made by Rutkevich to an analog of the "spirituality" peculiar to followers of the Indian religious and philosophical systems and neo-oriental religious sects. "Technology of psychoanalysis, - Rutkevich wrote, - some lines reminds both "secret exercises" of the past, and that equipment which is used by today's sectarians for "the address." (Rutkevich, 1997a). Meanwhile, it should be noted that prototypes of the past are found in many spheres of action of the person including in psychotherapy. More likely, it characterizes processes of resistance to psychoanalysis in culture.

3. Methods

The biographic, historical-and-literary method and also "sociocultural literary criticism" (culture criticism) were used during this research. The research demanded broad cross-disciplinary approach since that was the nature of the studied subject: cross-disciplinarity was a distinctive property of Alan Watts.

4. Results

It is important to emphasize that Watts defined unconscious as the identification of "Me" projected outside and in it his attempt to connect one of psychoanalytic models of the mental device to the meta-psychological concept of the Yung ideas affected. However it is absolutely wrong, as Jung's hermeneutics psychological, but not ontologic. Watts thought of actually unconscious as something out of time and out of memory, but such a super abstract treatment is unacceptable for the theory of psychoanalysis. Relying on the consideration of structural model of the mental device which in most cases serves as a support for the development of modern psychoanalytic theories, it is necessary to recognize that Watts gave preference to his own understanding and, respectively, interpretation of the psychoanalytic ideas.

In order to provide an adequate understanding of the Watts' position concerning psychoanalysis the comparative research has to be based on right idea of the nature of psychoanalytic procedure per se and valuable and functional orientation of the theory of psychoanalysis. It is in this regard difficult to agree with that characteristic which gives to this A.M. Rutkevich procedure: "When to the Freudian the patient speaking about loss of sense comes, and then he pronounces long months the associations on a couch as a result to find sources of all the problems in the forced-out children's inclinations, we deal with obvious abuse of the word "therapy." (Rutkevich, 1997a). It would be possible to coordinate partly this opinion with reality if to replace the word "Freudian" with a surname Freud. I see in similar approximate treatments one of the existing difficulties in dialogue consideration psychoanalysis Buddhism. In attempts of comparison and comparison it seldom comes about that development which there passed in the history the theory and practice of psychoanalysis. For example, in this way do not work with patients at whom the problem is made by loss of sense, and in time of writing Watts of the book "Psychotherapy. The East and the West" the theory and practice of psychoanalysis already represented qualitatively other level.

The point of view of Alan Watts is the hero of the time, the bright spokesman of moods of contemporaries are characterized by result of joint cooperation of E. Fromm and D. of Suzuki. And at the same time it slightly opens a superficial and optimistic veil of a stage of the beginning of dialogue psychoanalysis, the Buddhism and demonstrates true motives of need of West for East.

The book by Watts cannot be carried to the area of mature, methodologically reasonable comparative research of psychoanalysis and the Buddhism in any way. The main idea penetrating contents of all book is concluded in an appeal to transformation of the theory and practice of psychotherapy on the basis of integration of resources of the West and the East and the West, due to loans and to achievement, thus, of qualitatively new level of speculation and the equipment in work of the psychotherapist.

A. Watts distinctly rejects a thought of expediency and need of a comparative research. In a manner peculiar to it he proves that to develop the discussion throughout the results achieved at Fromm's cooperation and Suzuki he does not intend. Using Watts's words, "it would be easy to it to weave a certain critical story of psychiatric interest in east thought from this material, having added the drawing with comparison of all main forms of psychotherapy to the equipment of east disciplines. The bulky volume which is of mainly academic interest would be result. Such formal research, in addition, is not my strength,

and therefore I leave it to those who has necessary patience and diligence." (Watts, 1997)

How constructive can be a similar comparison? Whether really E. Fromm and D.'s dialogue of Suzuki completely defined orientation and levels of this loan on the basis of registration of coincidence? Or on the example of A. Watts's work we deal with the come to a standstill comparative research? Our last assumption is based on acquaintance of both Fromm, and Watts, mainly from one of Buddhist schools, about Zen, and superficial acquaintance.

Now it is obviously possible to analyse, whether really eclectic psychotherapeutic model – not illusion, not fantasy execution of the desire resulting from "dissatisfaction from culture". Watts's work is focused on an imperative of cross-cultural dialogue – on recognition of need of the East and West to learn each other. Watts declares importance of comparison, but in practice he seeks "to stir up both parties … both that and others wander in darkness, though are not deprived of light." (Watts, 1997, page 5.)

A. Watts urges not to reveal and investigate a typological convergence and distinctions, and to experiment, create, directly going to the field of practice. Certainly, in the theoretical relation the similar position does not maintain criticism, but its analysis is important in aspect of understanding of the identity of Watts as intermediary in dialogue of cultures. I believe, his point of view is hidden is motivated with the need for self-therapy and a possibility of its implementation. But that opportunity is regressive in the basis: Watts acts as children arrive: mixing paints, sorting, breaking toys, building "worlds", learn to cope with reality. In lifestyle of Watts the personal perspective in creation of the relations with reality is distinctly looked through first of all, ways of permission or compensation of which he looked for everywhere.

As starting point in Watts's reasonings comparisons between a conduct of life in the cultures of the East and the western psychotherapy act. Apparently, he believed that the conduct of life in the east has a psychotherapeutic most important task. It is impossible to explain with anything else obvious incommensurability of the historical and cultural material taken as a comparison basis. As base for development of a further discourse finding of community in that, "to make changes in consciousness, in a way of experience of our public existence, our relations to human society and to the world of the nature acts." (Watts, 1997, page 9.)

Watts it is perspicacious notices the gap which was outlined between natural-science and humanitarian culture in the West. In particular, he says that ways of natural sciences and psychology dispersed also the scientific achievements substantially adjusting idea of the world and the person were not integrated into the field of psychoanalysis. The choice for Buddhist loans in the western model of psychotherapy is also proved by it as attempt to overcome a gap, having carried out it in the roundabout way. However he considered similar loans not as incorporation in psychoanalysis or in the western culture in general. The Buddhism for it is the phenomenon performing functions of criticism of culture. And, both in culture Old Indian, and in the modern culture of the West. It also assumes "to impart" criticality psychotherapy of the West and, first of all, to psychoanalysis.

The psychotherapy, according to Watts, has to conduct truce between individual desires and sociocultural standards, helping the patient to find a way to itself, but without entering at the same time the conflict with society. Similar balance, reflects it, is hardly feasible because if the psychotherapist takes the part of society, then therapy comes down to a bringing under the answer: "unconscious inclinations" under ideal public aspirations that does the person by the appeasable member of society. And on the contrary, A. Watts continues the thought if the psychotherapist sides with the patient, then he inevitably falls into confrontation from the surrounding patient Wednesday.

Ignoring a basic position of psychoanalysis – the principle of neutrality, differentiation of the sociocultural environment, without mentioning regularities of formation of a psychological perspective, without analyzing the existing psychotherapeutic potential, Watts directly speaks about "east" way of permission of a contradiction between the individual and his environment. "They (psychotherapists – E.S.), - he writes, - face people whose sufferings result from what it is possible to call Hindu - the Buddhist word of the Maya which exact value is not exhausted by "illusion" - it is the whole view on culture believed by illusion in the most strict sense of a word according to etymology. It is a game … The purpose of a way of release is not extermination of Maya, but vision of what it represents – or a look through it." (Watts, 1997, page 14-15.)

The subsequent statement demonstrates that in this case I am about formation of borders and identity. There is a question - what dictated ignoring of realities of psychotherapy of the West? Why did Watts need to declare allegedly new contents by means of giving of east color to that which already exists in psychotherapeutic daily occurrence? Uottsovsky vision modern to it conditions of psychotherapy is

intended to emphasize need of the appeal to the East: "It is even worse than the fact that it is still unclear whether the psychotherapy is the placebo which is simply operating at random: except for several psychotic symptoms which can be controlled by means of certain drugs we in accuracy do not know, than "treatment" differs from spontaneous remission. Some technicians of psychiatry, like lobotomy and a shocking therapy, are result in vain of despair." (Watts, 1997, page 16.) It is necessary to accent in every possible way discrepancy of the aforesaid to that real level of development of the theory and practice of psychotherapy which was already it was reached by 1960 when the book by Watts was issued. Apparently, the trend of charge of psychotherapy of inefficiency, a blindness and limitation prevailed over Watts's thought.

I draw this conclusion, being based on accounting of a condition of the theory and practice of psychoanalysis at a boundary 50 – the 60th of the 20th century. In 1957one of considerable works of the late period of creativity of Melanie Klein (1882 - 1960) "Envy and gratitude" was published. (Klein, 1997.) The klyayniansky school of psychotherapy (and now very effective in work with frustration of the identity of the boundary organization and psychotic level) already then was quite registered.

Detection by M. Balint (1896 - 1970) in the course of psychotherapy of "oknofiliya" and "filobatizm" - two forms of the object relations developing from an archaic phase of primary love belongs to the same period. Technically Balint (Balint, 2002) worked with regress out of limits of "basic defect", considering a direct subject of therapeutic work deficiency of mental structures.

Anna Freud (1895 - 1982) at that time wrote about "fear of impoverishment" and specifics of the relations of the person to things. Donald Woods Vinnikott (Vinnikott, 2000) fixed functions of imagination as the aspiration of the person to cope with reality. And of course, it should be noted it should be noted that by 1960its work "Distortion I in the form of true and false Egoism" was published (Vinnikott, 2002) where the nature of clinical work of Vinnikott reveals.

From told becomes obvious that psychoanalysis had the extensive theoretical potential and a practical arsenal of work with patients of various level of functioning and a perspective. But this circumstance did not find the reflection in Watts's discourse.

According to A. Watts, the psychotherapy and those "ways of release" which were laid by east culture have two spheres of common interests: orientation to an introspection and achievement of independence of the conditions set by society. It fairly believes that "theoretical knowledge of other cultures helps us to understand our own as only by comparison to others we can find clarity and objectivity concerning our own social institutes. If in other cultures there are disciplines having something the general with psychotherapy, then theoretical knowledge of their methods, the purposes and the principles will help with the best understanding that itself (the psychotherapist, - E.S.) it does." (Watts, 1997, page 20.) In an outline of this reasoning the request for a comparative research is distinctly read. It is traced at the level of the purpose, the principles and methods of transformation of mental processes. Watts sees positive sense of "release" in freedom of a game while the negative background comes to light in criticism of "a social game".

Level of the comparison which is carried out by A. Watts clearly is shown by a characteristic illustration. He calls neurotic frustration senseless repetition and on this basis identifies it with a sansara - circulation of births. At the same time such major ideologems of the Buddhist doctrine as a sansara and nirvana are interpreted by it as follows: "Buddhist nirvana is defined as disposal of a sansara – literally, a circle of births and death – that is lives in a vicious circle, in infinite repetition to solve a false problem. Therefore the sansara is comparable with a squaring the circle, with designing of the perpetual motion machine." (Watts, 1997)

According to Watts, neurosises, and "schizophrenic leaving" (Watts's term) as forms of permission of the intra personal conflict are resonant fluctuation of the senselessness put in a social context. And "… comparison of cultures, in particular comparison with such difficult cultures as Chinese and Indian", gives the chance to get rid of senselessness, first of all in psychotherapy per se, "difficult cultures" "grew in relative isolation from our own, and in them we find attempts to find release from examples of cultures." (Watts, 1997).

5. Discussion and Conclusion

Thus, Watts proves need of comparative analysis for the purpose of identification of the "cultural samples" defining psychopathology.

Thought, I believe, is really deep and can be really accepted as one of problems of a comparative research. However the result of any comparison was not slow to be shown when it came about interpretation of a position of the founder of psychoanalysis. "Freud, - wrote Watts, - designated the aspiration to return to

a maternal bosom of oceanic consciousness as "the principle of nirvana", and his followers constantly confused all ideas about an ego "transcendenting" of Ego with a simple loss of the Ego force (Watts, 1997). In this statement the real position of Z. Freid is not obvious. As for the mentioned confusion by Freid Watts' followers are not named. And that, in turn, opens broad lands of interpretation as, owing to theoretical efficiency of S. Freud, all those who developed the Freudian provisions formulated by it during various periods of creativity can be ranked as his followers.

The distortion allowed by Watts accrues when really there is a confusion of theories of the personality and the strategy of psychotherapy, as a result Abraham Maslou appears the psychotherapist which in fact he was not.

Undoubtedly, in how Watts defines the need of continuation of dialogue at the level of the comparative research, there is an evidence of deep empathy to modern to it to a perspective of the sociocultural environment and psychotherapy. Here the productive ideas adjoin to the deforming interpretation of theoretical concepts of psychotherapy that, unfortunately, real participation of Watts in dialogue about psychotherapy substantially depreciates.

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Impact Analysis of Environmental Risks to Development of the Regional Construction Complex

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Abstract

The article analyzes the environmental risks and its classification. It is investigated the system interconnection of the construction complex and the state and the social spheres. Thereupon, it is identified the system-wide factors, that are the sources of environmental risk. The proposed recommendations will provide reducing the environmental risks of urban development and improving the quality and safety of the final construction products.

Keywords: environmental risk, construction complex, socioeconomic sphere, society, management activities, green building, ecological education, insurance

1. Introduction

Operating of construction complex is tightly attached to the social and government surroundings while they interact with and influence each other in a quite significant way. This influence can be both positive and negative for each side. Usually negative effect can be interpreted via rising probability of adverse events in totality with growing value of possible material damage or loss what can be named "risk" in economical terminology.

This research paper we step a bit out of the classic definition of "risk" – further the term "risk" is considered as the mechanism of negative influence of operating of construction complex on environment and health state of population in general. It is reasonable to underline its direct effect in natural environment. That is why the complete name of object in this paper is "ecological risk".

The purpose of this paper is to present main results of analysis of ecological risk influence on qualitative development of operating system which include regional construction complex and other systems interacting with it.

2. Procedures and Methods

Analysis and classification of ecological risks.

It is generally accepted to use two types of ecological risk analysis - qualitative and quantitative ones. Qualitative risk analysis involves determining the factors, areas and types of risk. Quantitative analysis concerns the numerical determination of the magnitude of certain risk. In fact, researches on assessment ecological risks are based on discussions about possible environmental and ecological damage, as well as about economic costs and losses after environmental changes. However, studying of ecological risks is a serious scientific work that is carried out mostly only by environmental professionals. Wrong assessment of ecological risk can lead to severe consequences for a certain region and for bigger territorial community [1, 2]. Therefore, a very important task is to identify the main sources of ecological risks, possible consequences and suggestions and measures to reduce the impact of ecological risks on the operating of construction system and related objects including systems.

There are many classifications of ecological risks. However, the classification adopted by the government of the Netherlands, in our opinion, is most applicable to reflect the undeniable influence of the construction and socio-economic spheres through the concept of ecological risk. According to this classification, three categories of ecological risks are:

1) damage to biological systems and humans;

2) damage of aesthetical appearance of ecology and environment which do not affect biological systems;

3) damage of planet Earth fundamental systems (Kulikova, 2006). The most common and spread category is the first one. It is so due to the usage of obsolete, poor-quality and environmentally harmful materials and technologies while the violation of technological processes and other factors cause a threat to the life and safety of people, deterioration in the microclimate of the accommodations and offices what

affects the overall emotional, mental and physical condition of people including those working in production buildings and offices (Ryzhanushkina, 2014). Thus, the number of sick days and absences increases, labor productivity falls, the number of random errors grows, production volumes decrease etc. All these consequences have negative impact on the amount of financial resources of the enterprise and the total volume of production. Ultimately the negative effect results in the degradation of the socio-economic indicators of the region (see Figure 1).

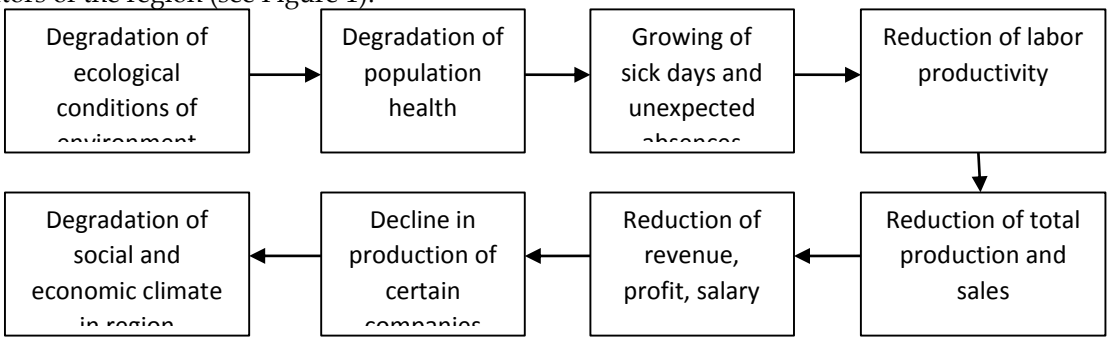


Fig. 1. A scheme of influence of the environmental risk on the social and economic climate

Industrial activity is of particular importance as the main source of environmental risks. Environmental risks as a category of industrial activity are most often determined by data on the probability of occurrence of certain events (for example, an accident at a cement plant) and the consequences of these probabilities (corresponding values of environmental damage). The expression that can be used to characterize the environmental risk in kind or in value is the following:

$$r(x) = \sum_{i=1}^{N} P_i * X_i$$

Where r(x) is the value of environmental risk; P_i - probability of occurrence of an adverse event, shares; X_i - consequence of the implementation of the adverse event (e.g., the magnitude of environmental damage) in physical and monetary terms. In case of possible accidents at industrial facilities that cause serious consequences and, above all, loss of life, the risk is usually expressed as follows:

$$R_s = \sum_{i}^{1} w_i * N_i$$

Where W_i – the frequency of the i-th accident; N_i - number of deaths caused by it; i - the possible number of accidents at the facility.

3. Results

3.1. Creation of ecological risk through interaction with governmental and social systems

As it was previously mentioned the construction system is tightly attached to the functioning of social and governmental systems. In this regard, the sources of ecological risks have been considered in the following categories (Table 1).

Table 1. Sources of ecological risks

Sources of ecological risks		
Constructing and building	Government	Society
1 Usage of obsolete urban planning, design, technological and organizational solutions, usage of environmentally hazardous building materials 2 Decline of structural	1 Violation of the control and supervision function in construction and environmental protection 2 Lack of an	1 Low level of awareness of scientific and technological progress achievements and incompetence in choosing accommodations and

safety of construction sites due to design, construction and exploiting mistakes 3 Low level of scientific and humanitarian knowledge, lack of environmental and ecological culture among managers and employees	effective regulatory system and legal regulation as well in construction and environmental spheres 3 Residual principle of ensuring environmental and ecological safety	buildings for living and working 2 Mistrust in state structures of supervision and control 3 Ignorance and unawareness of human rights among Russian citizens (right for security and a healthy environment)

The consequences of environmental and ecological risks concern and violate each of all three mentioned spheres. Influence on the socio-economic sphere was reflected in Figure 1. As for construction organizations, the consequences of ecological risks may result in a decrease in competitiveness (damage to the image of the organization, reduction of orders, decline in investment volumes), increase in penalties and other costs for violation of building regulatory safety standards and, finally, quality of construction projects.

3.2. Reduction of environmental risks with the regard of system interactions

In previous stages of this research a mathematical model of an ecologically oriented regional innovation-building complex has been developed in the form of an oriented graph [5]. This model visually reflects the interaction of factors that have the most significant impact on the development of related systems (construction, the state, society). A mathematical study of the model using absolute and impulse stability methods has shown that it is environmental risk that acts as a destructive external influence that leads the system to an extremely unstable state, disrupting the normal development of the systems and all objects which it interacts with. Concerning the results it was suggested that rational management actions should be reduced to two main areas: prevention of environmental risks and minimizing already occurring consequences of ecological risks. Possible management measures to reduce the probability of ecological risks are presented in Table 2.

Table 2. Measures for reducing the probability of ecological risks

Construction companies level	Governmental level	Socium level
1 Reconsideration of legal frameworks for construction 2 Improvement in types of insurance protection 3 Transition to eco-construction, staff training, formation of ecological culture 4 Development and implementation of own environmentally friendly and resource-saving technologies	1 Improvement of the legal and regulatory frameworks for construction 2 Gradual deurbanization 3 Improvement and strengthening of the control and supervision function of government in construction 3 Economic and other stimulation of households and other establishments for environmentally friendly behavior 4 Widespread introduction and stimulation of environmental education	1 Development of public institutions of eco-construction, raising public awareness, studying eco-construction 2 Selection of quality housing and working conditions on relevant criteria 3 Encouraging and spreading of eco-construction principles 4 Active civic position

Insurance is considered as a proven tool to minimize the consequences of risk situations. In the insurance of the construction industry, the following insurance objects are distinguished:

1) the construction site (where any unintended events lead to material damage);

2) liability to third parties (as for damage to any objects on close areas and territories);

3) construction equipment (which can cause violation of the deadline and / or quality of the construction site);

4) insurance of people (in case of accidents on the construction site);

5) post-launch warranty obligations (in case of defects in the construction site during operation) [6].

This list should be expanded by adding special types of insurance protection associated with causing damage to the environment as a result of pollution, depletion, damage, destruction, irrational usage of natural resources, degradation and destruction of natural ecological systems, natural complexes and natural landscapes.

One of the promising concepts for the development of the construction industry is eco-construction ("green" construction), which is becoming increasingly popular both abroad and in Russian. Eco-construction involves the development of territories in harmony with the environment and nature through the usage of environment-friendly materials, renewable energy sources, improved thermal insulation, ventilation of buildings which reduces energy costs, processing and recycling of building materials, use of recycled and rainwater, landscape design allowing to make maximum usage of natural light.

Development and introduction of own environmentally friendly and resource-saving technologies is one of the concepts of "green" construction. From the point of view of economic efficiency, it is much more profitable to use local ecological friendly materials in the process of construction rather than to order and transport them from abroad due to significant reduction in costs of entire building processes.

Improvement of the regulatory and legal frameworks will allow to establish progressive and up-to-date standards for construction (both technological and operational), which will improve the quality of construction sites and the environment as well.

Strengthening the control and supervision function in construction should ensure the quality of inspections for compliance with established standards and regulatory frameworks both at the design stage and deployment.

The economic stimulation of economic entities that are environmentally friendly should promote the foundations of ecological construction among construction organizations and the population as well. The main tools for economic stimulation are the tax exemptions, subsidies, and other forms of financial aid for economic entities which use environmentally friendly building materials, energy-saving technologies etc. Nowadays there is a set of measures to stimulate "green" construction, developed for environmental construction program in Russia [7]. Responsibilities of this set are development and implementation of infrastructure projects. It is necessary to adopt experience from foreign colleagues in terms of natural-oriented, “green”, eco-friendly project management.

The introduction and spread of environmental education will attract attention to global and local ecological problems among the younger generation. It is especially important to take into account environmental aspects in the educational process of university specialists as later such graduate specialists are more likely to manage various spheres of society on administrative and governmental level and will be able to concentrate their efforts on environmental and ecological safety.

If the introduction of environmental education is an obligatory measure at the level of the state or the region, then raising awareness of environmental security issues, studying eco-construction are more voluntary actions that should appear among population and civil institutions. These measures touch upon self-acknowledgement among people of the quality of environment, ecological condition of their habitat and other relevant information..

The choice of quality housing and working conditions is based on the person's prior knowledge of the criteria for the quality of the habitat, and accordingly, the choice of buildings, premises and offices which meet these criteria.

Housing construction based on the “green” principles provides full awareness of quality and ecological characteristics of an building object (from the choice of construction materials to energy consumption aspects). That provides maximum confidence in the environmental safety of a house.

An active civic position should include the defense of citizens’ civil rights for safe environment, coordinating with legislative initiatives to improve the quality of the environment and other activities aimed at improving the habitat and ecology as well.

4. Conclusion

As a result of this work the interaction of the construction, state and social spheres and its

influence on the quality of the environment has been researched. The main sources of environmental risk occurrence for each sphere, possible consequences as well as measures for preventing and minimizing the consequences of environmental and ecological risks have been identified. Thus, at each level which are the organizations of the construction industry, society and the government, it is necessary to carry out preventive activities concerning environmental and ecological risks since these activities will have influence not only on a certain citizen but the entire welfare of territorial community.

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The Validity of the Use of the Term "Emotions" in Modern Science and Society

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Abstract

Everyone understands what emotions are, but no one can clearly answer the question "What is this?" Due to the fact that, on the one hand, interest in the topic of emotions is high, and on the other hand, attitudes towards emotions are ambiguous, including attempts to exclude them from the lexicon of people who claim to be serious, efficient and successful in business, an attempt was made to investigate the need to use this term. How justified are the proposals "to drop all emotions" and is it possible to say that the topic of emotions has exhausted itself or is there a tendency to this? The study covers randomly selected literary sources in the amount of 35 copies from the period of Antiquity to the present day, containing reasonings, research results, offering theoretical models relating to the topic of emotions. It was revealed that with a persistent interest in the study of emotions during the evolution of pre-scientific and scientific thought, it was not possible to differentiate the terminological apparatus. The concepts of "emotions", "feelings", "passions" among some authors act as synonyms, while others offer clear criteria for differences. The negative background of studying emotions, emphasizing the base nature of passions and affects, provokes skepticism about emotions and emotional resources. Over the past three centuries, a number of concepts describing emotions have continued to expand, but there is no agreement on basic concepts. The emphasis in the last 35 years has been on the notions of "emotional intelligence" and "emotional competence," the practical significance of which can be considered training opportunities for enhancing emotional literacy that is relevant for a person self-fulfilling in a social context. A variety of points of view and approaches in understanding and studying emotions only stirs interest and makes the researchers of this topic move further, experiencing some comfort from having a large number of alternatives.

Keywords: Emotions, Social-psychological sciences, Story of emotions, Definition of emotions

1. Introduction

Today, interest in the topic of emotions is so high, and the understanding and approaches to their study are so different that in order to establish a conditional platform for studying issues of the emotional spectrum, it is necessary to understand the content side, the meaning of the term "emotions". Repeated reference to retrospective analysis (Magera, T. (2008), combined with dynamically changing trends in science and society, creates a new life context in which the formerly existing theories become obsolete, do not work, which makes it necessary to take a fresh look at the seemingly familiar concepts. With all the familiarity and use in everyday life and the scientific field of the concept under study, it is worth emphasizing the lack of a generally accepted approach and the abstract semantics of the word "emotion" ("emotions"), which aggravates the problem being described.

In psychology today, about twenty theories of emotions are known, if not to take into account near-scientific developments. V.C. Viliunas (2007) rightly observes that "much of what the doctrine of emotions traditionally calls the promising word "theory" are in essence rather separate fragments that only come close to (...) a perfectly comprehensive theory". In this article, the research interest is directed and limited to the space of social-psychological phenomena, the originality of which is largely determined by the presence of emotional components in them. Personality as a phenomenon that is one of the cores in the human sciences, being endowed with mental content and emotionally enriched, does not close on itself, but fits into the social context formed by social and psychological phenomena.

Without setting a task to list all the theories of emotions and their authors, it will be correct to mention those researchers whose developments and ideas correspond to the content of this paper. It is known that scientific articles often remain in the field of view of the scientific community only, the practical use for contemporaries is small or not noticeable at all. Of course, it would be extremely incorrect to extrapolate directly the results of scientific researches into everyday phenomena, but there is no intention to artificially separate scientific and everyday experience. It remains to adhere to the balance.

In addition, the global trend to appeal to emotions is relevant today. In the context of the competence-based approach, there are attempts to present a variant of a competent and productive use of the emotional

resource, in particular among managers. Emotional competence is based on emotional intelligence, in which the author, following his predecessors, teachers and mentors, identifies intrapersonal and interpersonal components. The intrapersonal component includes emotional self-awareness and emotional self-order. The interpersonal component includes social skills as a personal quality and constructive management of emotion-based interaction. Those. emotions are actively represented, involved and influenced both in intrapersonal processes and in the external social environment. Special attention is paid to managing emotions, which is also reflected in this article.

V.G. Krys'ko (2013) defines social-psychological phenomena as "psychological phenomena caused by the interaction, communication and mutual influence of people on each other and their belonging to certain social communities (classes, ethnic groups, small and large groups, religious denominations, etc.)" . The emotional component of a psychological phenomenon in social psychology is defined as the feeling or mood of a person, which may be related to his social status, social position, or arise when communicating with someone. Zhmurov V.A. (2012) suggests that these emotional states have certain physiological characteristics. It clearly establishes the relationship of social and biological components in emotions, with the emphasis placed on the subject area of social psychology. However, in the scientific literature, as noted above, the approach to the concept of emotions, feelings, passions, affects is still controversial; their interaction with the physiological, volitional, and cognitive components of the human psyche is discussed; raises questions the nature of the origin and expression of emotional aspects, the possibility of tracking, regulation, use, the need for measurement, development, a detailed study of these indicators.

The article takes into account that the ambiguity of understanding the meaning of the human emotional sphere has been observed throughout the history of the development of pre-scientific and scientific thought, and the dispute between social constructivist and universalist theories of emotions continued throughout the 20th century. This dispute structured research practice in various fields: social constructivists believe that emotions are mainly the result of learning, culturally specific and subject to historical changes, while universalists insist that emotions are the same in all cultures and at all times. It is pertinent to note that the evolution of the issue will be reflected in the literature review of this article, as well as the approach of Jan Plamper (2015, 2018), which puts binary opposition in the study of emotions behind the brackets, indicating the possibility of studying emotions beyond constructivism and universalism, the author considered as the most appropriate.

2. Literature Review

In the dictionary edited by B.G. Meshcheryakova and V.P. Zinchenko, the emotions are defined as, for example, "psychophysiological complexes of processes and states of an individual, (...) the subjective process of reflection (evaluation) in the form of direct experience of the significance (value) of (...) situations, their relationship to the needs and motives of the individual (...)". In the dictionary edited by Karpenko L.A. (1998) as "a special class of psychic phenomena, manifested in the form of direct, biased experience by the subject of the vital meaning of these phenomena, objects and situations to meet their needs". The term "emotion" comes from Lat. "emoveo", "emovere" – shaking, worrying. In Latin, as one of the most ancient written among Indo-European languages, in addition to "shake, worry", this term is also characterized by such verbs as "push, shake, move" (Zaliznyak, A. (2005)). This is important due to the fact that, to this day, there is confusion not only in terms of meanings, but also in defining the boundaries of the concept of "emotions," the ways of classifying emotional reactions and emotional states. Thus, synonyms of emotions, come from different contemporaries and authors of the past, are motivation, feelings, affects, passions, etc. It is necessary to deal separately with this variety. In addition, given the dynamic nature of the verbs laid down in the base of the word (shaking, agitating, vibrating), they lose their power in the sense of reasonableness to be called emotional states such as "pacification", "calm", "serenity" suggesting a neutral character of flow.

According to the controversial and interesting hypothesis of linguistic relativity, which assumes that language determines world perception, thinking, it is extremely curious that there is a complete lack of the concept of emotions in Tibetan culture. Dreyfus, G. (2002) notes that this concept had to be borrowed under the influence of the outside world — people visiting Tibet — and creating the appropriate neologism. Again, somewhat slipping into the discussion field of constructivists and universalists, I would like to allow myself to mention various ways of displaying the conditional reality (or reality) and a person in it. Those, about the picture of the world or the worldview. For a psychologist who studies the psyche, which allows you to create a specific model of the world, fit yourself into it and develop behavior appropriate to this model, the

scientific works of Wilhelm von Humbold, written by Maria Buras and Maxim Krongauz (2011), are quite close to the fact that each language has its own cultural-specific model (picture of the world). In this sense, contradictions have no place in the example of the Tibetans, since the natural-philosophical worldview inherent in many Eastern cultures implies contemplation, observation, non-intervention, associated with meditative practices and a state of rest. Emotional "shocks", "excitement" and "fluctuations" are indeed absent in such a worldview and in speech. S.L. Rubinstein (1999) distinguishes three levels in manifestations of the emotional sphere of the personality, in which, in addition to the level of organic affective-emotional sensitivity and the level of objective feelings, a level associated with ideological feelings (states expressing the general stable ideological attitudes of the individual) is distinguished.

As a scientific opposition in relation to the hypothesis of linguistic relativity, the theory of universal grammar (Noam Chomsky) is presented, capturing with the thesis of the deep unity of all languages, allowing to approach the understanding of the complex integrity of the world and humanity. Also, as noted by Maria Buras and Maxim Krongauz (2011), his theory endows people with innate linguistic abilities. This mention of the opposing directions existing in linguistics is appropriate not at all for the continuation of "scientific wars," as E.O. Trufanova (2017) writes, for granting the exclusive right to the truth, but in order to take into account the problem of both scientific knowledge in general and the study of the concept of emotions in particular. Perhaps the unity of the opposing ideas is the way to convey the complex contradictions of the world.

It is extremely difficult to fully describe a person and his (her) emotional world. But any author, undertaking scientific work, implements it according to his (her) own value orientations and in accordance with the existing plan. How do dear authors begin their fundamental works? Thus, Jan Plamper (2015, 2018) begins his "History of Emotions" by mentioning and describing the amygdala, medulla, cerebral cortex, habitually for the relevant specialists alternating psychophysiology with negative emotions, fear, "hit or run" reaction, soldier's fear, immediately puzzled by the question about the location of the amygdala (which neurons belong to the amygdala, and which do not) and its functionality (only negative emotions are localized in the amygdala? ... and perception? ... and sense of smell? ...). The starting and defining specificity of the presentation of research material is the point in this case, the psycho-physiological side. For example, W. Kennon (1927) and F. Bard in the talamic theory of emotions, the accents are placed on the same principle, based on the work of certain brain structures. Emotional experiences, bodily sensations are the result of signals processed in the thalamus. And in the alternative theory of W. James and K. Lange (December 1927), bodily sensations (neuromuscular changes) precede subjective emotional experiences. This is a special line in the history of the psychology of emotions, because in the Kennon-Bard theory, emotions precede neuromuscular changes, and in the organic theory of James-Lange, on the contrary, emotions follow neuromuscular changes. At the same time, Magda Arnold (1960), in contrast to the talamic theory, in which the thalamus, the subcortical structure of the brain, plays the decisive role, suggested the cortical theory of emotions. Proponents and followers of I.P. Pavlov adhered to similar views. Over the next 50-70 years, the study of emotions and the brain will seriously advance. Today, people talk more often about the limbic system and the hypothalamus, as structures that are "responsible" for emotions.

W. Kennon criticized the identification of emotions with purely physiological processes, although this is a rather common algorithm when understanding and studying emotions. For example, V.M. Bekhterev interpreted emotions as mimic-somatic tone and mimic-somatic reflexes. Of course, the Kennon-Bard theory also belongs to the category of identifying with the physical processes occurring in the central nervous system. Thus, the contradictions in the circle of the psycho-physiological approach to understanding and describing emotions are obvious.

Jan Plamper uses the word "emotions" as a meta-concept, uses the word "feeling" as a synonym and gives definition of passions according to Aristotle (1978) with his quote from "Rhetoric", emphasizing that this is one of the "first to come to us and the most enduring definitions of emotions. "Passion is all that, under the influence of which people change their decisions, with which there is a feeling of pleasure or displeasure ..." Aristotle thus gives instructions to those who need to emotionally influence the listeners through oratory. J. Plamper, speaking about the understanding of emotions by Aristotle, mentions the "school of feelings", which from the point of view of Aristotle is capable of teaching young people to develop good habits. The theme of moderation, moral education, elaboration of excessive emotions was further supported by Galen in his teaching about temperaments. Formation and development, training of "social intelligence", "emotional intelligence", "social and psychological competence" largely consists of exercises similar to the components of the "school of feelings" of Aristotle and the education of emotions of

Galen.

"Feelings", "passions" and "emotions" are different concepts, but this difference disappears under pressure of uncoordinated publications and the lack of agreement. Emotions and feelings differ in a number of parameters (for example, in E.P. Ilyin (2007). P. 302.): evolutionary emotions arose earlier, feelings are attributed only to a person, feelings are longer and more stable, and others. In particular, feelings are subjectivity. Simply put, you can rejoice (joy is an emotion), regardless of the subject to which this joy spreads. But to experience love or hate (feelings) is impossible, they are aimed at a specific object of love or hate. MacDougall (1928) pointed out the uncertainty of these terms, but could not understand them either.

Paul Ekman (2010) from the first pages of "Psychology of Emotions" refers to the intercultural social context and the opportunity to improve the quality of life through the development of skills related to emotional awareness, choosing the appropriate situation (episode) behavior, the ability to feel the emotions of others, the ability to properly use the information. Here almost completely coincides with the elements of emotional competence: from intrapersonal components (emotional awareness, choosing the appropriate behavior) to interpersonal (the ability to feel the emotions of another person and control his (her) state).

E.P. Ilyin (2007) immediately focuses on the entanglement of many approaches and definitions of emotions and suggests studying the emotional sphere, as a more capacious concept that includes many phenomena. He opens the first chapter with reflections on the emotional response, thus revealing the significance of the reaction (emotional response). The reaction in the psychological dictionary edited by B.G. Meshcheryakova and V.P. Zinchenko (2006) is defined as an action, state, process, arising in response to an influence, an irritant (p. 352). Comes from lat. re – against and actio – action. E.P. Ilyin refers to V.K. Vilyunas (1986), mentioning two main approaches to attitudes towards emotional response: in the first case, emotional response plays an universal role and accompanies every mental process; in the second case, it is studied as an independent phenomenon, indicating the presence of deviations in a particular situation of human or animal life (violation of homeostasis).

By Ch. Darwin (1872), in his famous work "The Expression of Emotions in Humans and Animals", expressive movements accompanying emotions (expression of emotions) are the most important in the course of adaptive activity. The evolutionary theory of emotions was the basis for the rudimentary theory (G. Spencer and his followers, T. Ribot and others). The universal emotional response inherent in man and higher animals, according to Ch. Darwin's evolutionary theory, allows one to adapt, and according to the rudimentary theory, people have residual behavioral manifestations from full-fledged biological reactions. Thus, the emotion of anger, within the framework of a rudimentary emotion, understood as a "inhibited fight", shows readiness to fight, to defend their rights and interests in order to survive: the body stiffens, the jaws close (ready to absorb a possible blow), the head leans down (the chin obstructing the nip (or hole), protection of a vulnerable spot – grooves in the lower part of the front surface of the neck), fists clenched (ready to strike), arms mobilized and divorced (ready to engage in hand-to-hand combat), legs spread, the feet are located on the whole surface, are located on the supporting surface (readiness to keep one's feet during a fight). The norms of social coexistence dictate their behavioral stereotypes. In the event that the regulatory impact of such norms is maintained, there will be no transition in the phase of active actions.

It is interesting that in business communication and etiquette, protocols of official behavior, echoes of these theories of emotions find their place. For example, a business suit with a jacket and tie, a shirt buttoned all the buttons is provided for cases when it is necessary to engage in negotiations that do not involve loyalty and concessions. Business attire, among other things, plays the role of protection. These are "knight armor", covering the vulnerable places, allowing to demonstrate confidence, determination, strength, and even threaten (straight posture, warlike appearance, powerful chest, etc.). But, at the same time, there is the concept of "meetings without ties": it is not necessary to solve fundamental issues, there is an opportunity to establish or maintain partnership relations; albeit temporarily, but "lay down their arms." Then the tie is removed or weakened, the upper buttons are unbuttoned, the position of the body can take a more relaxed look, as can the facial expression.

Daniel Goleman and co-authors (Richard Boyacis and Annie Mackey) (2007) open their "Emotional Leadership" with arguments about the timeliness and success of publications related to the role of emotions in organizations, business and, as the name implies, they pay particular attention to emotional leadership and related efficiency. The types of emotional leadership described by the authors are used depending on the current situation. A competent leader, therefore, cannot afford permanent compliance to only one type, and the one who has chosen the right strategy here and now. Emotional first principle of leadership is based on the effect of resonance. D. Goleman and co-authors used the results of meetings with hundreds of

executives and managers, thanks to whose experience they revealed performance criteria. Emotions and their manifestation in the workplace, which has long been considered taboo, because impeded the rational activity of organizations, now rehabilitated with their proper use. From about the middle of 90s of the twentieth century, the subject of emotional intelligence became the cause of discussions, which lasts until today, and therefore this topic is relevant, as well as the entire previous period of the study of emotions in 2500 years.

3. Method

3.1. Participants

Considering the words of A.E. Bochkarev (2017) that "study of the emotional substance becomes linguistic only under the condition of recourse to witnessed words", a trigger mechanism, we turn to the authors whose works are available for analysis. From the times of Antiquity to the present day, this is an incalculable number of books, articles, treatises, monographs and dissertations, of which 35 copies were selected for analysis.

3.2. Materials

Literary sources in Russian and English in the amount of 35 copies. Sources are selected at random from the total number of publications available for study, covering the entire period from Antiquity to the present. In addition to primary sources (for example, J. Plamper, V.K. Vilyunas, E.P. Ilyin and others), it used descriptions of works of famous personalities on the topic of emotions by other authors (for example, such famous authors of the history of psychology as A.V. Petrovsky and M.G. Yaroshevsky). It is mandatory among the selected sources that there are works reflecting the state of affairs on the issue under consideration in such major periods of the history of methodology and science as Antiquity, the Middle Ages, New Age, Enlightenment.

3.3. Procedure

During the entire period of study by the author of emotions, emotional intelligence and emotional competence, from 2007 to 2019, a tendency was noticed: emotions were studied, terminology expanded, concepts became more complicated, but clarity and accuracy in understanding the concept of "emotions" did not appear. Until now, the term is defined conditionally and blurry. But for a qualitative response to the demands of society regarding emotions, the use of the emotional resource and its development, its clarification is required. From the general list of used literature (350 sources), presented divided into groups, corresponding to the main historical periods, 35 sources were selected, the results of the analysis of which are presented in Tables 1 and 2. Counting the number of references to the terms implying emotional content by the authors of works on the psychology of emotions, made it possible to identify accents in different historical periods, trends of our days.

4. Results

Until the XIX-th century, the terms "passions" and "affects" are most often mentioned, which is reflected in Table 1. Passions and affects are endowed with negative characteristics, indicate weakness, sinfulness, contrasted with reason and rational beginning. But already Aristotle and Galen propose and in their own way justify the need to develop their emotional qualities (art, mastery).

Table 1. *Until the XIX-th century*

Subject of study	Personalities	Number
Emotions	Plato, Cicero, Avicenna, D. Gartley,	4
Feelings	Aristotle, F. Bacon (1935), B. Spinoza (1932), G.V. Leibniz (1982), J.-J. Rousseau,	5
Passions	Aristotle, R. Descartes (1989), G.V. Leibniz (1982), J. Locke (1985), D. Gartley, J.-J. Rousseau,	6
Spi	Hippocrates	1

ritual qualities		
Affects	Stoics, Galen, Avicenna, B. Spinoza (1932), T. Hobbes (1989), D. Gartley	6

Since the XIX-th century, the development line of the physiological approach in the study of emotions has been planned, many works devoted to bodily sensations during emotional experiences. Accents changed very quickly. But the desire to engage emotions remains. According to A.V. Petrovsky, M.G. Yaroshevsky (1994, 1996), D. Gartley paid special attention to the role of education in emotional self-regulation, J.-J. Rousseau – the development of feelings. According to age periods, the main milestones in emotional education were indicated, the connection with morality and ethics was traced.

***Table 2**. XIX, XX and XI centuries*

Subject of study	Authors	Number
Emotions	S.L. Rubinstein (1999), L.S. Vygotsky (1984), J. Plamper (2018)	3
Feelings	S.L. Rubinstein (1999), L.S. Vygotsky (1984), J. Plamper (2018)	3
Passions	L.S. Vygotsky (1984)	1
Basic emotions	D. Watson (1926), K. Izard (2000, 2006)	2
Emotional intelligence	Payne, Wayne Leon (1985), Lyusin D.M. (2004), Roberts Richard D., Moshe Zeidner, Matthews Gerald (2002), Goleman D. (2009)	6
Emotional leadership	Goleman D. (2009)	1
Emotional health	Leahy (2002)	1
Emotional competence	Reuven Bar-On (1985)	1

5. Discussion and Conclusion

Everyone understands what emotions are, but no one can clearly answer the question “What is this?”. The problem of studying emotions, as this work has shown, is the lack of a generally accepted approach and the abstract semantics of the word "emotion"; with a clearly established relationship between the social and the biological in the emotions, no balance was found; in the dispute between social constructivist and universalist theories of emotions, J. Plamper puts the binary opposition in the study of emotions behind the brackets, pointing to the possibility of studying emotions beyond constructivism and universalism. But his opinion is shared only by individual members of the scientific community; the validity of neutral emotional states is questionable, – given the dynamic nature of the verbs laid down in the base of the word (shake, agitate, fluctuate), they lose their power in the sense of validity to be called emotional such states as “peace”, “calm”, “serenity”, suggesting neutral nature of flow; even within one approach (for example, among supporters of the physiological approach) there is no consensus; there is no desire of the authors to apply a clear differentiation of such concepts as "emotions", "feelings", "passions", "affects". Over the past centuries, the interest in emotions has been preserved, the terms "affects" and "passions" in negative connotation are much less often used, there is a tendency to study emotional intelligence and emotional competence and practical application of corresponding developmental exercises, but the term "emotion" ("emotions") is not determined, there are no agreements in the scientific community, and a single mechanism for interpreting the concept is not developed. Thus, ambiguity and a vague idea and the term "emotions" is not a reason to

refuse to further study it, and its use is justified by relevance and practical significance.

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Emotional Lexicon in the Professional Environment

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Abstract

Understanding of emotional lexicon as the way to improve the relations in social groups, including relations in the professional environment is presented in the article. The difficulties, arising within the human interaction are considered: ratio of rationality and irrationality of human mentality, emergence of disagreements, contradictions, conflicts. The results of the analysis of references, which authors investigated this difficult perspective are presented capaciously. At the moment the question remains unsolved, but there is no opportunity to stop communication and interaction. Besides, living conditions of a person are characterized by extreme instability. At the same time builders still should build, doctors should to care for health of their patients, teachers should to learn and pass on the experience of the previous generations to those, who is growing up. The opportunity to agree is represented as the key aspect for the establishment and development of constructive social contacts. In this case common language is the means of communication. In the professional environment such language is not satisfied with the terminology. There is an enrichment of the professional language with new words, performing some functions, like emotions, and emotionally charged. The acquaintance to the emotional lexicon of representatives of various professional groups paves the way for further communication, promotes spirit of consent and cooperation. Professionalisms are given in the article, shipbuilders, programmers, builders and also students and teachers of construction higher education institution, health workers acted as the example. It is interesting that emotional lexicon has no rigid character even for difficult professions in difficult conditions, it is designed to remove stress, it is supposed to restore sincere balance since, for example, there is a place for the sense of humour in it.

Keywords: Communication, Opportunity to agree, Emotional lexicon, Professional language, Professional environment, Constructive social interaction, Rational and irrational

1. Introduction

The quality of communication, as the exchange of information, in the century of digital technologies is extremely relevant. On the one hand the hi-tech world gives the opportunity "to be in touch" constantly , on the other hand it introduces some amendments in the process of communication and interaction: the language of communication, the information transfer condition changes, there is a need to consider the new barriers and hindrances, which are capable to distort, and at worst to destroy mutual understanding. Social interaction is a difficult, contradictory, often unpredictable (owing to irrationality and subjectivity of human mentality) process.

During the last decades much research have been devoted to the ratio of rational (intellectual intelligence, cognitive abilities, logic …) and irrational (emotions, feelings, instincts, emotional intelligence …), including research without emphasis on this or that component, but in the balanced interconnected variety of all the components about, which is confirmed in works by Vygotsky, Hp (1984), Payne, Wayne Leon (1985), Shabanov, Sergey and Alyoshina, Alyona, (2013), Sternberg, Robert (2002), Gardner, Howard (2007), Ayzenk, Hans (1995) and other authors. This approach is mostly divided by the author of this article because of its understanding of the convention of division of the person and his or her mentality into elements; the analitic-and-synthetic approach, peculiar to scientific studying of the world around and the person, giving the opportunity for studying of difficult objects and the phenomena, but concealing in itself danger of the use of the principle of reduction, is also considered (distortion, simplification, data of the existence of objects or the phenomena, difficult for studying, to zero …). Human is the complete creation, that corresponds to the scientific and philosophical position of holizm. There is everything in a human: rational and irrational, constructive and destructive mechanisms are provided.

Many scientists, including Freud, Z. (for example, 1921), Fromm, AA. (2004), Lombroso, Part (2005), Le Bon, about (1995), Zimbardo, T. (2013), Lorentz, To. (1994) were engaged in the matters of existence of the destructive beginnings in the person and their description. The prerequisites and conditions, provoking their manifestation, were investigated. The subject of disagreements, conflicts, wars, which were studied within military disciplines initially, from where the term "conflict" was involved by other disciplines (for example, "Sociology", "Psychology", "Management" and many others) is closely connected with this subject, Antsupov

A.Ya. and Shipilov, A.I. write that (1999). The external environment and conditions of activity, situational factor, also affects the process of social interaction. Both characteristics of a homo labouring, and characteristics of the environment, caused by the contents and originality of the related professional activity which existence and efficiency (taking into account the discrepancy of human nature and associations of people, nonlinearity of ways of interaction, depends on an opportunity (ability) to agree. Such words and phrases as "to agree", "to sign the contract", "to agree", "to reach mutual agreement" are synonyms of the verb "agree. It is obvious that common language acts as the means. The ancient example, remained up to now, is the Babel tower (the known legend of the Babel tower) can serve as a metaphor. The ambitious building, which united numerous professional groups could take place only on the condition of existence of a uniform system of coding, i.e. language of the communication promoting the optimization of interaction promoting intergroup adaptation. Language of builders and some of its emotional features were considered before (Magera T., 2018), and thanks to the concept of the intergroup adaptation, developed by Bulgakov A.V. (2106) there is an opportunity to investigate the emotional component as the factor of intergroup adaptation in the construction organizations. The tower is still not completed presumably because the uniform language was lost, the discord was caused in communication, joint activity as well as its efficiency is impossible under such circumstances.

2. Literature Review

Rosenthal D. E. and Telenkova M.A. (1976) define emotional lexicon as "the words having the emotional coloring, expressed by language means" in the dictionary reference of linguistic terms. For example, granddaughters, beloved, lassie, Big Hippo, heat. Secondly, they can be defined as swear words: rascal, yobbo, creep. Thirdly, they can be defined as interjections. Classification of interjections according to their meanong includes emotional ones (express various emotions and emotional states: "Alas!", "Joke!", "Eh", "Wow!"), incentive ones (call for action: "Stop!", "Shoo!", "Wons!"), etiquette interjections (etiquette speech or the speech corresponding to the rules of speech behavior adopted by society: "Hi"", "So Far", "Excuse") (The stylistic encyclopedic dictionary under M.N. Kozhina's edition (2003)).

Some linguists (for example, E.M. Galkina-Fedoruk) as Rosenthal D. E. and Telenkova M.A. note, treat the words serving as designation of the feelings, moods, experiences or means of expression of emotional assessment as emotional lexicon also. Here are some examples: fastidiousness, roughness, rage, hatred, disgust, grief, fear, isgusting, nasty, unusable, mean, opposite, nasty; tender, favourite, nice, wonderful.

The professional environment (according to the Internet dictionary on career guidance and psychological support) is the set of subject and social working conditions. The subject of the professional and working environment and also environmental factors have been revealed by many domestic and foreign authors. In the Proceedings "At the Point of Production: The Social Analysis of Occupational and Environmental Health" under the edition by Charles Levenstein (2009) industrial dangers are studied through understanding of the social, political, economic context of specific industries or jobs. A wide range of problems (globalizations, influences of privatization on health and safety of workers and communities in Brazil and Mexico, environmental issues, subject of the gender relations, labour hygiene) is mentioned. The modern professional environment, which underwent changes because of automation and informatization, forcing people to find their place in the "artful labour market" is considered by Prokurat, Sergiusz (2013). The author cites Steve Jobs's quote, characteristic of the book mood: "Your work is going to fill a large part of your life, and the only way to be truly satisfied is to do what you believe is great work. And the only way to do great work is to love what you do. If you have not found it yet, keep looking. Do not settle. As with all matters of the heart, you'll know when you find it". That is an emotional quote containing an appeal to be guided by one's own interests, values, requirements, emotions and feelings. According to Jobs, that allows to maneuvre successfully in the changing and aggressively developing world. He notes that the development has both creative and destructive forces.

According to Berskaya, D.V. (2017), words and expressions (professionalisms, special words, special terms) used in various spheres of the person' activity, which did not become common, belong to the professional lexicon, according to most of researchers. I.e. that is one of the forms of lexicon of the limited use. E.N. Serdobintseva (2011) differentiates the set of the concepts which are often perceived as one: "professional dialect", "professional slang", "professionalism". Berskaya D.V. mentions the main function of the professionalisms, which is the nominative function; in this connection nouns are met most often among them.

Restriction of the use of certain professional lexemes is imposed by the borders of the professional

group, differing in their characteristics, known to sociologists and psychologists, based on collective behavior, studying of social groups, group activity. According to Blumer G. (1951), the group activity can be understood as the collective behavior. The term "collective behaviour" is used by sociologists for the designation of the sphere of the scientific interests covering such phenomena as crowds, concourses, panic moods, manias, dancing insanity, spontaneous grass-roots movements, mass behavior, public opinion, promotion, fashion, hobbies, social movements, revolutions and reforms. When individuals act together at a certain labour division, mutually adapting lines of the behavior, the ordered, coordinated behavior is formed. Blumer G. notes that such behavior is collective by nature. It is directed by certain expections and the group activity is under the influence of customs, traditions, conventions, rules or institutional regulatives. Blumer also pays attention to the development of elementary, spontaneous behavior forms (unregulated group activity: excitement, panic, hysteria, social tension) and their transformation in organized ones. In the context of studying of the public as the group, belonging to elementary and spontaneous collective groupings (arises not as envisioned one, but as a response to a certain situation), it is appropriate to mention a collective product of process of interaction, i.e. the public opinion which formation is based on the use of common language.

Language is a way of verbal communication; it is developed by its carriers belonging to the social group. The elite culture (exclusive, opposed mass) addressing the elected minority, uses the closed languages, including Latin and Sanskrit. Development of the common special professional language does not perform function of coding with the purpose to save the used information in a secret. That is the function of a slang as a social dialect. Professional lexicon is designed to provide working process, it is used in working situations. The professional language develops, besides all, thanks to some loans from everyday language, from foreign languages, from languages of other professional groups. It has original or deliberate simplified nature, can partially perform function of removal of the excessive tension, caused by work at the expense of ironic, the deriding background. As the mechanism of protection from overloads, in certain cases there is a reflection of professional cynicism (doctors, police officers, etc.) at language.

The validity of emotionality of professional lexicon can be caused by the functions of emotions (cited as Vilyunas, V.K. (1984), etc.) among which the communicative function is of the greatest interest to this work:

1. Motivation function. The aforesaid incentive interjections promote the transfer from one psychoemotional state to another, they draw attention, direct activity focus on the working situation.
2. Assessment function. For example, positively emotionally charged words or expletives can report about the first impression, made by the new partner in interaction or the unexpected situation, briefly and brightly. Emotional assessment often precedes the conscious consecutive thought-over assessment and thus saves time for making decision on the adequate behavior.
3. Mobilization function. The statements bearing emotional loading are based, first of all, on the physiological basis. The approximate reflex (to stand, get accustomed, listen, to sniff, etc.) is the full mobilization of all the opportunities and resources of an organism for overcoming a situation (the situations uncertainty, negative situations are most often).
4. Function of compensation of information deficiency. "Emotional advance " in case of the lack of necessary information for adoption of the logical decision.
5. Communication function. The conventional form of expression of emotions promotes mutual understanding. Emotional signals which are interpreted equally or in a similar way, create the strong base for the constructive social interaction. It is extremely important for the professional environment since rapprochement of participants of the labour process and realization of the purposes and tasks, common for representatives of the group taking into account the economy of language, occurs ("to explain briefly").

3. Method

3.1. Participants

Representatives of such professional groups as shipbuilders, programmers, builders, students and teachers of construction higher education institution, health workers made the selection for this research.

3.2. Materials

The results of research on the emotionality of professional lexicon, completed by such authors as Tverdokhleb, O.G. (2017) (27 various professional groups); Yelagina O.I., Berskaya D.V. (language of shipbuilders); Magera T.N., Komarov L.N. (2001) (language of builders)"; Antropov P. (2005), Korotov A.

(2010) (language of programmers); Kottsova, E.E. (2013) were used a the materials.

Procedure

From the moment of understanding, that the professional environment undergoes continuous changes with the accelerating intensity under the influence of external conditions, the opportunity to agree as the necessary condition of constructive social interaction and efficiency of work, meets some obstacles, connected with the use of the professional language, which is characterized by emotionality on its way. Tverdohleb O.G. (2017) presented various professionalism, recorded during the observation of labour process by different professional groups. In this article an attempt to study the emotional lexicon of the professional environment is made, pointing out the units, which are capable to cause an emotional response in the respondent. It is supposed, that the emotionality of any language serves as a factor of rapprochement, optimization of intra group and intergroup interaction and adaptation.

4. Results

Yelagina, O.I. (2016) offers and describes five theme groups of professional lexicon of shipbuilders of Severodvinsk: 1) names of the plants and their parts; 2) designation of the territory which is outside the plants; 3) names of workers, employees at the enterprises; 4) names of submarines and ships; 5) names of tools, instruments. The set of lexemes is formed within one specialty, they occur only in oral elements of the working ship-building enterprises are regionally marked. The use of such emotional names as "wood" (the wooden shop), "robots" (working), "long loaf" and "Goldfish" (submarines and the navodny ships), "dog", "horse" (instruments of labor, tools) is characteristic of shipbuilders.

Such emotional names as "pancake" (compact disk) are characteristic of the professional group of the producers, sellers and experts, serving the computer equipment, "to buzz" (to fix the connection by the means of the modem, loan from household language); "reanimator" (the master who is carrying out repair, restoration of the idle computer (loan from medical terminology) and "teapot" (the inexperienced programmer or the novice user); "iron" for computer (examples of a metonymy, the use of a jargon).

Such emotional names as "vira" (motivation to action – the team when loading, unloading, heavy lifting by means of the crane, the winch designating: lift! up!) and mina (motivation to action - the team when loading, unloading designating: lower! down! heave ho!) are characteristic of the professional group of builders, students and teachers of construction higher education institution (Komarov, L.N. (2001)). Vira and mina are borrowed from the professional language of seafarers. Tiny louse (the shortest self-tapping screws, which are no more than 1 cm long according to the language of builders-finishers); "candle" (the multiple story administrative building of the university complex of the construction higher education institution), "camomile" (the building of the lectures audiences with a round shape), "Broadway" (the central floor of the building, through passage connecting parts of the university complex of the construction higher education institution).

Such emotional names as "little squirrel" (delirium tremens, diagnosis), "drake" (spleen, the name of internal body), "parachutist" (a patient with the injuries, got as a result of falling from height), "beaks" (nippers in stomatology, the name of the tool) are characteristic of the professional group of health workers (Kottsova E.E., 2013).

5. Discussion and Conclusion

Social interaction is initially carried out in the conditions of obstacles, connected with the irrationality of human mentality. Some authors claim that the disruptiveness is inherent in human nature, others authors connect it with the environment, including the social environment. There is a trend to understand and use irrationality as a resource recently. In spite of the rich research heritage, the issue remains unsolved.

The opportunity to agree by the means of common language is the key thesis in social interaction; that it is extremely difficult to carry out in human community. The history of mankind is followed by the infinite conflicts, wars.

Emotional lexicon in the professional environment is deprived of emotions only partly or very conditionally, that is confirmed by the fact of existence of professional language. Otherwise, the word formation would be excluded. The analysis, submitted in this work, confirms that in many cases the professional language is emotionally enriched, showing insufficiency of the compact, accurate, formal terminological dictionary for the full communication. Thanks to emotionality, professional languages become socially active, they overstep the bounds of some professional groups.

Emotional language is created to serve the new reality, concerning the professional environment; that is connected with such global processes as informatization and automation.

The emotional professional language does not serve the idea of isolation, it promotes removal of tension, unites.

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Construction of Children's Sports and Leisure Facilities as a Means of Solving Social Problems (on The Examples of Moscow Suburbs and New Districts of Moscow)

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Abstract

The conditions, created in the Russian capital and in the cities of the Moscow region for the development of children's and youthful sport are analyzed i the article. The actions, which are carried out by architects and city planners in the territories which entered the Moscow agglomeration in 2011 are taken to consideration by the authors. Construction of the sporting facilities, supposed for the younger generation of athletes is regarded as the means of social adaptation of youth and school students. Involvement of young people in sport is the guarantee of health of the nation in the future. The problem of ensuring this health determined the relevance of the work. Some examples of construction of sports facilities in Moscow and Moscow region are given (Naro-Fominsk, Mr. Shchelokovo, the settlement Kiev within the Moscow agglomeration, etc.). The main method of the work is the analysis of materials of media, experts poll, interviewing method, additional methods are general scientific methods of induction and deduction, conclusion by analogy.

Keywords: sports facilities, architectural environment, youth sports, sports grounds, Moscow, Moscow suburbs

1. Introduction

Construction of gyms for children, organization of sports schools and children's sports complexes is the subject of special attention from municipal authorities in some large megalopolises in the Russian Federation. Much attention to this question is paid by the authorities of the Moscow region. It is made much already in the areas which in 2011 were attached to the capital megalopolis. Construction of sports complexes happens in this part of Moscow especially intensively. The principle of involvement of children from preschool and younger school age in sports life is implemented by the city authorities, Department of school education of the capital region and the management of educational institutions, as at this age the main physiological functions of an organism are formed, and the probability, that the new generation of citizens will grow physically strong thanks to exercises and going in for sports, increases. It is important to realize, that health better under the influence of various means of physical training, physical development improves, movement skills are formed, physical qualities develop, conditions for moral, intellectual and labour education are created (Hukholeva, 1976).

Physical training is a component of comprehensive education. Therefore, physical training of children of preschool and younger school age is the first and very important link of the system of physical training in modern Russia.

The authors this work consider how the problem of providing the Russian youth, living in the capital region (in areas which only became a part of the city of Moscow in 2011), with necessary sports facilities is solved. In order to have the sport of records developed, broad involvement of youth in the sports movement is necessary. It is important to develop infrastructure of children's and youthful sports for this purpose. The need to involve various age groups of youth in sports activity is obvious for everyone. Meanwhile if in preschool institutions attention is paid first of all to physical development through exercises, then at high school the involvement of pupils to sports activities is possible. The sport at preschool age, is known to be not applied, as it demands long trainings, huge physical and nervous tension during the competitions. Sports can do harm to a preschool child, weak physically and intellectually. However, children are to be given sport elements, sports entertainments, connected with a game, work, esthetic education. Internally The space, intended for exercises, on the one hand, and halls for sports activities, have to differ from each other internatally. Architects and interior designers have to consider this circumstance.

The public need for physically developed younger generation determined the relevance of the research, offered by authors.

2. Methods and tasks of the research

Meaning the task, specified in the previous paragraph, authors address the methods of the retrospective analysis of media reports (the newspapers "Novye Okruga", "Vechernyaya Moskva", "Soroka", "City Centre", "Shchelkovchanka", etc.), normative documents, where the regulations of construction of sporting venues are defined, as well as to general scientific methods of deduction and induction, methods of theoretical level of knowledge (Ivanova, 2009). The analysis of opinions of experts as which the journalists, authors of news reports of the Moscow media, civic activists, interested in development of sport, sports trainers act, is taken into account. The complex analysis of long-term plans of the urban development, the analysis of solutions of public hearings, conclusions of town-planners and organizers of sport in the Moscow region, the analysis of decisions and orders of the Department of school education in the Moscow region also belong to the methods, used during this work. The interviewing method is considered in the article.

The authors use the method of scoping and maintenance of a concept as the theoretical method. In particular, such concepts as "physical training" and "physical education" are used in the work. Physical training is the education, directed to the achievement of perfection, i.e. high level of health, physical development and physical fitness. During physical training intellectual, moral, esthetic and labour education is carried out at the same time. Physical education is one of the parties of physical training including mastering special knowledge, movement skills and abilities. Physical training is the function of educational institution, physical education is the function of specialized educational institutions, in particular, institutions of children's sports schools.

Thus, physical education belongs to physical training as a part to whole.

Let's designate the subject and the object of the research. A research subject is presented by the sports facilities and public buildings, intended for children and young men, which are in the region of the Russian capital. The object of the research is the resolution of conflicts, arising during construction of the facilities between civil society, municipalities and builders of sporting venues.

The circle of the sources, used in the work is in many respects determined by the task which is set for themselves by the authors. The analysis of the performance and the prospects of construction of sporting venues for children and youth in Moscow and in Moscow region is this task.

3. Materials

We begin with data of the general statistics, which is presented in the official newspaper of the Moscow mayor's office "New districts". According to these data, preschool educational institutions in Troitsk and Novomoskovsk administrative districts could accept 3 thousand children in 2019. One of the largest kindergartens for 300 places appeared in the settlement of Kokoshkino (cited as "New districts", 19.04.2019). There are well-planned and spacious gyms in the new child care facility, and that means that all the conditions for physical training of young residents of the country are created there.

The authors also address the facts, stated in the periodical press of Moscow suburbs. For example, here is the way the newspapers and magazines describe the problem of construction of preschool institutions and institutions of a sports profile for youth (that is institutions of physical education) in the Naro-Fominsk district of Moscow region which part entered "New Moscow" now. Several new sports groups were opened in this municipal district on October 25, 2018 within implementation of the program for increase in number of places in child care sports facilities. As the regional mass media report, additional sports groups in child care educational institutions of the city of Aprelevka and village of Ateptsevo were opened. During 2018 the sports schools, which are in the area, began to take children to nineteen groups of different profiles. Places at children's sports schools are enough for more than 800 children (cited as Panorama, 30.01.2019). The regional management considers the problem of elimination of deficiency of places in child care educational institutions and in institutions of the sports profile as one of primary. The solution of these tasks has to happen not only due to opening of additional groups, but also due to construction of new kindergartens, high schools and schools of the sports profile. The purpose of construction of nurseries and junior sports schools is physical training and education. The way of conversion for the needs of sport of institutions of other appointment is undesirable, but this way is widely applied in the capital region too. The local executive authority recognizes that the task to construct and reconstruct more than ten kindergartens is being executed in 2019 only partially (cited as "What happened", 30.01.2019). But some works on capital repair and reconstruction of buildings of kindergartens in Naro-Fominsk, Vereya, Aprelevka, Selyatino were already carried out. New kindergartens in residential locations Kalininets, schools in Aprelevka and in the settlement Kievsky are under construction. All the listed objects have spacious gyms. Sports groups are

already organized at separate high schools, sports circles work. A part of the building is returned to kindergarten No. 1076 in the settlement Kievsky, which became a part of New Moscow. The additional group in kindergarten No. 52 in Vereya is already opened, the foundation for small children's school near the railway station Bekasovo-Sortirovochnoye in the southwest of the Russian capital is laid.

However the organization and construction of preschool institutions occurs not without problems. During the period of economic reforms of the 1990th some preschool teaching and educational institutions were closed. For example, in the settlement Kievsky one of three kindergartens was converted in a sports complex Lokomotiv, while a part of rooms of another kindergarten was occupied by the Centre of culture, and only in 2016 those rooms were returned to kindergarten. But also there was a collision between the sports institution, intended for adults and preschool institution. The shortage of rooms still is considered as one of the problems of the development of preschool physical culture and school sport.

Creation of institutions for children continues in some areas of Moscow region. However, it occurs not so intensively, as in Moscow. Construction of kindergartens is adjusted in the Mytishchi and Shchyolkovo districts. In 2016 in the settlement Sverdlovsk, Shchyolkovo district the SU-22 group of companies built a kindergarten, the first for twenty years, which "not only began to be built, but also finished" (cited as Shchelkovchanka, 17.02.2018). However here interferes with commissioning of the object "the conflict with the inhabitants of houses of the private sector refusing to free the territory under the sports ground" (cited as Shchelkovchanka, 17.02.2018). The regional newspaper starts the key part of the problem: "The kindergarten has no earth for a shadow canopy and a walking zone, stadium and other sporting and recreational facilities of small architecture. On this place there are three private houses which owners refused to move to new places closer to the centre of the settlement resolutely" (cited as Shchelkovchanka, 17.02.2018).

4. Results

4.1. Recreational facilities and festive actions in the capital as the way to mass sports

Let us return to the matter of the organization of sports leisure of children and teenagers, which is one of important social problems for our country. We find an example of the solution of this problem in one of the regional centres of Moscow region in the regional newspaper. In the Palace of culture which is in Naro-Fominsk, holding cultural actions for school students and youth became regular for a long time. Children's competitions including the All-Russian scale are often held. One of such child teenage actions is the All-Russian competition of children's and youth creativity "Be famous, our Fatherland!" (cited as Panorama, 30.01.2019). Not only artists, musicians, but also athletes compete there. Chess tournaments, competitions in rhythmic gymnastics, classical and Greco-Roman wrestling, etc. will be organized. Competitions of this sort and competitions are held in Moscovsky town in the southwest of the capital megalopolis (Figure 1). Competition is carried out for the purpose of identification of the best teams and certain athletes which will be able to present Russia on the International actions adequately. Within this project for participants of competitions and heads master classes and round tables are held, and the Gala concert of participants and the Ceremony of rewarding of winners finish the action. Winners of competitions receive considerable grants for training in sports facilities (cited as New districts, 08.09.2017).



a



b

Fig. 1. Competitions of school students in Moscovsky town in the southwest of Moscow. Competitions on wrestling (a) and on rhythmic gymnastics (b)

As one of the directions of urban policy in the field of the organization and the equipment of the sports grounds and other facilities, intended for exercises, actions for creation of inclusive sports space act. In

compliance with the problems of achievement of inclusivity in the field of physical training of citizens in the settlement of Voskresensk, which is within capital agglomeration, the park, in which both representatives of the senior generation, and youth, first of all school students can train and hold sports competitions, was established in 2018. The zone of playing table tennis, exercise machines, the variety platform, an artificial covering at playgrounds appeared instead of the previous uncomfortable park in 2018. During the public hearings on the improvement of the park the inhabitants also asked to make the field for soccer, so that young athletes could train in the street (Zinina, 2018). The embankment of the river, flowing near the park obviously pleased the athletes of Voskresenskoe doing team sports. Volleyball players, handballers and athletes are engaged there. In 2018 there passed the first stage of the improvement of the park zone. At the second stage there will be surveillance cameras, new support of street lighting.

The project of further improvement of the park zone in Voskresenskoe is in the development. After the statement it will be submitted for public hearings. We can conclude, that the project in the settlement of Voskresenskoye, as the local media emphasize, is implemented within the My District programme.

Sporting events and festivals are often "built in" the schedule of recreational events which quite often take place in the cities and settlements of Moscow region and also in the capital. The City Day, which is annually celebrated in the capital, acts as the action involving representatives of all sports. Within the festive events, in particular, competitions in checkers and chess are held (Vasnetsova, 2018). Fans of extreme sport are annually brought together for "Track of Fighting brotherhood" in the settlement Voronkovskoye. Within this competition it is offered to overcome 30 tests. Participants of military and sports competitions run in the cross-country terrain, pass a water barrier (cited as "New Districts", 31.05.2019). School teams participate in the competitions. Any games-master will confirm that run is the great means of developing respiratory organs and blood circulations. Therefore it is important to hold competitions in run in the fresh air. Run and a cross-country run favourably distinguishes the competition "Fighting Track" from other sports competitions for children.

4.2. Care of handicapped groups of population

Construction of institutions is of great importance for handicapped teenagers, having physical defects, mental and psychosomatic disturbances, visually impaired children, the disabled children moving on carriages. Periodicals of the Naro-Fominsk district publish materials about the social importance of institutions of this sort. Material by E. Skripko (2019) in one of the regional newspapers is devoted to the rehabilitation Centre "Skazka". Work with sick children in all directions, beginning from full medical attendance, before psychological assistancefor them and their parents is carried out there. At the same time 5 offices supposed for 55 people: stationary, office of medico-social resettlement, office of the psychology and pedagogical help, day stay, administrative part exist in the district (Skripko, 2019). Classes in physiotherapy exercises are given in the center.

4.3. Organization of sports grounds as one of the problems of the comfortable urban environment formation

Existence of available sports facilities for teenagers of an average and the advanced school age is of great importance for socialization of youth. In the old cities of Moscow area search of free territories for new sports complexes becomes a serious problem. Here is one of the examples of successful solution of this sort, about which the Mytishchi newspaper "Our Mytishchi" tells (26.01.2018-01.02.2018). In the residential location Mytishchi near kindergarten No. 19 the old building of the coal boiler house, which was not used for designated purpose, remained long ago. Residents of the residential district appealed to administration to make the functioning sporting venue in the old building. The commission, which established that the building, despite the seeming durability, is not suitable for sports activities and physical culture, was organized. It needs not just capital repair, but installation of full-fledged ventilation systems, heating and water supply. Simple calculation of reconstruction cost forced to refuse the plans for reconstruction of the existing facility. It appeared to be cheaper to demolish the old building, and to build the covered sport centre with game and gym on its place, so that the youth of the city would have the opportunity to play sports "within walking distance". That was made.

Thus, construction of sports and improving complexes is made within the complex development of territories, which happens in pursuance of the contracts consisting between legal persons builders and public education (for example, the executive authorities of the settlement, municipality). Within the contract preparation of documentation for construction is made, the boundary-setting plan, taken for sports and improving complex is approved, actions for commissioning of the facility are outlined.

The aforesaid examples give an idea of in what directions work on the organization of space for

exercises and sport in Moscow and the Moscow region is conducted. For the organization of comfortable architectural and planning space construction of the social institutions and institutions of preschool and school education, intended for exercises, is of particular importance. The sharpness of the problem is realized at the moment, both in the megalopolis, and in the suburbs. However only in some settlements of Moscow region and only in the certain districts of Moscow real measures in this direction are accepted. The issue of opening of child care facilities of the sports profile, is connected directly with the problem of mobility of young parents, their resocialization and adaptation to life in the megalopolis. The kindergarten or school, in which the child develop physically, can exempt the young mother from the burden of care of the child, promote her social and professional self-realization, return it to social production.

The problem of construction of sporting venues has to be solved in a complex with common problems of town planning. Awareness of complexity is characteristic also of municipal authorities of Moscow. In the interview, given to the Moskovsky Segodnya newspaper, the Mayor of Moscow S. Sobyanin says: "I consider that two thirds of the territory of Moscow require a close attention, they are arranged absolutely differently. We did not pay attention to some territories for fifteen years, and they need care. Therefore this year we will put about about 160 parks in order. It is the huge volume" (Sobyanin, 2019). According to Sobyanin, complex improvement means creation of the most comfortable environment for life. In the Moscow district of Kapotnya complex improvement with the creation of sports infrastructure will affect nearly a half of the territory, including the embankment (paths for cyclists, fans of run will appear here), especially protected natural territory, residential quarters (Sobyanin, 2019). Meaning the construction of recreational and children's constructions the deputy mayor of Moscow M. Khusnullin in one of the interviews formulated a task: "To build reasonable, kind, eternal …" (Klinky, 2019).

5. Discussion and Conclusion

The urban environment is complex and mosaic as the society itself. Owing to this circumstance the urban architectural development, supposed the placement of sports facilities, has to meet requirements of whenever possible broader categories of urban population playing sports and physical culture. Exercises as it was emphasized make the condition of harmonious personal development. Full development of the person at early age is first of all the formation of movement skills and abilities, development of interest in different types of movements, formation of moral and strong-willed trait of the individual (Fomina, 1974, The programme of education in kindergarten, 1972).

But besides occupations it is important to create conditions in which they will take place. And all this while the urban environment is multipurpose. It is supposed for all the categories of urban population. During organization of the architectural and planning environment the needs of youth for places for active holiday, in sports activities and physical culture, in entertainments, in perhaps bigger availability of institutions of cultural and leisure character have to be considered. Young parents have to be in return provided with access roads for carriages and the sledge. The barrier-free environment is sharply necessary for the working-out disabled people and elderly people. The last have to play sports for maintenance of the health. For children correctly organized architectural environment becomes a decisive factor of their socialization. The sports ground for children carries out a role of game space in which children seize norms and rules of interpersonal communication. The same function is performed by occupations team sports.

The organization of the comfortable environment for exercises and sport in the large megalopolis has one more aspect. Now safety of children in the conditions of the megalopolis turns into extremely important political task. For overcoming demographic recession and education of physically healthy younger generation it is necessary to put first of all in planning of Wednesday creation of comfortable living conditions for young parents and juvenile children. It is necessary to provide such conditions, so that they go in for sports together.

The analysis of messages from media, undertaken in the article allowed us to make some preliminary results. Creation of comfortable conditions for life in the city assumes providing conditions for self-realization of the young people living in the megalopolis, satisfaction of their cultural requirements. Development of sports infrastructure will promote the decrease in crime, involvement of youth in activity, useful to society. Examples of the solution of this problem are given in our article. It is shown that during the organization of places for children and teenagers we meet some local conflicts, connected with the discrepancy of interests between different social groups in the modern city. Preparing the work we addressed the private conflicts concerning construction of institutions for children in Shchelokov and Mytishchi. Cases of the solution of problems in the cities of the next Moscow area, mentioned above, are

described.

A lot of work is carried out on the organization of sports rest in parks. However the list of sports disciplines in which the citizen can be engaged in parks of the capital is limited. They could be expanded with team sports. Our research also revealed that during construction of children's sporting venues in the cities of the Moscow region in the sphere of investment construction difficulties and contradictions are not overcome. Some of these contradictions (mainly between groups of urban population) authors concerned in the research.

Creation of the comfortable urban environment is one of the key problems of the complex of municipal economy of Moscow for 2019. The solution of this task is impossible without creation of conditions for exercises and sport.

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Physical Culture and Sport for Disabled Persons: Urban Planning Aspect of the Problem of Creating Conditions for Sports Activities for Low-Mobile Townspeople

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Abstract

The article discusses the problems of creating a comfortable architectural and planning space for sports. According to the authors, city planners, designers of sports equipment and facilities, architects and road engineers are obliged to take into account the needs of representatives of low-mobile groups of the urban population in physical training and sports. Special attention should be paid to the involvement of disabled persons in team sports (volleyball, football, etc.). The authors emphasize that the involvement of disabled persons and disabled citizens in sports competitions will help their socialization. The authors used following methods: retrospective analysis of sources, primarily media reports, general scientific methods of induction and deduction, zoning of the urban environment, the theory of urban planning, regulations on the organization of a barrier-free architectural and planning space in cities.
Keywords: Key one, Key two, Key Three, Key four

1. Introduction

In a large metropolis, meeting the needs of disabled persons in physical training and sports is one of the indicators of the convenience of urban space, which is formed by architects, city planners, builders and representatives of municipal authorities. Such convenience is doubly required by representatives of low-mobile populations, moving in wheelchairs. The latter need special measures to create a barrier-free space, and they need sport and physical culture as the means of socialization.

Today, much attention is paid to meeting the various needs of low-mobile citizens, and especially the basic ones, which have a connection with maintaining their physical health. And the maintenance of health is promoted by physical exercises, and whenever possible in the open and in a group with others exercising persons. Another criterion is the absence of injury, the reduction of pollutants in the air that people breathe. The safety of the urban environment is determined by such factors as a comfort and minimum risk of emergency situations. In general, the fulfillment of such requirements is a prerequisite for the health of all categories of citizens, and not only low-mobile populations. Hence the requirement of inclusion, that the designers of stadiums and urban sports facilities fulfill. The Russian Federation began to pay serious attention to this during the period of the Winter Olympics in Sochi. It should be noted that it was in the city of Sochi on the eve of the Winter Olympic Games that public transport routes were introduced, adapted to the requirements of low-mobile visitors during the sports festival. The Paralympics in this city were highly appreciated.

Creating safe sports facilities should be the subject of construction education. In this paper, the authors set the task to find out what are the components of the safety of representatives of low-mobile populations in sports facilities and in the areas where sports events are organized. The second task is how to reflect these requirements in curricula for training civil engineers.

A comfortable and, most importantly, safe architectural and planning environment will provide opportunities for vocational training, retraining, advanced training of disabled persons, for organizing sports competitions and cultural events designed for these categories of urban residents. So, we need constructions and objects of small architecture that facilitate the movement of disabled persons through the streets of a megacity, making this movement safe. The current trend is associated with the involvement of disabled persons not only in employment, but also in the "freelance" and in the field of self-employment [1, p. 3], and most importantly in active life, integral part of which is sport. These trends should be taken into account when building sports facilities in a city. After all, the fascination of people with disabilities to Paralympic sports sets new requirements for architects for organizing the interior of sports halls, changing rooms, places where entertainment events are held. In this case, these facilities should be not only a place of recreation and satisfaction of the everyday needs of representatives of low-mobile populations, but also to become a convenient place to prepare for competitions, including international ones. On the other hand, it is

necessary to organize a dialogue between civil society and representatives of low-mobile populations living in a city. The environment should not hurt future paralympic participants.

Being limited by the framework of the article, the authors would like to outline some problems that should be reflected in the course of training civil engineers.

2. Method

The main work method is the method of retrospective analysis of sources, analysis of survey data conducted by VTsIOM among residents of the capital in 2017-2018, and the survey conducted in the construction university among future builders. In the last of these surveys, 120 respondents took part. In this article, the authors take into account the views of modern Russian and foreign experts on the formation of a comfortable barrier-free environment. Of interest are the findings of such modern researchers in this field as Danilina N.V., Privezentseva S.V. [2, pp. 49-56], Shimolina M.V. [3, p. 1491]. Ecological aspects of the problem are considered by Zavyalova T.V. in the article [4, pp. 36-41]. Problems of a barrier-free environment for athletes are posed in the works of Plaksina N. A. [5, pp. 198-201], Belenkaya M.P. [1, p.3], Naberushkina E. K. [6] and several others. The situation with the organization of a barrier-free environment in the megacities of Southeast Asia can be found in the article [7]. Most of these authors share the thesis that the problem of low-mobile populations has a complex nature, and therefore it should be solved by means of social, town-planning, psychological and legal sciences with the involvement of architectonics, municipal workers, designers and even social philosophers and ethnologists (it is indisputable fact that the attitudes towards disabled persons in different societies due to ethnic and cultural specificity). Transport problems of low-mobile citizens are raised in studies by Orlina K. V. and Pryadko I.P. [8, p. 2] and Davydova E. A. [9, pp. 145-155].

At the same time, in none of these articles there was a question about including the problems of organizing a barrier-free environment at facilities intended for sports for low-mobile populations in the training of urban planners. We will try to connect the achievements of scholars and practitioners in the field of urban planning with the requirements of construction education and with the requirements of social security for low-mobile populations by applying legal knowledge. After all, what architects, specializing in the construction of sports facilities, and coaches write about in articles, can also be included in the training programs for builders and architects.

3. Results

The availability of social services, the convenience of urban infrastructure in general in the Russian Federation in some cases continues to be a factor of social inequality for disabled persons. Today, one of the tasks of the complex organization of a barrier-free urban space is to overcome this inequality. Aggressive, filled with various obstacles, the architectural and planning environment of Russian cities is uncomfortable and unsuitable for citizens who need special conditions and care.

Sports facilities are often not available for them. The authors of this article believe that in order to overcome this negative trend, an interdisciplinary model of training builders is needed, the model is aimed at mastering the competences to create a barrier-free architectural and planning environment at sports facilities (for competence-based approach in construction education, see: [10, pp. 132-135]). In order to implement this model, it is required to develop curricula and courses that enable civil engineers to find out the social needs of urban low-mobile populations (hereinafter referred as LMP), including the need for physical training and sports. In this regard, the Russian construction education is still significantly behind the global level. Coordination of town-planners, social workers, representatives of civil society, entrepreneurs, economists, and faculty members of construction universities is required, as well as taking into account the wishes of the Paralympic Committee, which understands from the inside the difficulty of the situation, which is an important consultative factor in creating a barrier-free environment for LMP. It is necessary not only to improve technical tools for the rehabilitation of LMP, but also to create conditions for their socialization, conditions for satisfying not only basic physiological, but also social, cultural, spiritual, and sometimes religious needs (for example, [11, pp. 235-241]). Today, social activities are often carried out separately from the architectural and planning ones. In order to overcome the inequality between capable and disabled persons, people with reduced mobility, in the capital region held job fairs and conferences on the employment and entrepreneurship for disabled persons. Within the framework of such events, teachers, business representatives, psychologists, sports popularizers, volunteers and social workers, physicians help people reduced mobility to believe in themselves, get a job and even start a sports career [1, p. 3]. The

authors of the article proceed from the confidence that well-known athletes, sport psychologists and physicians, as well as representatives of committees of government organizations in physical culture and sport, expressing the general mood of athletes with disabilities, could join the work of these fairs. With their participation at such events, complex inquiries of representatives of the LMP would be revealed, including requests for the development of physical training complexes for the disabled persons and equal categories of the population.

For example, one of the central psychological problems for representatives of LMP is the problem of loneliness, resulting from the inability to overcome spatial barriers, from the inability to do physical exercises (i.e. this is a city planning, social and psychological task). Up to 41% of Muscovites surveyed by VTsIOM, are convinced that the number of lonely people in the city is constantly increasing [12, p.3]. Hence the task: to organize the architectural and planning environment so that such barriers do not exist, and loneliness is overcome. This task should be set and solved already at the stage of training future specialists-designers and city planners, in the context of compliance with the Convention of the World Health Organization (UN). Loneliness can be overcome by involving LMP in team sports such as volleyball, football, handball. Of great importance for psychological and social well-being is the holding of chess tournaments for people who have lesions of the musculoskeletal system. The development of family sports is of interest.

The organization of a barrier-free environment inside sports facilities should be a factor in the safe stay of disabled persons and similar categories of citizens. The life of people who have road and rail injuries, people with neurosurgical pathology is quite complicated in modern interiors, which the regional press quite often writes about [13, p. 4]. Questionnaire surveys, including those conducted among students of NRU MSUCE, have shown that the layout of interior spaces intended for low-mobile persons should be fundamentally different from the rooms designed for other citizens. The entrance to the locker rooms, the shower cabins can be provided with a ramp (here, at least, there should be no threshold preventing the passage of a wheelchair), and the doors should open in the direction opposite to the movement of a wheelchair user. Projects of the 1960s and 1970s in the USSR (for example, buildings of the K-6 series) were built without taking into account the requirements of people with reduced mobility, there was no provision for re-equipment or retrofitting of premises for wheelchair users. For this reason, at present, such a re-equipment of apartments for representatives of the LMP is very difficult due to the small room area. According to the respondents, it is advisable to return to the system of adjacent rooms, which will also provide the disabled persons with better access to the premises themselves. At the same time, it would be desirable to provide platforms for turning with sufficient size for wheelchairs. Platforms for turning wheelchairs should be provided in gaming halls, in the halls for hand-to-hand fighting, on gymnastic campuses (Figure 1). Cases where ramps are installed with gross violations of existing ergonomic requirements (see Fig. 1 and Fig. 2) are not allowed. The same requirements should apply to public spaces. Familiarity with the architectural and construction standards for space planning should be included in the training course for students of the departments of ICA (construction and architecture) and ICE (industrial civil engineering) in architectural and construction institutions or similar specialties in specialized secondary schools, in construction technical schools and colleges, where they train, for example, masters of general construction works, technologists-operators of apartment buildings.



a **b**

Fig. 1. *a.* Team sports require special equipment for sports facilities.

b. In the architectural and planning space of the city, territories are needed where both healthy citizens and people with disabilities could play sports.

When designing apartments for low-mobile populations (namely, those apartments within the MCD, which will be issued by the state exclusively for wheelchair users), it is necessary to take into account modern trends in architecture and construction, where the desire for autonomy is becoming more pronounced. "A person, emphasizes the modern author, needs a house that will allow him (her) not to depend on the external environment" [14, pp. 59-63]. Home safety for disabled persons should remain a priority. It is also important, while making efforts to green the urban architectural and planning spaces, to preserve the transport facilities for LMP [15, p. 12].

The curriculum for the creation of architectural and planning space for LMP, which could be used in the practice of training, should be aimed at meeting the requests of representatives of low-mobile citizens and compliance with the standards for the organization of an accessible environment. For example, the compliance of such Federal laws is mandatory: Federal Law of December 27, 2002, N 184-FL "On Technical Regulation"; Federal Law of November 24, 1995, N 181-FL "On Social Protection of Disabled Persons in the Russian Federation"; Federal Law of March 30, 1999 N 52-FL "On the sanitary-epidemiological well-being of the population". On the basis of which the "Code of Practice (SP) SP 59.13330.2016 "Accessibility of buildings and structures for low-mobile persons" was developed and put into effect in the Russian Federation. To this should be added an updated edition of the SNiP 35-01-2001 (English name: Accessibility of buildings and structures for persons with reduced mobility, which indicates that the regulatory framework of the Russian Federation for the protection of LMP exists and does not contradict the Convention of World Health Organization UN "Standard Equal Opportunity Rules for disabled persons, adopted by General Assembly Resolution 48/96 of December 20, 1993).

4. Discussion and Conclusion

In the previous paragraph, we already talked about the need for close communication between athletes with disabilities and the coaching community, sports experts, doctors, and architects who create a barrier-free environment. There is an urgent need for communication between low-mobility categories of townspeople and civil society. To help build it should be trained today architects. They will accept the advanced world experience and satisfy the demands of the residents of the cities of the future. Thus, Danish city planner invited by the authorities of the Russian capital, the head of Gehl Architects, Jan Gehl, in his projects taking into account the social component of architecture, advises to expand walking and running tracks (see Fig. 3), to increase recreational zones, zones for volleyball and football to facilitate movement in the metropolis of townspeople with reduced mobility [16, c.6].

At the beginning of the XXI century, in many countries civil society institutions appeared that support Paraolympic sports. These institutions actively influenced the decisions of state or municipal authorities, and the problem of a barrier-free space for disabled athletes gained wide public resonance. Moreover, not only professional architects, but also people with reduced mobility are increasingly involved in the discussion of architectural projects of sports facilities, plans for urban development of sports campuses, and technical tasks for creating rehabilitation facilities. Already today, competition commissions are organized to approve such projects. Now in our country, specialists with reduced mobility themselves check the quality of what regional departments of the Foundation for disabled persons are purchasing. Under these conditions, there is an urgent need to study the needs of low-mobile groups by tools of sociology, social ecology, theory of architecture and urban planning. There may be needed survey methods. Regular inspection of the architectural and planning space is now also carried out in the Russian Federation by ombudsmen and representatives of public organizations. The devices necessary for the movement of disabled persons are subject to analysis and expertise: ramps and handrails, as well as parking for cars in public places, the interior space of trade and cultural institutions.

And yet, work in the Russian regions has not yet yielded tangible results. And in order to have such results, when training architects, they need to instill the idea that when creating a barrier-free urban space, it will be necessary to take into account and overcome conflicts of interest arising between different categories of urban population, for example, disabled and mobile citizens, disabled people involved in sports, and those of them who are not involved in physical exercises and sports. It is necessary to learn how to apply the methods of their resolution, which have already been developed in the framework of the western practice of urban planning. And in our country the active interaction of citizens should be supported in the approval of

urban projects. The participation of citizens should be as wide as possible. The experience of the Passenger Mobility Center in the Moscow Metro is important. This Center organized a service of guides for the Moscow "subway". The students of transport sector and builders should be familiar with the experience of this service. With the help of this and similar services, it is necessary to study the routes that are most convenient for disabled persons by their assessment.

The third group (after the city authorities and representatives of civil society), which should be involved in the solution of the sport problems of the LMP, are sports institutions, clubs and the sports community. Heads of sports clubs have an obligation to certify sports facilities, to ensure accessibility to places where disabled people should go in for physical training and sports, comply with sanitary and technical standards [17, p. 3]. Now let's talk about the rehabilitation of workers with disabilities. In most cases, employers are concerned about the law "On Special Evaluation of Working Conditions" [18], since in accordance with this regulatory legal act, special conditions for the assessment of work and safety will be applied to disabled persons. Meanwhile, in order to solve the problem, it is sufficient to arrange a disabled person to work as a homeworker, which in turn will not be a violation of Sect. 3, Art. 3 of the Law in force in the Russian Federation, since such work is not subject to special evaluation. At the same time, within the enterprise itself, the employer is obliged to re-equip with ramp congresses both from the entrance to the building and moving around the building of a wheelchair user.

It should be noted that the problem of socialization of disabled persons, their involvement in socially useful work cannot be solved only by legal or architectural and planning methods. In this regard, experts draw attention to the fact that in today's conditions, it is difficult for entrepreneurs to implement the law on quoting jobs for disabled persons. Businessmen are not satisfied with the fact that they are not able to dismiss people with disabilities. It is easier for a business to pay money to a quota fund than to comply with legal requirements. We no longer say that the employer is obliged to protect the health and promote the physical training of disabled persons, if they are its employees.

The development of regulatory support for the creation of a comfortable space for disabled athletes, the implementation of these standards in the design of gyms and sports facilities are tasks that should be solved in a complex. A builder and an architect should be guided by the requirement: "An accessible environment is the norm of modern urban planning". The principles of urban planning of the XXI-st century should be taken into account, in particular, the principles of complexity and consistency in creating a barrier-free architectural and planning space and the principles of organizing an exclusive space for athletes with reduced mobility. At the same time, it is important to take into account trends in architecture and city planning, which have become widespread not only in the west, but also in the east. However, the creation of a barrier-free environment that meets the requirements of disabled athletes is possible only through the improvement of training programs for future civil engineers, an integrated approach to the study of special legal positions, taking into account the conclusions of sociologists and psychologists working in the field of sports psychology and sports science.

Sports facilities should be designed not only for the social rehabilitation of disabled citizens, but also in their pursuit in high-end sports. Therefore, facilities for disabled persons should be designed to engage in various sports. In any case, such facilities should be.

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Quality Assessment of University Graduates and Legitimacy of Obtaining Summa Cum Laude by Them

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Abstract
The article is focused on quality assessment of university graduates. It was shown that the introduction of third generation standards of the higher education in Russia brought in a problem of assessment competencies. The methods used for assessment of knowledge "by the end result" are anything but indicative of real opportunities the graduates have. Teachers and employers face the common problem: what is shown by modern marks? Do they represent proficiency, competence, compliance to norms, possibility of correction? Currently, a certain "quality mark" of the modern graduate is the summa cum laude (also called as diploma with honors or honours degree). If at the end of training the student does not meet the requirements for obtaining diploma with honors, he/she can retake exams in several subjects. The detailed methodology aimed at evaluating the actual level of readiness of the student following the results of the entire study period is given in the present article. The factual findings enable the head of higher education institution to make the motivated decision on whether to give a chance to the student to retake the exam and improve the marks or to refuse. The received results showed that the students who were granted the right to improve the marks have progress above the threshold for obtaining diploma with honors.
Keywords: Student quality assessment , Method of evaluation of university Graduates, Summa cum laude, Honors degree, Competency, Knowledge, Certification tests, Employer, Higher education

1. Introduction

From the beginning of the 21st century Russia has been undergoing permanent modernization of higher education. Since 2000 there have been developed and introduced three generations of educational standards. Standards of the first generation (that were adopted in 2000-2005) and standards of the second generation (that were adopted in 2005-2009) are focused on giving students knowledge, abilities and skills. Standards of the third generation (that have been adopted since 2009) are directed to the development of common cultural and professional competencies shown by students (Pryadko & Shnyrenkov, 2015). Requirements for the results of training and qualification are established by public authorities taking into account opinions of employers and providers of educational services. Yet, it is too early to acknowledge distinct and transparent interrelation of the Russian professional standards, qualifications and educational programs (Sigova, Kruglova & Ignatova, 2016). In these conditions quality assessment of students is of particular importance.

On the one hand, quality assessment of graduates has constantly been a subject of disagreements between higher education institutions and the sphere of real production (Khripko, 2017). On the other hand, it is obvious that in our world of rapid changes the previous education system cannot produce desirable results. It is necessary to admit that present professional education is not capable to satisfy quickly changing market needs any more (Vlasenko & Pryadko, 2016, Khripko, 2017). It will always lag behind pressing demands of the market (Romanova, 2016). Employers claim that insufficiently competent graduate can make negative impact on workers and a workplace or seriously affect public safety. Educators agree that such underqualified specialists can also negatively affect trust of the public to the quality assessment accepted at the national level (Quality assessment.., 2016). The most evident reasons of poor quality of these specialists' preparedness for the future work are the following: reduction of the fundamental knowledge base of the graduate; student's orientation on the "correctness" of result, rather than on creativity; immaturity of students (Ishkov, 2014, Romanova, 2016, Ishkov & Miloradova, 2016).

The issue of quality assessment of university graduates, coupled with the urgent task to increase efficiency of verification process concerning knowledge, abilities, skills and competencies, are the most current didactic problems (Markina & Piskureva, 2013). Nowadays the quality assessment consists of external and internal assessments. Internal assessment is built on the extent to which the requirements of the Federal State Educational Standard of Higher Education are met; on the opinion of students and teachers, whereas external assessment includes carrying out survey of consumers' opinion (employers and other interested parties) and analysis of the survey results (The provision, 2016).

According to the Federal State Educational Standard of Higher Education, the university graduate has to show a certain set of the competencies characterizing him/her as the personality and as the expert (Ishkov & Magera, 2015, Magera, 2017). Therefore during quality assessment the students should demonstrate that they have acquired the competencies prescribed by standards (Kurina, 2015, Miloradova & Savina, 2015). However, in fact, quality assessment of the graduate is based on the results of intermediate and State Final Exams (SFE). These control techniques help to evaluate large sets of knowledge and abilities, and only in certain cases – formation of professional competencies. Intermediate tests are carried out by teachers of higher education institutions in the form of credits, examination, assessment of the course papers and projects, protection of reports following student apprenticeship. The examination board for SFE includes employers, too. They note that results of the majority of the state certification tests are not enough informative. It is impossible to judge by them how the graduate is prepared to solve specific problems of professional activity. These problems are presented in qualification characteristics and in qualification requirements and also in requirements for the university graduates' training. The employer can gather much more information on the progress of the graduate from the Annex to the Diploma (Kolomiets, 2002).

The graduate who got summa cum laude is traditionally considered as being more prepared for performance of professional activity. Actually it often turns out that there is no essential difference between abilities of an "excellent student" and a graduate with the average grade 4-4.5.

The aim of this research is to obtain objective information about quality of training students on the basis of the data analysis of their progress and to offer a way of mathematical assessment of graduates' qualification for making decision on release of the honors degree.

2. Literature Review

Determination of education quality in narrow sense assumes two procedures: measurement and assessment. Measurement is a process of finding quantitative values of any criterion. Assessment is formation of value judgments on the result of measurement and on the object. Quality assessment of students and graduates is carried out in two main directions: assessment of the level of knowledge in different disciplines and assessment of the competencies of students. The object of assessment is knowledge, abilities and competencies of students. Nowadays works of numerous authors are devoted to the techniques of education quality assessment. The majority of the techniques offered in literature have been developed mainly for the educational approach focused on gaining knowledge; so these methods assess isolate knowledge in this or that discipline instead of competencies.

The score and rating system of assessment allows researchers to get an impression about the success of students in different types of activity. In the course of training students have to score the fixed number of points for different types of activity to get a satisfactory/good/excellent mark. This system has been well described in works of the Russian and foreign authors. D.A. Makhotin (2011) in his article reveals the specifics of the modern tests and other control works acceptable for quality assessment of education, presents various types of quality assessment, analyses approaches to the introduction of the score and rating system of assessment. O.L. Guzakova (2011) sees the score and rating system of assessment concerning the real knowledge of the student in this discipline as an element of the assessment of student achievement. O.Yu. Popova and V.I. Zyabkina (2011) made a comparative analysis of the five-mark grading system and the score and rating system of assessment of student achievement and draw a conclusion about their advantages and disadvantages. The mark and rating system enables educators to make control more regulated and transparent, provides the lecturers with means for the current control of how students have learned the subject; this system is designed to motivate students and gives them the chance to plan the educational activity. Nevertheless, it turned out that this system also has negative sides. First, such system does not take into consideration specific features of students, for example, insufficient language fluency (foreign students); defects of the speech (stutter), etc. These students cannot express themselves during the discussions and other types of oral work and therefore get the necessary number of points. Secondly, quite often the activity of students is connected with their desire to simply gain the fixed number of points. Having achieved this objective, such student ceases to take an active part in educational process. Thirdly, the tough regulations of the score and rating system do not allow to quickly vary the pedagogical technologies used by the teacher during this or that course. Fourthly, this system, as well as other traditional methods of assessment, is generally connected with the consequences of training when the discipline has been studied.

R.Y. Fedorov (2014) states that the mentioned difficulties can be eliminated with using the techniques of the formative assessment. These techniques imply that students understand the purposes of training and

realize the possibilities of the practical application of their theoretical knowledge, while the teacher gets ample opportunities for correcting the process of training (Portnyagina, 2017).

H.-Z. Gu & C.-W. Ku, (2018) thinks that active and immediate feedback to the students increases their productivity and gives a simultaneous assessment. The free software described by the researcher allows students of different educational teams to get the quantitative and quality expert estimation online. This technique gives the chance to assess a current status of training and to get acquainted with the responses or comments made by peers. It also helps students to change their pace and strategy for the subsequent improving their result of training.

The Knowledge Relative Assessment System using Becker's method are used for classroom activities and for independent work. It allows allocating extra time for development of practical skills (Romanova, 2017).

Assessment by peers is regarded by N.A.Z. Abidin, A. Masek, N.S.M. Faiz & S. Sahdan (2018) as one of the best methods of assessing group work of students. Nonetheless, honesty of students in the role of assessors is still doubtful. Honesty of the students while evaluating peers consists of three elements: honesty of themselves, honesty in social interaction and commitment to work.

M.B. Blochina (2008) suggests evaluating success of training by the means of sociological poll.

Yu.V. Yermolaev (2008) presents result of task performance of the student in the petal charts. The possible indicators can be results of control and laboratory works, working on course papers, calculation and design works, etc. All indicators have identical unit of measurement: five-point or ten-point (with the spacing of 0.5 point) scales. Results are presented in the form of N-hedra, where N is number of indicators.

V.P. Gusakov (2003) offers a method of monitoring satisfaction of employers with the quality of student training. This method registers the index of loyalty, the demand for the formed competencies, and allows educators to continuously update the curricula taking into account opinion of employers.

With the approval of the state educational standards of the third generation there arose a question of how assess competencies. It is well-known that they differ significantly from knowledge and abilities which standards of the first and second generations assessed. V.D. Lobashev (2006) brings up a question on what the educational standard is focused on in each situation, whether it relies on the concepts of "assessment", "proficiency measure", "competency". The teachers are forced to decide what their assessment means, be it compliance to the standard; a possibility of the student "to give" an answer; a measure of deviations from some level; possibility of correction concerning the actual level of knowledge (Leontev, Bondarenko, Shebzuhova, Butko & Egorova, 2018).

M.V. Pokrovskaya & V.V. Sidorin (2011) under the most effective method of identifying the competencies formed in the course of education mean writing the final qualification works. They suppose that the result of training can be presented in the concentrated form for the state examination board.

V.V. Kotenko (2004) et al. make attempts to assess quality of education from a position of virtualization concerning creativity and knowledge. This method may include additional parameters along with the traditional ones; the former should incorporate space of group assessment, space of individual assessment, active assessment. Active assessment is understood as quality assessment of training which at the same time allows the educators to estimate quantitatively opportunities for this quality improvement. S.B. Koval, M. V. Molodtsov, E. S. Isakova, Y. M. Berezyuk & E. V. Chistyakova (2012) apply the linear function depending on numerical values of some predetermined indicators for the quality assessment. The purpose of his work is "finding such function in which interrelations between indicators could be taken into account". V.I. Sarchenko & T.P. Kategorskaya (2015) reckon that the degree of professional competence is the quantitatively expressed indicator of professional qualification of the graduate. They suggest considering only those factors which have an impact on the end result or a value of the complex indicator. Their assessment method factors in results of intermediate control, which monitors the process of competencies formation, and in case of some obvious deviations this method can be used to take quick measures for the elimination of deviations.

Thus, quality assessment of the professional training of graduates relies on two approaches to estimation. "Humanistic" approach is characterized by the subjective (expert) judgment formed on the basis of studying opinion of the subjects of educational process (students, employers), assessment of their satisfaction with education quality (Leontev, 2017). "Technological" approach excludes the analysis of the student opinions, but focuses attention on assessment of the formalized indicators of university training quality and achievement of criteria values by the subjects of educational process.

However, irrespective of the applied approach to assessment, the student who has successfully

mastered the main educational program in full and has successfully passed a State Final Examination is given the document on education and qualification (diploma).
Conditions of obtaining the summa cum laude (honors degree) are:

all marks specified in diploma annex in every discipline (module), marks for writing the course papers, for passing the practice, for doing scientific research are either "good" or "excellent" (except for the marks "passed");

all marks of a State Final Examination are "excellent";

the share of the "excellent" marks specified in the diploma annex, including the marks following the results of a State Final Examination, is not less than 75% of the total number of the marks enlisted in the diploma annex (except for the marks "passed") (Order.., 2014).

According to the tradition existing in the Russian higher education institutions, students whose share of the "excellent" marks is less than 75% can in exceptional cases retake intermediate certification to improve their results. The repeating of an examination is possible for no more than three disciplines in which the student has no more than one "satisfactory" mark. The decision on whether to permit a student to retake an examination is made on the basis of personal merits of the student taking into account his/her current progress. This research is directed to the development of a method of the analysis of students' progress which will allow justifying the decision on granting a possibility to repeat an examination for the improvement of the score or on refusal to retake an examination.

So the aim here is to define progress quality of these students for making decision on permission of a repeating an examination to make their mark(s) better; to find students whose training quality exceeds training quality of the student applying for honors degree with the worst results.

For this purpose the following hypotheses were formulated.

Hypothesis 1: the current progress of the students applying for retaking an examination in at least one discipline in which the present mark is satisfactory is below than that of the student who meets the conditions of obtaining summa cum laude but having the lowest current indicators of progress.

Hypothesis 2: among the students who do not have the right to get summa cum laude there are such students who have the current progress which is at least not below than that of the students with summa cum laude.

3. Method

3.1. Participants

The bachelors who completed training at the Moscow State University of Civil Engineering in 2018 acted as the research participants. The database contains information on 64 students.

At the time of the end of the last term 6 students have 75% and more "excellent" marks. This grants them the right to summa cum laude in case of excellent passing a SFE. 5 students submitted the application for retaking an examination or final tests in several disciplines for improving their mark and subsequent obtaining summa cum laude

3.2. Materials

For proving hypotheses the following methods of the qualimetric analysis were used.

The qualimetric analysis is a research method which allows comparing and estimating objects in relation to the known standard. In this work two standards were applied: an indicator showing the progress of the ideal student (having only excellent marks) and an indicator showing the progress of the student meeting the minimum conditions of obtaining summa cum laude. In the work the simplified method of quality assessment was used. It is the method characterized by the maximum acceptable margin of error and minimum acceptable value of reliability of the final results (Azgaldov, Kostin & Sadov, 2012). Experts (professors and associate professors of the university) were involved in one of the operations of quality assessment.

3.3. Procedure

1. Definition of a situation of assessment

The curriculum includes 46 disciplines, essential for studying, 12 blocks of optional disciplines, 6 internships, a SFE. For disciplines and internships the following types of control are provided: credit, the differentiated credit (with 5-mark system of assessment), examination, defense of the course paper / project,

the report following the results of practice. The workload of disciplines varies from 2 to 11 credit units, duration of studying the disciplines – from 1 to 6 terms.

2. Building a tree of properties and identification of the indicators for assessment

According to the educational standard, all estimated objects are divided into three blocks: B1 "Disciplines (modules)", B2 "Practice", and B3 "SFE". Disciplines are divided into "basic", "variable" and "optional". Internships ("Practice") are divided into "educational" and "apprenticeships". The SFE block does not have further divisions. For each discipline / internship control form is specified in the curriculum (c – credit, cm – the differentiated credit (with a mark), e – examination, CP – the course paper, AYP – the academic year project). So there is the ground for building a tree of properties (Fig. 1). It allows structuring and analyzing the marks received by the student during intermediate certification.

	A	B	C	D	E
3	B1 Disciplines (modules)	Basic	B1.B.1	History	e
4			B1.B.2	Philosophy	e
8			B1.B.11	Ecology	c
22			...	...	...
47		Variable	B1.V.1	Psychology of social interaction	c
48			B1.V.2	Sociology	cm
49			B1.V.3	Mathematics	e
50			...	...	...
76		Optional		Physical education and sport (elective course)	c
77			B1.V.O.1.1	History of expertise	c
78			B1.V.O.1.2	Introduction to the specialty	c
79			B1.V.O.2.1	Russian language and culture of speech	c, CP
80			B1.V.O.2.2	Ethics of business communication	c, CP
81			...	...	...
82			...	...	...
102	B2 Practice	Educational	B2.E.1	Familiarization	c
103			B2.E.2	Educational	c
105		Apprenticeships	B2.A.1	Technological	c
106			B2.A.2	Organizational and managerial	c
107			B2.A.3	Predegree	c
108	B3 SFE		B3	State Final Exams	

Fig. 1. *Tree of properties (initial)*

Then those disciplines and internships in which intermediate certification is carried out only in the form of credit were removed from a tree of properties since judging by these properties all the objects will be absolutely identical.

The number of parameters was reduced from 105 to 57. Branches "Practice" and "SFE" completely disappeared (see Figure 2), the branch "Optional disciplines" lost one alternative.

A	B	C	D	E
B1 Disciplines (modules)	Basic	B1.B.1	History	e
		B1.B.2	Philosophy	e
		...	...	...
	Variable	B1.V.2	Sociology	cm
		B1.V.3	Mathematics	e
		...	...	...
	Optional	B1.V.O.2.1	Russian language and culture of speech	CP
		...	...	...

Fig.2. *The tree of properties for further use*

3. Calculation of values of importance coefficients

Coefficient of importance (weightage) of property is a quantitative characteristic of importance (ponderability) of this property among others. For determination of coefficient of importance we used opinion of experts who ranged the disciplines. For correctness of further processing there was carried out normalization of expert assessments (N.a.) by a formula N.a. =xi/MAX (x1:xi).

The bases of ranging and assessment are given in Tab. 1.

Table 1. *Normalization of expert assessments*

Basis	Groups	Rank (assessment)	Normalized assessment
Curriculum	basic	1	0.333333333
	variable	2	0.666666667

	optional	3	1
Formed competencies: GC – general cultural, GPC – general professional, PC – professional	GCC	1	0.142857143
	GCC+GPC	2	0.285714286
	GPC	3	0.428571429
	PC	4	0.571428571
	GCC+PC	5	0.714285714
	GPC+PC	6	0.857142857
	GCC+GPC+PC	7	1
Scientific field	humanitarian	1	0.25
	fundamental	2	0.5
	general professional	3	0.75
	professional	4	1
Workload	the number of points corresponds to the number of credits	1	0.2
		2	0.4
		3	0.6
		4	0.8
		5	1
Form of intermediate certification	credit	1	0.25
	the differentiated credit (with a mark)	2	0.5
	course paper / academic year project	3	0.75
	examination	4	1

There was found an arithmetic average value of normalized assessment. There was determined a weight coefficient of each property by a formula (1):

$$W.c. = \frac{\text{av. value}}{\sum \text{av. value}}$$

4. Determination of reference and acceptable values of indicators

Reference (basic) value of an absolute indicator *Qref* of properties is the best reached value of an absolute measure of property. Reference value for the student applying for getting honors degree implies getting only "excellent" marks during all stages of intermediate certification.

Acceptable value of an absolute indicator *Qacc* of properties is the worst, though permissible value of an absolute measure of property. Acceptable value for getting honors degree shall be not less than 75% of "excellent" marks in the disciplines specified in the diploma annex.

For calculation of acceptable value there was used the additional criterion in the expert assessment of properties – regarding influence on obtaining summa cum laude (Tab. 2).

Table 2. *Additional assessment of the stages of intermediate certification*

Basis	Groups	Assessment	Normalized assessment
Influence on obtaining summa cum laude	does not influence	0	0
	influences	1	1

Weight coefficient of each property was counted by formula 1, taking into account the above criterion.

A method of linear programming was used for the calculation of acceptable value. The received results were included in further calculations to get reference (*Qref*) and acceptable (*Qacc*) values of an absolute indicator of property (Tab. 3).

Table 3. *Reference (Qref) and acceptable (Qacc) values of an absolute indicator of property*

Value of an absolute indicator of property	Assessment
Qref	4.69973
Qacc	4.44264

5. Determination of values of properties indicators

We carried out an assessment of academic performance of students on the basis of their results of intermediate certification. An absolute indicator of progress (by all stages of intermediate certification) was determined for each of 64 students, as well as an indicator of student's progress according to the diploma annex.

There were 2 groups of students: 1. those who make a claim for summa cum laude as their marks conform to the requirement (not less than 75% "excellent" marks of the whole amount of marks) and 2. those whose marks would conform to this requirement if the students take the advantage of their right to retake an examination in no more than three disciplines (to improve their marks).

Results of absolute progress of each student and their progress according to the diploma annex were compared to reference and acceptable values.

4. Results

After distribution of all students on a vector space according to the indicator of absolute progress (from bigger to smaller values) it was revealed that the absolute measure of progress had not been reached by any of these students. When comparing progress according to the diploma annex with an acceptable indicator of progress it was established that all students claiming for obtaining honors degree as conforming to requirements, have values of a progress indicator in the range from reference to acceptable. In the same range there were all students who at the moment did not conform to requirements of obtaining summa cum laude, but who could claim for it after retaking an examination in no more than three disciplines. Any student who could not claim for summa cum laude (Fig, 3) did not get in this range.

cipher	absolute academic performance	progress according to the diploma annex
Reference (basic) value	4,7645	
14-B-6775	4,3914	4,6611
14-B-6740	4,3904	4,6606
14-B-6806	4,3711	4,6379
14-B-6748	4,3666	4,6358
14-B-6790	4,3634	4,6070
14-B-6802	4,3373	4,5948
14-B-6736	4,2892	4,5313
14-B-6746	4,2887	4,5447
14-B-6767	4,2542	4,5013
14-B-6798	4,2216	4,4861
14-B-6800	4,2053	4,4921
Acceptable value		4,4369
14-B-6777	4,1766	4,4241
14-B-6759	4,1250	4,3863
14-B-6754	4,0950	4,3586

Fig. 3. *Comparison of absolute progress and progress according to the diploma with reference and acceptable values*

The result of the analysis is presented in the graphic form in Fig. 4.

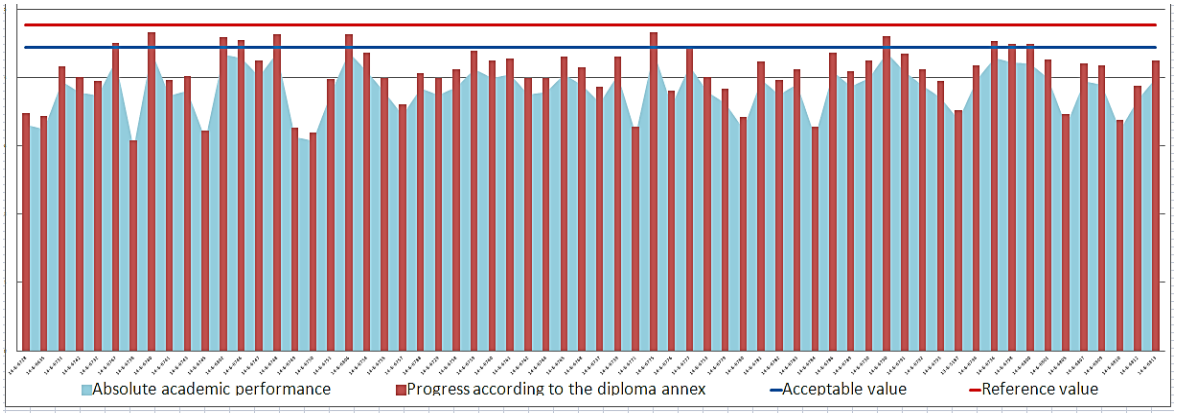


***Fig. 4**. Graphical representation of the analysis result*

Thus, the hypotheses stated at the beginning of the research were not confirmed. The current progress of the students applying for retaking an examination in at least one discipline in which they got "satisfactory" mark is above than that of the student whose performance corresponds to the requirements of obtaining summa cum laude with the lowest current indicators of progress (level of acceptable value).

Among the students who do not have the right to summa cum laude there are no students who have the current progress over or equal to the level of acceptable value.

5. Discussion and Conclusion

Results of the research showed that the existing rules of issuing the documents on education enable singling out the most successful students. The success of the student is determined by the amount of "excellent" marks received by students during training. However, what is specifically assessed by these marks remains unclear. It is known only that with the existing approach the quality of graduates is estimated by representatives of education, but not future employers. Internal and external assessment of training quality of students do not interact sufficiently in the Russian legislation (Nikanorov & Volkova, 2017).

Every year the increasing number of employers "hunt" for university graduates, who would be the most suitable for the requirements of companies. Still, the diploma obtained and the standard CV do not reveal potential and features of the formed competencies of the graduate. K. Mertins, V. Ivanova, Yu. Daneykin & N. Daneikina (2017) proved that in job search it is expedient to graduate to use a portfolio. They offered optimum structure and criteria of a portfolio.

Need of training of the highly qualified specialists demanded in labor market brings higher education institutions to the development of special methods and trajectories of training. The systems of elite education attract talented young people and create for them an individual trajectory of preparation (Daneykin, Daneikina, Solovyov & Patil, 2017, Solovyev, Mertins & Shagdyrov, 2017)

The technologies strengthening active training combine educational content from the lecturer, experience of the student and vast experience of coeducation. This approach introduces innovations in the content of training practically by means of pedagogics, technology and class design. It helps students to advance in active training, improves quality of their preparedness, and thereby enhances their opportunity for employment (Hassan, Puteh & Sanusi, 2018).

The development of new ways of quality assessment of the graduates, their compliance to the requirements of the educational standard and to the employers' demands has to become the following step to modernization of the higher education system.

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Influence of Investment Attractiveness of Regions on The Volume of Direct Investments In Economy of the Russian Federation

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Abstract

The research is devoted to the analysis of direct investments in the economy of the Russian Federation in 2013-2018, the reasons of the decrease in foreign investments into the economy of Russia are revealed, and the main directions of the improvement of the investment attractiveness of the regional economy for the intensification of inflow of the foreign capital to the Russian economy are developed. Some statistical data on the volumes of investments flow to the Russian Federation are analysed, and its attraction in terms of the need of modernization of the economy is considered. The research proved that foreign investors are more interested in certain types of economic activity, despite of the fact that direct foreign investments to Russia considerably decreased in comparison with 2013. Besides, imperfection of the legislative base in our state and in the state, native for the foreign investor, defects in the customs legislation, the unstable external political and economic situation connected with introduction of economic sanctions from the EU and the USA for Russia frighten off foreign investors from the Russian economy. Thus, for receipt of foreign investments for the Russian market it is necessary to fix the aforesaid problems. For the improvement of the Russian investment climate it is necessary to realize the actions, directed to improvement of infrastructure and comfort of business, effectively; that has to cause the inflow of foreign investments into Russian economy. In the research the main problems of outflow of investments for the specified period are analysed, the reasons of failure to follow the main investment projects (which completion date coincides with the analyzed period) are considered, it is specified perfect positive actions of public authorities for the improvement of the investment climate in Russia, the attention on the developed normative documents in this direction is concentrated.

Keywords: direct foreign investments, direct investments, foreign investors, investment climate, investment attractiveness, investment image, regional economy

1. Introduction

In the conditions of strengthening of dependence of the development of national economy on extremely dynamic development of the world economy and processes of financial integration, the priority direction by drawing up strategic development programmes of any country is the development of the effective investment policy, directed to the optimum use of internal reserves for the purpose of ensuring financial self-sufficiency of development of regions. Aggravation of this problem is connected with the consequences of the following processes:

- sanctions which are directed to the most attractive sectors of the economy as the Head of the center of analytical information of the TeleTrade company Sergey Lysakov claims. First of all, it is the oil and gas sector, he though production of natural resources is still the key "magnet" for foreign investors in Russia, that is confirmed by analysts according to the UN in the report for 2017;
- the foreign business focused on domestic market was influenced by economic instability, fall of real income of the population over the last 5 years in this connection the country is left by many foreign retailers;
- reorganization of the Russian business working through offshore zones. More than 50% of foreign investments come to Russia from offshore zones (Cyprus, Luxembourg, the Bahamas, the Bermudas), and the companies in these zones are supported by Russian structures; thus their investments to Russia (or outflow from it) affect the general dynamics of foreign investments;
- sanctions pressure from the USA and the policy of the Russian authorities on deoffshorization of economy became the reason of the increase in the transaction costs and risks connected with maintenance of such offshore structures. According to Lysakov, means of the Russian business from the offshore began or to come back in the Russian Federation, or were reoriented on foreign projects (cited as Russian investment forum, 2019).

The adverse investment climate, deficiency of internal investment resources have negative effect on the results of economic activity of domestic enterprises and the prospect of development of regional economy and national economy in general.

Economy growth prospects of the Russian Federation depend on the strategy of development of investment activities of real production sector, the real, single region and the country in general. The solution of this problem demands considerable efforts from the Government and the separate ministries and departments in development of qualitative methods of management of investment activities and understanding that the investment policy is a key component of financial policy of the state, each region, the industry and a single enterprise.

2. Literature Review

The researches of economic growth in the conditions of transformation of economy include such authors of scientific as D. Voloshchuk, E. Gaidar, V. Starodubrovsky, etc.

The Russian investment forum which took place on the 21.02.2019 in Moscow was devoted to the analysis of the problems which arose in the economy of Russia in recent years. It was noted that within the last five years (according to the Bank of Russia), foreign investments into the Russian economy in 2018 in relation to 2013 decreased by 36 times. In the third quarter of 2018 5.2 billion dollars, were brought out of the country, according to the results of last year, the Bank of Russia estimated the reduction of direct foreign investments in the company of the Russian Federation by 14 times. According to the regulator, the volume of such investments last year decreased to 1.9 billion dollars (comparing with 27.1 billion dollars in 2017 (cited as Russian investment forum, 2019). At earlier stage of the development of the problem according to its separate aspects, connected with the features of investment activities at the macrolevel there were works Arakelyanam. I. (2015), K.I. Botvina, E. Gritsays. (2016), Volkovan. M. (1988), Ivanchenko I.S. Nalivayskogov.Yu. (2014), Osei D D.[6], Spandaryanav.B. (2016), Trofimenkov I. (2011), Hesin E.S., Yudanov Y. I. (2011), Kuznetsov A.V., Baronin Y.I., Volodin M.N., Gemuyeva K.A., Kvashnin Yu.D., Lukonin S.A., Makarov A.A., Nevskaya A, Frumkin B.E., Chetverikova A.S., Shchedrin A.V.; Tsukarev T. B. (2016).

The special attention is deserved by the works of the famous Russian scientists A.M. Volkov (1988) and V.B. Spandaryan (1988) who in the 1980th years practically expected the duplication of problems with foreign investments into the USA on today's situation in Russia. A.M. Volkov, for example, noted that "The analysis of the role of the foreign capital in accumulation is complicated by the fact that the exact quantitative assessment of its participation in development of economy is almost impossible" (2016). Speaking about direct investments of Japan in economy of the USA, V. B Spandaryan noted that "the Japanese investors were attracted in the USA by the huge sizes and potential of the American market, the developed infrastructure, rich natural resources and rather low energy price" (1988). That is in economy of the USA there were in the late eighties practically same investment processes which happened in the Russian Federation till 2013.

Due to the happened changes concerning placement of direct investments in Russia from investors foreigners, there is the need of further theoretical researches on questions of improvement of the public investment policy.

The revealed problems set the object for us: definition of the main directions of improvement of the public and regional investment policy for ensuring financial self-sufficiency of regions.

3. Method

The methodology of the research is based on methods of the analysis and synthesis, induction and deduction, methods of comparison and generalization, methods of groups, the system analysis, expert estimates, tabular methods.

In the research polling, statistical, complex, process, administrative, marketing approaches were used; statistical materials of the State committee of statistics and reports of the Central Bank of Russia in a section of internal and external investments are used.

The scientific novelty consists in identification of shortcomings of the public and regional policy on attraction of the direct investments (DI) and, especially, the direct foreign investments (DFI) and in allocation of the competitive advantages affecting investment attractiveness of certain regions of Russia and also formulation of offers on activization of attraction of direct investments in national economy.

Both the Russian and foreign analysts use the folloing methods for the assessment of investment attractiveness of projects:

- economic-mathematical methods;
- methods of the factorial analysis;
- methods of expert estimates.

Technique of the Agency of strategic initiatives which results were used by us in the research.

Technique "the Expert" was actively used by RA in the Russian Federation up to 2014. The decrease in popularity of this technique is connected with some disadvantages, such as:

- subjectivity of opinions of experts;
- insufficiently expeditious adaptation;
- lack of information on the actual distance between participants;
- lack of the factor of specifics of capital intensity of the major industries of the region;
- lack of clarity in risk assessment at removal of the general an indicator;
- labour input and opacity;

Technique of Council for studying of production forces of the Ministry of Economic Development of the Russian Federation has many advantages from which main thing is that the most part of indicators is estimated by statistical methods, but at the same time in a technique there are no factors of innovative capacity of the region and the technique of assessment of the indicators making the investment potential and risks is imperfect;

Technique of National rating agency differs from described earlier by popularity of Rating, recognition of its resulting effects and a wide range of respondents. We consider it one of the most adapted for national peculiarities of Russia.

Author's techniques (the Bard, Sivelkin, Smaglyukova, Khusnullin, Klimova) have some disadvantages, of which unpopularity at investors, the lack of public access for potential investors to results of assessment and complexity of real assessment of investment attractiveness of regions when comparing results on many techniques are main.

Foreign techniques (Euromoney, Forbes, Fitch, Moody's, S&P) approach the Russian realities least of all since do not consider specifics of the Russian economic system, do not cover all regions, have the narrow approach to assessment of the International Party of Russia which is based generally on assessment of extent of support of small and medium business. However, it should be noted that these techniques are recognized by foreign investors, their ratings enjoy popularity and differ from earlier listed techniques in recognition of resulting effects.

4. Results

In the course of the research the following work was carried out:

- factors of impact of regional economic integration on direct foreign investments which are as follows:

a) political stability;
b) extent of integration of the region;
c) participation in export and import of products of the region;
d) need for types of investment;
e) creation of the free trade area with investors;.
g) regulatory environment;
h) institutes for business;
i) infrastructure and resources;
j) support of small business;
k) gross regional product;
l) gross regional product per capita;
m) index of industrial production;
o) the mastered volume of direct foreign investments;
o) volume of investment into fixed capital;
p) specific weight of the profitable organizations in the region.

- recommendations for attraction of investments into certain regions of Russia and the Russian Federation in general are developed and proved:

1. The Government of the Russian Federation needs to continue work on elaboration of public policy on attraction of direct foreing investments;

2. It is necessary to develop new image of the state and to take marketing steps for representation to the international investors of the unique advantages;

3. It is necessary to introduce new incentives for the purpose of increase in number of projects, attractive to investors;

4. The Government of the Russian Federation has to make use of positive experience of the Tyumen

region for stimulation of investors to increase in financing.

5. The Government of the Russian Federation has to provide stable feedback with the companies investors for the purpose of identification of the factors limiting inflow of investments for the purpose of prevention of "freezing" of subjects to investment.

Advantages of direct foreign investments are: (Hesin, 2006)

- direct foreign investments promotes strengthening of economic capacity of the host country. Sometimes it is reached by investment into the new innovative projects broadening the sphere of economic activity and, respectively, diversifying developing economy;
- development of the human capital.

But, as it was noted earlier, there are also negative aspects of direct investment (Ivanchenko, Nalivaysky, 2014):

- weakening of producers of this country;
- recession of the usual branches of economy of this country;
- approach of "dirty" productions;
- deterioration in structure of the balance of payments because of homecoming of profit of foreign investors, etc.

No doubts, direct foreign investments are an important indicator for long-term economic participation of foreign investors in economy of this country and display of prospects of growth of national economy.

Some economists consider that durability of positions of foreign investors in economy of this or that country has to be determined by such indicators as, for example, the number, let us assume, of the Russian enterprises acquired by foreigners, their share in key performance indicators of the Russian business - cumulative profits, sales, capital investments, etc. As a result there is an opinion that direct investments make greater impact on the economy of Russia, than other forms of the foreign capital.

Let's analyse the data in Table 1, which are provided in the balance of payments published by the Central Bank of Russia (Balance of payments, international investment position and external debt of the Russian Federation, 2019).

Table 1. Structure of inflow (outflow) of the foreign capital in 2013-2018, billion dollars

	2013	2014	2015	2016	2017	3 quarters of 2018
Direct investments to other sectors	60061	17637	6624	30931	27088	2825
Direct investments in banks	9158	4394	589	1608	1470	2879
Total: direct investments	**69219**	**22031**	**6853**	**32539**	**28557**	**5703**
Portfolio investments	**748**	**-23203**	**-12872**	**3020**	**9330**	**-7500**
Derivatives	**-8834**	**-21881**	**-28654**	**-13617**	**-14165**	**-7884**
including obligations of other sectors	4657	-5777	-6615	-13590	-8542	-9131
Other investments:	**63257**	**-26733**	**-38254**	**-28112**	**-20795**	**-18105**
including loan and loans	43594	-8803	-4816	-13856	-7753	-12171
In total investments	**124390**	**-49786**	**-72927**	**-6170**	**2927**	**-4754**

As Table 1 proves, direct investments in 2018 (for 9 months, since official data for 2018 are not published yet) in relation to "presanctions" 2013 decreased by 92%.

Reorganization of the Russian business working through offshore zones is the reason of gain of direct foreign investments from Singapore. More than 50% of foreign investments come to Russia from offshore zones, such as Bahamas and the Bermudas. As a rule, the companies in these zones are supported

by Russian structures therefore their investments to Russia (or outflow from it) affect the general dynamics of foreign investments. "Sanctions pressure from the USA and the policy of the Russian authorities on deoffshorization of economy became the reason of the increase in the transaction costs and risks connected with maintenance of such offshore structures". According to Lysakov, means of the Russian business from the offshore began or to come back in the Russian Federation, or were reoriented on foreign projects (Russian investment forum, 2019).

From the moment of imposition of sanctions Russia looks for new strategic partners, generally in the east, in such countries as China and Korea though in 2018 China withdrew money from economy of Russia also actively, as well as "the western partners". It once again indicates the need researches of internal reserves for investments on the near future since the period for which sanctions are imposed, we do not predict.

According to the Central Bank, for the first half of the year 2018 the Chinese investors brought more than
1 billion dollars out of Russia, and business brought 92% of this sum (921 million dollars) directly out of the capital of the Russian companies, at the same time, in the international ratings of investors, China remains the third country in the world on the volume of outgoing foreign investments, but this money is not sent to Russia.

Table 2. Direct foreign investments in economy of Russia according to the countries investors (balance of operations of the balance of payments), million dollars

	2013	2014	2015	2016	2017	3 quarters of 2018.
Direct foreign investments	**69219**	**22031**	**6853**	**32539**	**28557**	**5703**
Singapore	-502	+162	+185	+15122	-	-
Bahamas	+2791	+3638	+5108	+1421	-	-
Switzerland	+1086	+2472	+203	+1010	-	-
Ireland	+10399	-531	+623	+784	-	-
Jersey	+509	-717	+2122	+711	-	-
Bermuda shorts	+404	+1777	+2239	+658	-	-
Netherlands	+5716	+1102	-246	+654	-	-
France	+2121	+2224	+1686	+438	-	-
Great Britain	+18927	+120	+1112	+422	-	-
Austria	-326	+841	+407	+374	-	-
Germany	+335	+349	+1483	+274	-	-
Sweden	-1203	+166	+122	+235	-	-
Kazakhstan	+208	+357	+433	+130	-	-
USA	+485	+708	+209	+125	-	-

Finland	+216	+124	-272	+86	-	-
Japan	+369	+295	+447	+77	-	-
Hungary	+736	+534	-452	+52	-	-
Italy	+118	+158	+56	+47	-	-
Norway	+94	+51	-93	+41	-	-
Malta	+47	+10	+41	+23	-	-
Estonia	+47	+38	+32	+20	-	-
Czech Republic	+36	+109	+54	+18	-	-

Certainly, growth of direct foreign investments (DFI) promoted transformation of the economy of regions, creating jobs and in passing stimulating economic growth. However one more type of participation financing is the direct investments (DI) remains rather uninvolved source of financial means. Theoretically, it has the potential combining the appeal to financial investors characteristic of the stock markets of the public companies, and positive impact on economy of regions

Direct investments are investment of money into production of goods and sale for the purpose of participation in business management or the company in which money is invested, income is received.

Direct Investments (DI) represent medium-term investments which have no liquidity and the short-term nature of use. Direct Investments assume receiving certain rights of control and management in the board of directors of the invested company. It allows direct investors to operate the investments and to carry out transformations. In this sense such investments are similar to direct foreign investments, however the term of their investment is shorter, but they can be an attractive source of the capital for economic growth during development of the region.

Direct foreign investments are directed to long control of the investor over economic operations of the company recipient in other country. The size of an ownership ratio of the company necessary for effective management keeps more than 10% of the company.

Actually, these differences of direct foreign investments and direct investments also define participation in these or those investment projects of potential "recipients of investments".

In Table 3. information on participants of the most significant projects is presented.

Table 3. Participants of the direct foreign investments projects in Russia

investing countries	Number of projects, piece						
	2013	2014	2015	2016	2017	3 quarters 2018	2013-2018.
Germany	12	11	36	43	49	-	151
USA	24	14	29	38	48	-	153
France	7	14	20	20	30	-	91
Japan	14	8	10	12	19	-	63
Austria	1	2	6	9	15	-	33

According to the estimates Ernst&Young, the primary branch of the Russian economy where there is the greatest number of the direct foreign investments in the projects is mining including not only fuel and energy resources but also processing industry. According to data for 2016-2018, leaders in the number of the

involved investments are the mechanical engineering, chemical industry, small and large electric equipment. Interest in investments and in agricultural industry grows. Wholesale and home shopping service also always differed in the high level of investments.

During the sanctions of the Western countries attraction of direct foreign investments from the countries, traditional investors of the Russian economy work against Russia, though it is possible, but in much smaller volumes, than till 2014. After removal of sanctions growth of volumes of attraction of direct foreign investments to Russia, can not only restore their former value, but also considerably will exceed indicators of 2013 in this connection, the Government of the Russian Federation has to pursue active policy for creation of favorable investment climate.

Let's consider the purposes to which direct investments on the example of 10 largest infrastructure and industrial projects which construction had to end in 2015 were directed.

Table 4. Largest infrastructure and industrial projects

Project	Volume of investment, billion rubles.
Resort Golden Ring	12.0
Oceanarium in Vladivostok	15.5
Science and technology park Almaz-Antey	21.0
CSKA stadium	21.0
IT city of Innopolis	23.0
Summits of SCO and BRICS	60.0
Boguchansky hydroelectric power station	90.0
Novorossiysk transport hub	120.0
Railroad Mga-Ivangorod	132.0
Vostochny spaceport	300.0

Speaking about implementation of investment projects, it is necessary to consider the problems on their realization. The analysis of these problems will help to increase the level of responsibility of investors and the invested funds "invested" for the most effective use.

For example, the Resort Golden Ring project was begun by the investor of Rusresorts in 2011, and in 2012 was "frozen". CJSC Corporation of Development Golden Ring (subsidiary of the developer company Rusresorts) began to implement the project. The resort in Pereslavl-Zalessky was included in the federal target program "Development of Internal and Entrance Tourism" (2011-2016). Two years later the investor and the owner of the project there was a group of VEB. The contractor of building - the Stroyrestavration company - managed to complete all works for 3.5 years, but дополнительноВЭБ invested 4 billion rubles in this project. "Golden Ring of Russia" - one of the most perspective excursion routes (in the 60th of the 20th century united the ancient cities of the Central Russia) not only in our country, but also in Europe. According to the research prepared by the Center of regional researches of the Russian Russian Presidential Academy of National Economy and Public Administration, annual tourist flow along a route can be increased up to 20 million people in 10-12 years. That is, the project can be considered successful, but, naturally, the payback period of investments will last in connection with considerable overestimate of the cost connected with rise in price of construction in time.

The Oceanarium in Vladivostok project is also finished with a great delay, on the 6th of September, 2016 (it was planned in September, 2014, and, this date was not planned too).

The science and technology park Almaz-Antey with the volume of investment of 21 billion rubles provides the creation in St. Petersburg in the territory of Obukhovski Plant (Obukhovsk steelmaking released artillery since 1863) a large-scale production and technological complex of military and defensive appointment with the total area more than 37 hectares where the arrangement of 16 production objects is provided. Financing of the project is carried out only on borrowed funds of JSC VTB Bank under guarantees of Almaz-Antey concern. The made calculations proved that creation of the facility will allow to increase the efficiency of floor spaces due to the concentration of intellectual and production potential of the enterprises of Almaz-Antey air defense concern, to exclude the duplicating productions, to reduce a manufacturing lead time, to optimize management and to lower non-productive costs considerably.

Concern VKO "Almaz-Antey" implemented three large investment projects on the creation of the new plants for production of modern samples of the VKO equipment, one of which is in St. Petersburg in the territory of Obukhovski Plant. The SZRTs enterprises are equipped with the modern equipment, at them the

advanced methods and production technologies are introduced. Almaz-Antey is the defense industrial science and technology park which united six leading regional enterprises of Concern in one territory: JSC GOZ Obukhovski Plant, JSC ZRTO, JSC KBSM, JSC RIRV, JSC VNIIRA, JSC Navigator Plant.

The decision on participation of Vnesheconombank (VEB) and in financing of construction of the new arena (CSKA stadium) was accepted by the supervisory board of Bank in 2012. The total cost of the project was 350 million US dollars, the volume of participation of VEB – 241 million US dollars. This project of VEB regards as successful – an object was built in time and with economy on the estimate. And because of serious cut in expenditure on construction it was succeeded to save 40 million US dollars (initially the credit was assumed for 280 million US dollars).

The IT city of Innopolis with the volume of investment of 23 billion rubles, directed, first of all, to creation of the IT city of Innopolis. Financing of the project is carried out from four sources: from the budget of Russia 15 billion rubles are allocated for creation of the special economic zone, JSC Innopolis directed 4.7 billion rubles, the Public housing stock at the President of the Republic of Tatarstan invested about 3 billion rubles, and private investors - 300 million rubles.

The given examples prove, that investment projects in case of the good organization can be carried out in due time and make for investors profit, and infrastructure - new jobs (at least). Investment projects which are followed by change of investors and increase in terms of construction (and, according to cost) - not only cause damage to infrastructure and conscientious investors, but also increase a payback period of investments. At the same time, we should note weak control from the public supervisory authorities of process of development of investments and prevention of "freezings" and failures to meet time constraints of implementation of projects.

Moreover, during the research it is established that there is no data on change of investors, the termination of terms of construction and the actual expenses incurred by investors before commissioning of the project for some projects (even from the TOP-10).

According to data of the research of the EY company, by 2030 325 large infrastructure facilities will be put into operation in Russia. Their most part has to be realized in 2015-2020.

The selective examinations of investment activity of the organizations conducted by request of the Ministry of statistics of the Russian Federation was made in 2017.

Results of inspection are presented as follows (percentage of the total number of the studied organizations):

- insufficient demand for products-23 %;
- lack of own financial resources-57 %;
- high percent of the commercial credit-53 %;
- difficult mechanism of receiving the credits for the inplementation of investment projects-44 %;
- investment risks-51 %;
- unsatisfactory condition of technical base-20 %;
- low profitability of investments into fixed capital-20 %;
- uncertainty of the economic situation in the country-57 %;
- imperfect regulatory framework regulating investment processes-29 %.

Nevertheless, the Russian Direct Investment Fund (RDIF) provided the information according to which the growth of interest of east funds in investments in the Russian Federation is noted. So, Saudi Arabia invests 10 bln. US dollars in joint projects with RDIF, and the sovereign fund of Bahrain acts as the co-investor nearly of all projects of RDIF. Bahrain will finance them for 5%.

Besides China, in the Asian region, the importance in attraction of PII to Russia is played by Japan. In the end of 2016 Japan increased volume in 15.1 billion dollars of own investments into the Russian Federation against 14.8 billion in 2015. In relation to other countries of EEU the Japanese companies were not so active. About 65% of all saved-up investments of the Japanese companies into the states of EEU are the share of a fuel complex of Russia, many capital investments attracted by Agricultural industry and a machine-building complex.

Important factor of attraction of direct foreign investments to Russia from Japan is also the interest of the Japanese investors in the regional policy, namely the Far East, where a large number of joint projects including in power, in the agrarian sector, construction is implemented.

Great opportunities for the attraction of direct foreign investments to Russia are shown in the recent years by India. Acquisitions of oil and gas assets in Russia in 2016 allowed the Indian multinational companies to increase the PII level in the Russian economy for 3.3 billion dollars. According to experts of

TsII EDB, India will continue to invest in Russia.

Useful work is carried out by the Government of the Russian Federation on creation of the free trade area of EEU with Vietnam. These countries show active interest in relation to economy of Russia, estimating it as the base for effective investment of capital.

During the research we used the National rating of the condition of investment climate which was carried out by "The agency of strategic initiatives" and which estimates efforts of the regional authorities on creating favorable conditions of business and reveals the best practices, and its results stimulate the competition in fight for investments at the regional level (cited as The national rating of a condition of investment climate in territorial subjects of the Russian Federation).

Pilot approbation of National rating took place in 2014 in 21 territorial subjects of the Russian Federation. The first full-scale rating was carried out in 2015. Work of regional teams on creation of comfortable conditions for business was estimated in 76 territorial subjects of the Russian Federation. In 2016 the research captured all 85 regions of Russia. In 2017 all regions of Russia under general conditions took part in rating, 51 regions showed the general growth of an integrated indicator in comparison with last year. In 2018 growth in rating was shown by 78 regions.

The national rating of a condition of investment climate estimates efforts of the regional authorities on creating favorable conditions of business and reveals the best practices, and its results stimulate the competition in fight for investments at the regional level.

The Rating is calculated by 44 indicators for 5 directions:

- regulatory environment;
- institutes for business;
- infrastructure and resources;
- support of small business;
- indicators out of Rating.

Obtaining information on indicators was carried out by holding polls of businessmen and experts and also with the use of statistical data.

The Agency created the group of 35-40 experts on the basis of lists of the candidates presented by business associations ("the Support of Russia", Chamber of Commerce and Industry of the Russian Federation, RUIE, "Business Russia") and the Agency of Strategic Initiatives (ASI) for each region.

Selection of respondents for the expert assessment was formed in a random way of the list of the presented candidates. The number of the interviewed respondents on each of regions is not less than 20.

During Rating the basic data necessary for calculation of results were collected, for example: data on certain respondents on any indicator on each territorial subject of the Russian Federation, statistical data in full sizes, estimates of experts.

After formation of the massif of basic data the result of Rating was calculated and it is represented at four levels:

- level of indicators;
- level of factors;
- level of the directions;
- level of the integrated index – score in all four directions of Rating.

Thus, the results of Rating can be considered as representative and look as follows (Table 5).

Table 5. National investment rating of territorial subjects of the Russian Federation (TOP 20)

Regions	Raiting
Tyumen region	1
Moscow	2
Republic of Tatarstan	3
St. Petersburg	4
Tula region	5
Krasnodar territory	6
Voronezh region	7
Chuvash Republic	8
Moscow region	9
Ulyanovsk region	10
Belgorod region	11

Leningrad Region	12
Kaluga region	13
Khanty-Mansi Autonomous Okrug Yurga	14
Kaliningrad region	15
Tambov region	16
Yaroslavl region	17
Khabarovsk Krai	18
Novosibirsk region	19
Sverdlovsk region	20

Let us analyse how the Tyumen region could get from the 15th place to the 1st.

Large investment projects were implemented:

1. Tobolsk industrial hub-4, the project, finished in 2013-2015 years;
2. Tyumen industrial hub-16, the projects 5 finished 11 it is opened in 2013-2015 years;
3. 8 open projects in the sphere of agrarian and industrial complex and the food industry;
4. 4 opened the project in the sphere of a recreation and hotel business;
5. Projects in the sphere of a commercial real estate - 12 opened and 2 finished.

Besides, the result of such serious investment program became:

- opening in 10 years of 49 new large productions;
- 21 new projects are started in 2017;
- 31 new productions in a construction stage;
- 4 hotels are under construction;
- large number of averages and small production and service objects.

The Program for improvement of investment climate which offers potential investors of 80 business cases on investment projects for realization in the Tyumen region is developed.

If we consider the officially published results on the activity of the region for 2017, and the key indicators look very attractively:

- gross domestic product of the Russian Federation in 2017 made up 92037 billion rubles (624.83 thousand rubles per person), including:
- the gross regional product of the Tyumen region in established prices in 2017 made up 854.8 mlrd. rubles (611.79 thousand rubles per person);
- index of industrial production-108.1 of %;
- the volume of direct foreign investments - 11217.2 million a dale. USA (7849.7 thousand dale. on the person);
- volume of investment into fixed capital-265.06 of billion rubles;
- specific weight of the profitable organizations-67.9 of %

Export deliveries to 76 countries of the world to the sum of 2940.2 million dollars.

The work conducted by the Chinese modern researchers who dealt with the problem of creation of theoretical model of influence of productivity and financial restrictions for the decision of firms to do direct foreign investments. They emphasize that limit influence of financial restrictions for direct foreign investments increases with the gain in productivity of firms. They constructed the multidimensional index for the measurement of internal and external financial restrictions. Using the database of the Chinese industrial enterprises as well as the base of firms in China, the authors of the research came to the conclusion that external financial restrictions influence decision-making of direct foreign investments of firms more than internal financial restrictions.

In another research various effects, which financial development of countries of source and countries of destination render on the direct foreign investments (FDI) are empirically investigated. According to the authors it is established relationship of cause and effect, using differences both in financial development of the concrete country, and in financial vulnerability of the invested sector. Such approach became possible thanks to detailed databases on the PII projects of real production around the world. Authors came to a conclusion that both SFD, and DFD have a great positive influence on new projects, expansion and merges and absorption of direct foreing investments, directly expanding access to external financing and indirectly

stimulating production activity. The general economic influence of SFD and DFD are, as a rule, similar, but their straight lines and indirect effects vary depending on a margin and the direct foreing investments types.

Summing up the result of an analytical research, it should be noted that Russia have great opportunities for attraction of direct foreing investments. The country can improve the economic relations in any region of the world, with any states and the economic commonwealth. The chosen strategy directed to the "reorientation" of the economic and political relations with China and other countries of Asia, South America and Africa will promote attraction of direct foreing investments to Russia and to development of economy of its regions.

We consider that sanctions and restrictive actions from developed countries, carry how many economic, how many political character: The EU all is also adjusted to conduct the dialogue some joint projects, but the arisen trend on restriction of actions prevents with Russia inflow of foreign investments and also joint development of the world housekeeper. Nevertheless, the Russian Federation has to develop immediately parallel strategy on attraction of other sources of foreign financing for the purpose of diversification of risks.

Unlike foreign direct investments foreign portfolio investments and bank deposits find areas of the application first of all under the influence of the current needs for funds of the economic mechanism which developed in the Russian Federation and their territorial distribution happens in greater compliance to trends of development of the Russian economy, than direct investments.

Influence of this part of the foreign capital can give both quantitative, and quality standard. Considering that foreign investors of the loan capital increase fund of accumulation of the Russian companies in two main ways (due to expansion of volumes of the credits to trade and the industry and acquiring securities of the Russian companies), they can be counted to within ruble. Portfolio investments represent investments made in economic assets for the purpose of commercialization and diversification of risks and belong to usually various issuers of securities which, unlike straight lines, represent investments in purchase of shares, not granting the rights to investors to influence activity of the company, and make less than 10% of total amount of the share capital and it is very important for independence (though relative) economies of the Russian enterprises.

As it was already underlined, portfolio investments can be considered as an element of diversification of risks by financial structures and parabankamiya, both a way of attraction of financial resources, and a way of mobilization of the capital by private companies. However, as the attention was already paid, we consider that it is unreasonable to rely on large and unstable flows of the private capital since they have also the destabilizing influence on the financial markets and on economy in general when the state faces these or those financial problems. Russian Federation example indicative for this purpose.

Besides, an alternative to direct inostanny investments it is possible to present other investments – the investments not suitable to definition of direct and portfolio investments. They include:

- commercial credits which generally take the form of the bank credits issued to the foreign companies or the governments;
- various forms of the help provided by developed countries to developing states;
- other credits including the financial credits of international financial institutions.

However, according to the data analysed in table 1, derivative financial instrumena in 2018 (in 9 months) underwent outflow of-7884 million a dale. The USA, and other financial tools - on record-18105 million a dale. The USA, we consider that in Rossi the methodology and the legislative base is worked insufficiently out actively to use such financial instruments in investment activities.

The authors attention was paid on studying of the experience of the leading regional programs for development of investment attractiveness of regions and shortcomings of work of the regions which downgraded the rating for the last estimated period.

The reasons of failures of the prolonged and unfinished projects, the reasons of their rise in price and a solution of problems were noted.

The main problems of outflow of investments for the specified period are analysed, perfect positive actions from public authorities for improvement of investment climate in Russia are noted, the attention on the developed normative documents in this direction is concentrated and, in particular, the attention to need of development of the available, but at the same time more differentiated assessment of investment attractiveness which would consider both specifics, and the number of the population, and resource intensity and if you want, the number of the efficient population, for achievement of comparability of indicators and estimates is focused. The main directions of improvement of the public investment policy for

ensuring financial self-sufficiency of regions were defined.

During the years which were analyzed the legal base significantly became stronger, and investors can feel quite surely. In particular, requirements to registration of cooperation management enterprises became simpler, its term was reduced to one month, in many investment attractive regions the multipurpose centers for business where representatives of small and average business are served by the principle of "a uniform window" opened. Guarantees of property of foreign investors are fixed legislatively. The majority of acts corresponds to rules of international law.

The author proved in the research that the most preferable foreign investments for economy of any country are direct foreign investments as they allow to accelerate production modernization, to introduce high technologies, to create new jobs and provide the unconditional growth of level of the Russian managers and workers due to introduction into process of experience of foreign investors. Despite of the huge carried-out work, still there were serious obstacles which worsen investment climate. In the foreign press subjects about corruption scandals in the Russian Federation are constantly untwisted, investors are pushed away by existence of administrative barriers, difficulties with paperwork, obtaining the necessary permissions and coordination, tax payment, complication of the external economic policy of Russia, introduction and constant extension of sanctions. Most of investors take waiting attitudes though it is obvious that political opposition of the Russian Federation and the USA with the European Union countries, gains the character which is not predicted in time. Only easing of sanctions will serve as a signal for potential investors to resume investment process though, according to us, the period between "signal" and the beginning of investment will be rather long too.

Conclusions

In the conclusion it should be noted that "in the conditions of delay of growth rates of economy of Russia need of attraction of all possible stimulants of production in proportion increases. However it should be taken into account the nature of direct foreign investments, their features and the purposes of their use as the obvious circulation of domestic means can hardly increase the production capital and to become the lever of development of the Russian economy". Attracting the foreign capital it is necessary to think of observance of own interests, to create favorable conditions in those industries which demand updating.

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Analysis of Social Vocational Guidance of Pupils

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Abstract

The conducted research belongs to the field of sociological sciences. The research objective is the identification of criteria for the selection of future profession by pupils and their parents. A sociological survey of the directors of schools, teachers and parents of the entrants for the definition of the factors, influencing the choice of a higher educational institution and direction of preparation is conducted. On each type of educational institutions respondents are broken into two groups. Parents, directors and teachers of the graduates on the technical focused profiles make up the first group (physical, mathematical, technical, etc.). Parents, directors and teachers of the graduates of other profiles treat the second group (humanitarian, natural-and-science, etc.). The empirical analysis of the relation of the students of two technical higher educational institutions to their work according to the future specialty is carried out. This research of the relation of the seniors to the choice of their future profession according to their parents, teachers and directors of schools was conducted in October...December, 2018. The research was conducted in 14 educational institutions of two types. High comprehensive schools make up the first type. The second type include gymnasiums and lyceums with profound studying of physical-and-mathematical and technical disciplines. It should be noted that while carrying out the poll a quarter of the interviewed parents of pupils of 11 forms reported, that their children did not decide neither on the choice of their profession, nor on the choice of higher education institution to enter yet. At the same time a half of the respondents did not interfere with the choice of children, and the second half of the respondents chose a joint method of the decision, together with their children, discussing their possible future professions and directing their choice. Parents consider the main criteria for the selection of professions for children: abilities and possibilities of the child; interest in the profession and future specialty; demand for the specialty in the labour market; a emploiment in the further life; worthy level of the salary; guarantees of stability of income; compliance of the reality to expectations; understanding of career prospects; sensibleness of the choice. The results of carrying out the research can be used by the heads of the schools and higher education institutions for the purpose of the development of methodical recommendations and programmes for vocational guidance of students, taking into account their requirements and wishes.

Keywords: vocational guidance , poll, pupil, choice of profession

1. Introduction

Choice of a profession and a career way which will determine the properties of all the further life is one of the most important decisions, which the person makes in the life. Unfortunately, such a choice is very often made without due considering, at the level of intuition. It is even worse, when desires of friends or parents, mood or impressions of recently seen profession become the main assistants in the solution of the problem of vocational guidance of the certain person without understanding of all requirements imposed by it and weak idea of specialty in general under pressure of the need of choice with the necessary United State Examination.

It should be noted that opinions of parents and representatives of schools on the role of these both of these parties in the choice of a profession by school students disperse. Most of parents consider the role of school and teachers to be main, as they, on the one hand, train in subjects and give the corresponding knowledge, helping to represent the maintenance of various professions, and, on the other hand, they have to see, find out and help to develop the tendencies and abilities of the children.

Teachers, on the contrary, consider the role of parents to be dominating in the professional choice of their children. The fact attracts attention that, despite the set of the events held by schools in respect of professional orientation work, parents consider this work insufficient. The main remark is that too little excursions for school students to the enterprises with concrete stories about concrete professions and places of work are organized. The representatives of higher education institutions agitating to come to educational institutions, focus attention on the advantages of these higher education institutions in respect of interesting study and student's life, but , according to parents, it would be more useful for children to get to know what

professions they can receive in this higher education institution that these professions represent and where give the chance to find a job. First of all it concerns technical professions and specialties as in public consciousness the idea, that the equipment is outdated, salary is small and there are no prospects of career development at all industrial enterprises, still dominates. Very few people from the interviewed parents and teachers know about the enterprises, where there is a successful modernization, support of young specialists is provided and their professional trajectory is built. Namely today it is necessary to speak about than to school students, to show them the corresponding productions, to show their appeal and prospects.

For this purpose it is necessary to invite not only and not just representatives of services of personnel of the enterprises in schools, but young specialists, literally, yesterday's university graduates, who can tell the children about their work and higher education institution, where they studied their interesting profession. Such meetings are especially effective in case, if this young specialist graduated in due time from that school in which he or she is invited now, and now can show an example of a successful professional career.

Besides it would be useful to invite not only teachers as representatives of higher education institutions, but also students of elder years which would tell about study and student's life, a work practice and the enterprises where it passed, productions where they plan to work after obtaining the diploma came to schools.

More active inclusion of parents in professional orientation work would be also expedient, as they help to organize excursions for school students to the enterprises where they work and also come to school to class hours and tell about the profession to children.

It is necessary to emphasize that professional orientation work has to begin not in seniors and even not in middle school. It has to be conducted with the first class constantly and systematically. As data of the conducted survey testify, such systematicity is inherent in not all the schools.

Meanwhile, the story about professions should begin with the first class in a form, available to children: excursions to the enterprises and stories by representatives of various professions, including, parents, during class hours.

In process of growing and transition of children to middle school of knowledge of professions have to go deep and extend both at the expense of theoretical material, and through more substantial excursions to the enterprises. In high school that is the acquaintance to higher education institutions in close connection with those professions and the enterprises for which these higher education institutions train experts. At the same time it would be useful to organize meetings with the representatives of higher education institutions so that at them there were children together with parents. It will also promote informing parents on higher education institutions, and more constructive discussion of the obtained information by children and their parents.

The attempt of some teachers of schools in the conversations with researchers to transfer the main responsibility on career guidance of pupils to their parents is wrong and even harmful. Certainly, parents play a considerable role in the definition of the future of their children. But the leading role in disclosure of abilities of pupils and definition of their optimum professional future belongs to school, to teachers. They can estimate the presence of individual interests and abilities and to help with their development. They can pay attention long before than in the 11th class to the interest of this or that pupil in some concrete subject. Even long before transition to the 11th class the school can have an idea of what palette of interests of their pupils and what directions of their choice of the future profession can be. Certainly, then there can be changes because of intervention of some circumstances. But the role of school in orientation of pupils to the concrete field of knowledge corresponding to their interests and abilities has to amplify constantly.

Many teachers said that they tell children about professions during the lessons. But the problem is that not all the teachers have a real idea of modern professions and work of the modern enterprises today. And they need the help of the same higher educational institutions. It is represented that there would be expedient a part of efforts on career guidance which is carried out by higher education institutions at schools, to direct to education of teachers, informing them about development of modern production both its traditional and new professions, about what experts our hi-tech productions need today.

4. Literature Review

The analysis of literature proved that many questions, connected with professional orientation work with seniors, found in it reflection. In particular: activization of social policy of the Russian Federation in the field of education, issues of professional orientation activity are considered by V.G. Aseev, E.V. Vorotnikova,

M.R. Ginzburg, A.A. Derkach, N.N. Zakharov, E.F. Zeer, A.N. Zimichev E.A. Klimov, S.I. Makshanov, N.S. Pryazhnikov, A.A. Rean, E.E. Symanyuk, S.N. Chistyakova, L.A. Yasyukova, other); the definition of the role and the place of vocational guidance (education) in development of society is considered by R.M. Asadulin, S.Ya. Batyshev, D.A. Belukhin, V.P. Borisenkov, A.A. Vaysburg, A.E. Golomshtok, N.I. Kalugin, E.A. Klimov, I.S. Kohn, N.V. Kuzmina, A.P. Menshchikov, L.M. Mitina, I.N. Nazimov, A.D.D.M. Feldstein, S.N. Chistyakova, other); psychological aspects of professional self-determination of the studying youth are considered by V.A. Andrushkevich, A.V. Batarshev, S.S. Bubnova, A.G. Gretsov, A.M. Pavlova, O.A. Rudey, E.F. Zeer, E.A. Klimov, A.K. Markova, L.M. Mitina, L.P. Tkachenko, P.A. Shavir, L.F. Shekhovtsova, other; psychodiagnostics in professional orientation work (N.A. Volkova, N.S. Glukhanyuk, V.V. Grishin, V.N. Druzhinina, B.F. Kulagin, N.I. Nepomnyashchaya, N. Podlesova, O.A. Rudey, Ya.S. Suntsova, S.N. Chistyakova, other); questions of vocational guidance, education and self-determination of the studying youth are considered by N.P. Anisimov, S.I. Vershinin, E.I. Golovakh, A.E. Golomshtok, O.A. Makhayeva, A.V. Mordovskaya, B.S. Patralov, Century. Pass, N.S. Pryazhnikov, A.P. Seyteshev, E.A. Surudina, S.N. Chistyakova, T.I. Shalavina, E.V. Shelobanova, other; techniques and technologies of vocational guidance in educational institutions are considered by T.G. Batasova, M.A. Bolshakova, E.I. Garber, M.Yu. Savchenko, E.V. Slabnina, Yu.V. Tyushev, B.A. Fedorshin, other); practice of professional consultation is studied by N.F. Geyzhan, F.S. Ismagilova, E.A. Klimov, R. Mai, G.V. Rezapkina, A.P. Chernyavskaya, L.B. Schneider, other; problems of professional orientation activity abroad are studied by I.Ya. Kiselev, I.V. Mikhaylov, I. Rudenko, E.I. Rudneva, V.A. Ryzhov, E.N. Proshchitskaya, S.S. Semiletov, Yu.V. Ukke, other.

At the same time, the analysis of literature proved that questions of the theoretical-and--methodological support of social-and-pedagogical maintenance of vocational guidance of seniors in the uniform educational space did not receive necessary reflection.

That allowed to reveal the developed contradiction between the need of social-and-pedagogical maintenance of vocational guidance of seniors and its insufficient theoretical-and--methodological support for uniform educational space.

3. Methods

3.1. Participants

Sociological survey of schools directors, teachers and parents of entrants for the definition of the factors influencing the choice of a higher educational institution and direction of preparation was conducted.

The research of the relation of seniors to the choice of future profession according to their parents, teachers and directors of schools was conducted in October-December, 2018. The research was conducted in 14 educational institutions of two types. High comprehensive schools made up the first type. The second type include gymnasiums and lyceums with profound studying of physical-and-mathematical and technical disciplines.

The empirical analysis of the relation of students of two technical higher educational institutions to work on future specialty was carried out. In total 18 students were interviewed, including 9 first-year students and 9 fifth-year students from two different universities: Samara State Aerospace University and Samara state technical university. Such selection of informants was caused by the task to receive the fullest and versatile view of the relation to work on the received specialty and to reveal trends of change of the relation to work in the specialty in the course of training at the university.

3.2. Materials

Sociological survey of directors of schools, teachers and parents of entrants for definition of the factors influencing the choice of a higher educational institution and direction of preparation is conducted.

Within a stage of the draft of the present report the empirical research in a qualitative paradigm with use of a method of the semi-formalized interview was conducted.

3.3. Procedure

On each type of educational institutions respondents are broken into two groups. Parents, directors and teachers of graduates on the technical focused profiles treat the first group (physical, mathematical, technical, etc.). Parents, directors and teachers of graduates of other profiles treat the second group (humanitarian, natural-science, etc.).

The empirical analysis of the relation of students of two technical higher educational institutions to work on future specialty is carried out.

3. Results

Having carried out the semantic analysis of the results of the poll of parents it is possible to see that the parents' attitude to the graduates of schools is based on the phrase "child", and here "choice" is just not a priority phrase (Table 1).

Table 1. Semantic *analysis by results of poll.*

Phrase/word	Quantity	Frequency, %
child	34	8.88
I think	31	8.09
work	28	7.31
me	27	7.05
will be	23	6.01
specialties	22	5.74
professions	21	5.48
higher education institution	21	5.48

It should be noted that the opinions of parents and representatives of schools about the role of data of the parties in the choice by school students of a profession disperse. Most of parents consider that schools and teachers the leading role in the choice, as they, on the one hand, train in subjects and give the corresponding knowledge helping to represent the maintenance of various professions, and, on the other hand, have to see, open and help to develop tendencies and abilities of children (Barieva et al., 2018, Bolotin et al., 2016, Buyak et al,, 2018, Fischer-Henningsen, 2017). Teachers, on the contrary, consider the role of parents to be dominating in the professional choice of their children.

4.1. Analysis of professional orientation work.

Acquaintance to the world of professions begins at younger school within the subject "World around" and also during the actions of out-of-class work, for example, of excursions to the different enterprises (most often teachers were called Coca-Cola and Russia chocolate factory, also other organizations - production company LLC Krayukha, the Samara central post office were called).

More serious theoretical acquaintance to the variety of professions happens in high school, namely in the 8th and 9th classes. At this time the elective courses connected with career guidance (Fischer-Henningsen, 2017) are given to the school students at some schools.

At one of schools professional orientation work practices cooperation with the PROGOROD newspaper which implements the project "School of the future". Within this cooperation famous people who became professionals of the business are invited to meetings with seniors: "*We cooperate with the PROGOROD newspaper, they work with seniors. They have a project "School of the future", cooperating with people, who achieved something come, made progresses, act and tell how they achieved it*".

One more interesting form of work is carrying out "Review of professions" at schools. As the teachers who reported about such form in school explained, representatives of various professions are invited, tell about their professions to school students, each school student can ask the interesting question (Gazizulina et al., 2018). Often such representatives of professional communities are parents of school students: "*We very often have profession reviews i.e. when parents are invited, a father military, a policeman, a railroader. In the autumn railroad workers invited us, to look at the trains, of course, there everything can be felt, touched*"

At one of schools the conference connected with professional self-determination, which is called "Science. Society. Knowledge" is regularly held.

Some schools participate in "Week of work" which is spent annually. The Ministry of Education and Science of the Samara region with the assistance of "Union of Employers of the Samara Region" spent the IV regional Week of the work "Seven Steps to a Profession". The action purpose is to help school students with the choice of future profession. Employers get chance to adjust constructive dialogue with the education system (Glukhov, Vasetskaya, 2018, Gorelov et al., 2017, Kasyanik, 2017). Every day "Week of work" is filled with discussions, meetings, competitions, excursions. In "Week of work" JSC Kuznetsov, JSC EPK Samara, CJSC PES/CKK, JSC Novatek, JSC Tyazhmash and many other enterprises and the organizations of the Samara region participated. The first meeting under the name "Lesson from Professionals" took place at school No. 1 in the settlement of Stroykeramika on October 21. Next day the relay was picked up by school

No. 117, which pupils became the participants of "Day of professions" at JSC Kuznetsov. Representatives only of one school from all of them, participating in the research reported about participation in week of work.

A part in career guidance is played by the circles on interests existing at schools. Teachers reported that at some schools circles of technical creativity work (Gorelov et al., 2017, Kharlamov, 2017, Khvatova, Dushina, 2017, Klochkov, 2018, Kogan, 2018, Kuralbayeva, 2018).

"Besides, circles on programming, information technologies, biology and also circles of hand creative activity took place.

However, similar circles do not exist in all the schools. Approximately at every third of the surveyed schools teachers reported that school students visit not circles, but elective courses as additional classes.

The fact that, despite of the set of the events, held by schools in respect of professional orientation work, parents consider this work insufficient to attract attention. The main remark is that too few excursions are organized for school students to the enterprises with concrete stories about concrete professions and places of work. The representatives of higher education institutions agitating to come to educational institutions, focus attention on advantages of these higher education institutions in respect of interesting study and student's life, and it is more useful for children, according to their parents, as they will receive in this higher education institution that these professions represent and where give the chance to find a job (Mutlu-Bayraktar, 2018). For this purpose it is necessary to invite young specialists, who will tell children about their work and about higher education institution where they studied some interesting professions. Similar meetings are especially effective in case this young specialist graduated in due time from that school in which he was invited, and now can show an example of successful professional career. Besides that would be useful if students of older years would come as representatives of higher education institutions and would tell about their study and student's life, work practice and the enterprises where it passed, productions where they plan to work after obtaining the diploma came to schools. Along with it, it would be expedient to higher education institutions to develop computer or business games which would give the chance to children to try out as representatives of different professions (Olennikova et al., 2018). Development of such games could become a subject of theses or master theses for the students of the corresponding directions of preparation. Inclusion in professional orientation work of parents is expedient, as they can help to organize excursions for school students to the enterprises, where they work and also come to school to class hours and tell about their professions (Pavlenko et al., 2016). It is necessary to emphasize, that professional orientation work has to begin not in seniors and even not in middle school. It has to be conducted with the first class constantly and systematically. As data of the conducted survey testify, such systematicity is not inherent in all the schools. Meanwhile, we should begin to tell about professions in the first class in a form, available to children: excursions to the enterprises and stories by representatives of various professions, including, parents, on class hours.

4.2. Analysis of students.

Within this work the empirical research, devoted to studying of the relation of students to work in the specialty was conducted. The empirical research was conducted in a qualitative paradigm. Survey of students was conducted by the method of the semi-formalized interview. In total 18 students were interviewed: 9 first-year students and 9 fifth-year students, two different universities: Samara State Aerospace University and Samara state technical university. Such selection of informants is caused by the task to receive the fullest and versatile view of the relation to work on the received specialty and to reveal trends of change of the relation to work in the specialty in the course of training at the university.

First of all, we found out what was the progress of the informants, when they graduated from school, and how difficult it was to enter their university. It became clear that some students had good progress at school and had no problems when entering a higher education institution.

The informants of a first year demonstrated three trends in the question of desire to work in the specialty: desire to work in the specialty, the relation to work at the industrial enterprise as to "spare option", uncertain relation to work.

First-year students, characterize their specialty just in general, they consider it to be serious useful to society. Students do not place emphasis on their future employment. It means that at the moment they are not interested in their future employment (Romanova et al., 2018, Sushchenko et al., 2016, Trostinskaia, 2018). First-year students have just entered to the university and study, without thinking of their future work. Quite often first-year students argue on the profession according to other people or being guided by

the general stereotypes. They call work on the specialty unfashionable, not prestigious.

Having analysed the answers of fifth-year students, we received the following results:

1. Among the interviewed fifth-year students there were no students who were not sure in their future profession (Varzin et al, 2014). Everyone had a clear idea of future place of work;

2. The group of students which does not consider work at the industrial enterprise as their potential place of work was detected.

Fifth-year students define negative and positive lines of the specialty in more detail. They call the following positive aspects:

1. The specialty is demanded, and they will have no problems with the employment;

2. Universality of a profession. That means that knowledge, gained in the specialty can be applied not only at the enterprises of one profile, but also in other spheres;

3. The specialty is developing, advanced (Viktorovna, 2018, Yaitchnikov et al. 2015). That means that this industry needs young specialists with fresh, relevant knowledge.

Fifth-year students also mentioned some minuses of the received specialty, connected generally with features of work at the industrial enterprise: monotony of work, adverse working conditions, low compensation, slow career development (Table 2).

Table 2. *Comparison of the relation of students of the first and fifth years to work in the specialty*

Characteristics of the relation to work in the specialty	Students of the 1st year	Students of the 5th year
Reasons of the choice of specialty	1. Entering a higher education institution in the target direction. 2. Prestigiousness of higher education institution, compliance to gender stereotypes.	1. Conscious revenues to the received specialty, interest in it. 2. Someone chose a profession accidentally.
Desire to work in the specialty	1. They will precisely go to work in the specialty as the specialty is pleasant. 2. They think of work in the specialty as "spare option". 3. They do not think of further employment yet.	1. They will precisely work according to their profession, it is interesting, great opportunities for employment. 2. They definitely will not work in their profession, low wage, bad working conditions.
Problems with the employment	They are sure that there will be problems with employment, connected with present problems in the labour market, but not with the received specialty.	1. Problems will not arise, as they already work at the enterprises or some offers from places of practical training arrived. 2. Problems will be, but they are connected not with specialty, but with the lack of experience.
Knowledge of the help of higher education institution during the employment	They are not interested in assistance of the university during employment.	They know about all the opportunities for the employment which are offered by higher education institution:
Reasons for which graduates do not go to work for the industrial enterprises	1. Work is not prestigious, unfashionable 2. It is difficult to work at the industrial enterprise.	1. Low compensation. 2. Bad working conditions. 3. Great responsibility, highly intellectual work.

4. Discussion and Conclusion

The fact that, despite of the set of the events held by schools in respect of professional orientation work, parents consider this work insufficient to attract attention. Too few excursions are organized for

school students to the enterprises with concrete stories about concrete professions and places of work. The representatives of higher education institutions agitating to come to educational institutions, focus attention on the advantages of these higher education institutions in respect of interesting study and student's life, but according to parents, it is more useful for children, to tell in details what professions they will receive in this higher education institution and where they can find a job. First of all, it concerns technical professions and specialties, as the idea that at all the at industrial enterprises the equipment is outdated, the salary is small and there are no prospects of career development for the present dominates in public consciousness. Very few people from the interviewed parents and teachers know about the enterprises, where successfully there is modernization, support of young specialists is provided and their professional trajectory is built. Just today it is necessary to speak about it to school students, to show them the corresponding productions, to show their appeal and prospects.

For this purpose it is necessary to invite to schools not only and not just representatives of services of personnel of the enterprises, but also young specialists, literally, yesterday's university graduates, who can tell children about their work and higher education institution, where they studied the interesting profession. Such meetings especially are very effective in case this young specialist graduated in due time from that school in which he or she was invited, and now can show an example of a successful professional career.

Besides it would be useful if not only teachers, but also students of elder years which would tell about study and student's life, a work practice and the enterprises where it passed, productions where they plan to work after obtaining the diploma would come to schools as the representatives of higher education institutions.

Besides more active inclusion of parents in professional orientation work would be expedient, as they help to organize excursions for school students to the enterprises, where they work and also come to school to class hours and tell about their profession to children.

It is necessary to emphasize that professional orientation work has to begin not in seniors and even not in the middle school. It has to be conducted from the first class constantly and systematically. As data of the conducted survey testify, such systematicity is not inherent in all the schools.

Meanwhile, the story about professions should take place from the first class in a form, available to children: excursions to the enterprises and stories by representatives of various professions, including, parents, during class hours.

In process of growing and transition of children to middle school their knowledge of professions should become deeper and extend both at the expense of theoretical material, and through more substantial excursions to the enterprises. In the high school the acquaintance to higher education institutions should exist in close connection with those professions and those enterprises for which these higher education institutions train specislists. At the same time it would be useful to organize meetings with representatives of higher education institutions, so that at them there were children together with parents. It will promote also informing parents on higher education institutions, and more constructive discussion of children with their parents of the obtained information.

The attempt of some teachers of schools in the conversations with researchers to transfer the main responsibility on career guidance of pupils to their parents is wrong and even harmful. Certainly, parents played and will play a considerable role in the definition of the future of the children. But the leading role in disclosure of abilities of pupils and definition of their optimum professional future belongs to school, her teachers. They can estimate presence at this or that pupil of individual interests and abilities and to help with their development. They can pay attention long before the 11th class to the interest of this or that pupil in some concrete subject. Even long before transition to the 11th class the school can have an idea of what palette of interests of their pupils and what directions of their choice of the future profession can be. Certainly, then there can be changes because of intervention of some circumstances. But the role of school in orientation of pupils to the concrete field of knowledge corresponding to their interests and abilities has to amplify constantly.

Many teachers said that they tell children about professions during their lessons. But the problem is that not all the teachers have a real idea of modern professions and work of the modern enterprises today. And they need the help of the same higher educational institutions. It is represented that there would be expedient to direct a part of efforts on career guidance which is carried out by higher education institutions at schools, to education of teachers themselves, informing them about development of modern production both its traditional and new professions, about what experts our hi-tech productions need today.

Besides, it would be expedient to higher education institutions to develop computer games which would give the chance to children to try out as representatives of different professions. Development of such games could become a subject of theses or master theses of students of the corresponding directions of preparation.

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Satisfaction with Urban Environment as Social and Psychosocial State of Citizens

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Abstract

The author poses the problem of ensuring socio-psychological comfort of citizens. She identifies priority elements for the quality of urban environment for Moscow residents based on data from a sociological study using interview, questionnaire and focus group methods and also determines the satisfaction of Muscovites with the state of the city and with the changes occurring in the capital of the Russian Federation. Respondents representing different social categories of citizens demonstrate a positive perception of the changes; however, they have serious complaints to the city authorities, especially in the area of renovation (demolition of five-story buildings), city ecology and transport system functioning. The author notes the components of urban environment, which give Muscovites a sense of psychological comfort and satisfaction with life, and also accumulates respondents' proposals for the formation of public hearings model on urban planning projects.

Keywords: Comfortable environment, Quality of life, Needs of citizens, Sociological survey

1. Introduction

Comfortable living environment presupposes satisfying needs and requirements of the residents of a settlement (city). Their implementation gives citizens the feeling of high standards of living, provides psychological comfort. People want to live in the "correct" city or village, on the "correct" street, in the "correct" and comfortable home. Correct is what conforms to the standards accepted in the given culture, corresponds to the values and norms by which relatives and friends have been living. "Correct" is what does not bother and does not create a sense of danger and threat to a person, his relatives and friends. These properties of a settlement or the quality of the environment can be determined - calculated and expressed using quantitative indicators.

In 2014, the International Organization for Standardization (ISO) approved a standard that established indicators for assessing urban services and quality of life. This standard covers the economy, education, energy, environment, finance, fire and emergency protection, government, health, leisure, security, housing, solid waste, communications and innovation, transport, urban planning, sewage, water supply and sanitation. City authorities must adhere to the requirements of standards making cities more comfortable for life, more tolerant, more stable, more economically attractive and rich.

Indicators (indices) of environment quality (ecological indices), of health care, quality and level of education, culture (attendance of cultural institutions) for assessing the quality of life are also introduced in Russia. The quality indices of the production, shopping and entertainment spheres, engineering infrastructure, transport, housing conditions, availability of services, amenities, safety of life and others were defined. International and Russian indicators of living quality are used to assess the quality of life of people in Russia. The Human Development Index, developed by the United Nations Development Program and the OECD Living Quality Index (Better Life Index), can be used as an integral assessment of the socio-economic component of the quality of life in cities. "Creating a comfortable living environment that allows citizens to meet housing needs and ensure a high quality of life in general is the goal of urban planning and housing policy," is stated in the Order of the Ministry of Regional Development of the Russian Federation, adopted in 2013 [1]

5. Literature Review

There are many studies on the definition of comfort indicators in the urban environment. Ensuring quality of life in cities is a priority in the policy of the state and city authorities in many countries. For example, a number of public documents aimed to improve the quality of the urban environment were adopted in Russia in recent years [1,2]. The Order of the Ministry of Construction of Russia dated 10.31.2017 N 1494 / pr "On Approval of the Methodology for Determining the Quality Index of the Urban Environment of Municipalities of the Russian Federation" contains a list of indicators for calculating the quality index of the urban environment and the calculation rules. Russian cities though are in different geographical and climatic conditions, therefore, specific indicators should be determined for each city. According to urban

researchers - urbanists, the indices determined by the government of the Russian Federation do not reflect the full range of social indicators.

Researchers define objectively measured and subjectively evaluated indicators of environmental quality more strictly and diversely. They are looking for ways to ensure the sustainability of the urban environment, biospheric compatibility and favorable social climate in the city [3]. Some authors offer their own interdisciplinary approach to achieve a holistic understanding of urban environment quality and well-being of people in conditions of sustainable urban development. Sustainable cities must be at the same time economically viable, socially fair, politically well-managed and environmentally sustainable in order to provide maximal comfort for people. Therefore, we need an integral index of urban sustainability. [4,5,6]. Other authors explore specific aspects of comfortable environment, attaching importance either to integrated improvement of urban areas ensuring sustainability [7], or paying attention to the development of social or aesthetic infrastructure [8,9].

Some authors associate issues of urban comfort with strategic planning, pointing out that all comfort indicators should be reflected in urban development plans. The lack of rules and proper planning methods leads to inefficient use of urban areas, entropy, reduced functions of ecological networks and deep environmental impact [10].

The works that determine the subjective assessment (feeling) of the comfort of urban environment using empirical methods are particularly interesting. The study of Chinese authors "Geography of urban life satisfaction: An empirical study of Beijing" focuses on subjectively experienced well-being, taking into account spatial differences [11]. They conducted studies to identify interethnic, interregional and intercity differences in life satisfaction. «It is found that inter-district differences account for around 10% of the variations in life satisfaction and there is a significant difference in life satisfaction between urban and suburban residents in Beijing. Findings of this research have important implications for making polices to improve subjective well-being through urban design and community planning [11].

The approach when citizens perceive the quality of the environment subjectively, associating quality with the ability to fulfill their needs, is quite possible. The opportunity-based approach offers a theoretical basis for explaining how an individual's perception of the quality of life in cities is developed. The authors of the article "Urban Quality of Life and Capabilities: An Experimental Study" found that the residents' perception of quality of life depends on personal characteristics, the presence of amenities (manmade and natural), and the actual use of those amenities. Residents of an Italian city were interviewed using a structured interview. The results showed that residents' perception of the life quality in cities largely depends on the choice that people can make. The choices are strictly connected with the accessibility of services, individual time allocation, and social interactions people enjoy [12]. Subjective perception provides psychological satisfaction with the environment up to the feeling of happiness. According to the authors of "Cities and quality of life, "Where we live affects all aspects of our life and thus our happiness. The intersection between the areas of happiness and urbanism is most adequately described by the quality of life and well-being" [13].

The overwhelming majority of people in Europe and North America and a significant part of Asian people are concentrated in cities, thus the study of the urban environment quality is one of the priority topics in modern urban science and sociology.

2. Methods

The purpose of the study was to identify the degree of satisfaction of the population with the changes occurring in the city, and to collect proposals from citizens for improving the urban environment. The authors have developed a methodology for studying the needs of citizens in urban environment organization, their satisfaction with the urban environment, a method for measuring the socio-psychological tensions of citizens. This methodology is applicable for use in subsequent studies of the urban environment, as well as for the sociological support of public hearings. It will require a slight correction depending on the research situation and the objectives of a study. The authors have also developed a research program and research tools, taking into account the system of integral indicators of public satisfaction with urban planning programs on the example of Moscow, organization of public hearings on the implementation of urban projects.

The research problem is complex, so the authors applied the following research methods: observation; sociological survey, interviewing, focus group; document analysis (including content analysis).

3. Results

The survey was conducted in October-November 2018. The respondents were: citizens (Muscovites) of different ages and occupations, city planners and architects - employees of the Institute of the General Plan of Moscow (NIiPI Moscow) and the Research and Design Institute of Urban Planning of the Moscow Region (NIiPI of Moscow Region); Master students of the Moscow State University of Civil Engineering (NRU MGSU) studying in the areas of "Urban Planning" and "Architecture". A total of 180 residents of the capital of the Russian Federation were surveyed.

In course of the survey, it was found out that all the respondents in general like the changes that are taking place in Moscow. Among urban respondents, the percentage of satisfied people is 76%, among employees of two scientific institutes — 72%, among students studying in the "Urban Planning" faculty - 100%; among the Master students enrolled in the direction of "Architecture" - 93%.

What activities are most favored by the respondents? Respondents answered to the question: "Which events do you assess as positive?" in this way: "The city has become cleaner" - this choice was made by 53% of citizens and 52% of employees of two scientific institutes; "Demolished kiosks and other illegal buildings" - responded 60% of the students - architects and 47% of the city planning students; "Recreational zones have been reconstructed and their number increased" - noticed 62% of urban planning students and 60% of architectural students. All categories of respondents were unanimous in assessing the work of the city transport system, noting that it has been improved (Table 1).

Table 1. Measures to improve the urban environment, approved by the respondents.

What changes in Moscow do you assess as positive? (Select three most significant changes for you or add your own variant).
1. The city has become cleaner.
2. The abundance of ads was reduced.
3. Kiosks and other illegal buildings were demolished.
4. Sidewalks were expanded.
5. Car parking's were normalized.
6. Transport system of the city was improved.
7. Recreational zones reconstructed, their number increased.
8. In general, the appearance of the city improved.
9. Your variant.

Results in % / Respondents	1	2	3	4	5	6	7	8	9
Citizens (Muscovites)	53	39	37	37	19	53	38	50	-
Urban planners and architects - employees of NIiPI of Moscow and the Moscow region.	52	39	47	33	15	60	45	50	-
Master's students (Urban Planning)	23	29	47	23	20	35	62	35	-
Master students (architecture)	33	27	60	33	27	53	60	27	-

Answering the question of what exactly the respondents do not like in the transformation of the urban environment, the majority of city respondents emphasized that they don't like the state of ecology and tree felling (71.2%). Also, a large number of respondents are not satisfied with the demolition of five-story buildings and the increase in high-rise buildings (42.9%), decrease in the number of parking lots (48.7%). The answers of the respondents working in the NIiPI of urban planning are mostly similar. The students - city planners and architects are not satisfied with cutting down trees in the city. Their disapproval is also caused by "tiled pavement." In general, the answers of all groups of respondents look as in the table (Table 2):

Table 2. Changes in Moscow, causing rejection of respondents.

What do you dislike about the ongoing transformation of the city? (Choose three suitable answers or give your own).

1. Reduction of the number of parking lots in the city
2. Demolition of five-story building, increase of multi-storey buildings number.
3. Tiled sidewalks.
4. Cutting down trees.
5. Reduction of the space for private transport in the center of Moscow
6. Your variant.

Results in % / Respondents	1	2	3	4	5	6
Citizens (Muscovites)	20	28	15	20	5	-
Urban planners and architects - employees of NIiPI of Moscow and the Moscow region.	47	48	34			-
Master students (Urban Planning)	23	29	23	44	35	-
Master students (architecture)	27	33	13	53	20	-

The respondents also expressed their proposals in solving urban problems in Moscow. The most acute problems from the point of view of the respondents are transport problems, respectively, the respondents recommend to deal with them in the near future: elimination of traffic jams, organization of new parking lots, etc.

In general, the respondents approve the activities held in Moscow. However, the respondents have also given negative and neutral assessments of the ongoing changes, and, approximately, in equal amounts. Most of negative assessments were received from interviewed experts (deputies of the Moscow City Duma, city activists). Informants are extremely negative about the situation associated with the "reconstruction" of old Moscow. “I do not like the irresponsibility with which important urban planning decisions are made,” one expert asserts. - The appearance of the capital does not require changes! It requires preservation of cultural heritage objects and their restoration».

The proposals of the experts are: “Decisions must be more responsible, the construction of high-rise buildings should be stopped", "the infill construction with low quality buildings, the construction of residential complexes under the pretext of transport interchange hubs, cutting of parks and natural areas of preferential protection should be stopped, the historical center of Moscow should be treated with care"; “the projects for the construction of transit roads through the districts of the city of Moscow should be canceled”. The experts relate the deterioration of the health of Muscovites, of their psychological state in the recent decades to the construction of high-rise buildings, infill construction, the cutting down of parks and gardens.

4. Discussion and Conclusion

So, the respondents have answered what prevents the citizens from feeling comfort and convenience. They have focused on the problems that need to be addressed first. It has become noticeably cleaner in Moscow in recent years. Despite the fact that the amount of household waste is increasing, the municipal housing and public service of Moscow manages to cope with the garbage disposal. However, there is no separate collection of garbage in the city, and Muscovites are worried about it. They believe special attention should be paid to waste disposal and the development of recycling technologies. A student studying in the direction of "Urban Planning" presented her project for recycling. The bioreactor, the operation of which is based on the principle of organic waste fermentation, may be one of the ways to improve the current environmental situation in the country, she said.

Bright advertising, especially on highways, distracts drivers and can lead to traffic accidents. Citizens advocate reduction of media ads. Students-architects suggest not abusing the media facades which is visual garbage. They also speak out against the abundance of wall advertisements covering the facades of buildings and infringing the historical, architectural and aesthetic appearance of the city.

The architects are sure that small "kiosks and other illegal buildings" represent a kind of visual garbage and also infringe the aesthetic appearance of the city. “The city should be kept in the same style,” “it is necessary to eliminate chaos and organize the urban space,” “trade should be allowed only in specialized centers” - are the proposals of citizens.

Muscovites are especially indignant about felling of trees and reduction of green areas. The majority of respondents in all the surveyed groups are concerned about the ecological state of the city. Moscow is not among the top ten in the ecological rating of Russian cities, and in the world rankings, the capital of Russia is on the list of the dirtiest cities in the world. For example, in 2018, the Moscow index was 43.4 points on a 100-point scale Forbes [14]. In a report by the Norwegian University of Natural and Technical Sciences, Moscow is called a city producing a large amount of carbon dioxide emissions into the atmosphere. [15]. Trees are known to absorb carbon dioxide and help purify the air of the city, so cutting them is a threat to the biosphere and human health. Muscovites recognize the need for sanitary cutting (for example, old trees) as necessary, but they propose to restore the green balance immediately by planting other trees and applying green building technologies. “Green architecture” is a priority for students-architects surveyed. The respondents suggest “to increase the quality and quantity of green areas, apply vertical gardening technologies”.

“The tense traffic situation, traffic jams” is one of the components of Muscovites' discomfort [16]. The index of the level of transport complex development was worked out in 2016 for comparing the transport complex of megacities in terms of quality, availability of transport services for population, traffic safety, the impact of transport on the environment, and efficiency of freight logistics. Tokyo is in the first place in the ranking, Moscow shared the second and the third places with London in 2017, rising from the eighth place in the ranking of 2010. Moscow is followed by New York [17]. Compared to many cities in developed countries of the world, Moscow falls behind substantially [18]. As many Muscovites and residents of the Moscow Region spend 3 hours a day or more on the road, the sense of psychological comfort is drastically reduced, they react particularly sharply to transport problems and make particularly many suggestions: “Limit car entry to the center”; “Remove large governmental organizations from the center (ministries, etc.); "Eliminate trolley buses"; "To develop a bicycle infrastructure." The city administration is trying to solve transport problems, but their efforts are clearly not enough.

The given sociological survey was conducted in the framework of the project "Improving the procedure for public hearings: social and legal aspects." The interviewed respondents believe that all problems relating to the comfort and health of citizens should be discussed at public hearings. For example, 85% of the respondents are convinced that urban planning projects that worsen the ecological situation in the city must be submitted to public hearings. The results of discussions (the wishes of citizens) should be taken into account in the adoption of a town-planning project. Of course, the quality of town-planning projects depends on the activity of the citizens themselves: whether they are responsible for their own habitat, whether they analyze the decisions made by the government, whether they want to take part in the life of their district, whether they can independently organize their habitat? It is necessary to measure the degree of civil activity of city residents, their interest and readiness to participate in territorial self-government bodies, in public hearings. Serious urban planning projects can only be approved in a dialogue between the government and the society, their mutual understanding and joint efforts. The formation of comfortable living environment, concern for the ecology of the territory, creation of biosphere-compatible cities and settlements, ensuring harmonious human development – are the core of modern urban planning projects.

The analysis of the survey results shows that the opinions of different categories of respondents are in many ways the same, which indicates the representativeness of the research results.

Our study revealed the main indicators of the urban environment giving a psychological feeling of comfort to citizens:

1) Rational spatial planning, free space, ease of movement.
2) Clean streets, no trash
3) Rational use of advertising, providing comfortable video ecology of the city.
4) Rationalization of trade, the use of specialized spaces.
5) Preservation of green spaces, ensuring ecological balance, biosphere compatibility.
6) Ensuring continuous operation of transport, absence of traffic jams, reducing the time to travel around the city.

Respondents expressed their priorities in ensuring the quality of the urban environment.

Unfortunately, sociological surveys are not conducted in determining the indicators for assessing the state of comfort of the living environment. The justifying calculations of indicators for assessing the living environment are based on standards set by the authorities. In particular, the Order of the Ministry of Construction of Russia dated October 31, 2017 No. 1494 / pr "On Approval of the Methodology for Determining the Quality Index of the Urban Environment of Municipalities of the Russian Federation" does not reflect the whole complex of social indicators of comfort of a city [2].

Claims of citizens and their proposals identified in the course of a sociological study will be used by the author in the process of developing a new model of public hearings procedure.

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Modeling the Role of Brand-Community on Brand Characteristics with the Moderating Role of Brand-Community Similarity

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Abstract

Objective: The purpose of present research was to model the role of brand-community on brand characteristics with the moderating role of brand-community similarity. The statistical population of the research consisted of the customers of Iranian (Daie and Majid) and foreign (Adidas and Lanning) sport brands at Shiraz sport shops level.

Method: According to Morgan table, 388 persons were selected as the statistical sample by stratified random sampling. Measurement tool was a 24-item questionnaire in a five-point Likert scale that was prepared using qualitative study by exploiting Delphi technique by interviewing 15 experts in snowball method, and its face and content validity and also its internal reliability was performed by using Cronbach's alpha test. Factor analysis and structural equation modeling test were used to investigate the hypotheses.

Findings: The research findings showed that the fit indicators are desirable and indicate model confirmation. It can therefore be said that brand-community directly and significantly impacts on increasing the identification and determination of brand identity and brand attachment by moderating brand-community similarity on increasing brand commitment.

Conclusion: According to the results, it cannot be confirmed that the brand-community similarity variable moderates the relationship between the identification and determination of brand-community on the identification and determination of brand identity.

Keywords: Brand Commitment, Brand-Community, Brand-Community Similarity, Customers, Sportswear.

Introduction

The sport industry is a market in which sport products are offered to their buyers who want sport services, health and wellness, safe recreations or leisure times related to sport and may include activities, products, services, people, places or ideas. Today sport as an industry has a familiar concept in advanced industrialized countries. "We have been convinced for many years that nowadays the market is at the disposal of sports, fashion and music," says Robert Mires, the manager of Reebok company. In the US, the sport industry forms the 11th largest industrial group.

In the classical literature of economics, workforce, capital and land are considered as the three main elements of production and the main sources of wealth. But this model is not capable of explaining how a product with similar efficiency, quality, and beauty is sold three times of the price of another product. Modern marketing approaches explain this phenomenon with an identity that brand has for the customer. In an era of increasing globalization expansion, competitiveness is an important issue among policymakers at various levels (country, industry and company) in various parts of the world (Seyed Javadin and Shams, 2019).

Today, branding is one of the most important marketing topics facing all companies including business companies. This importance is to the extent that brand management has become an independent discipline in scientific circles. Brands are strategically and economically valuable assets of companies and even without exaggeration they are considered among their most valuable assets. A trademark is a name, phrase, or term, sign, mark, symbol, design, or a combination of them, intended to introduce a product or service offered by a seller or a group of sellers, thereby they are differentiated from the products of the competitor companies. Branding adds dimensions to a product or service to make that product or service distinct from others (Keller & Lehmann, 2016).

According to the definition in the Inter Brand Institute Glossary: Brand is a combination of observable, non-observable, and symbolized features in a trademark, that, if managed properly, brings value and credit ". From a consumer or marketing perspective, branding is a promise of delivering an experience from a

business point of view, ensuring future earnings and legally is a separable piece of intellectual property. The purpose of the brand is to create relationship that creates and guarantees future earnings with the growth of customer preference and loyalty. Brands make decision-making easy, and fulfill ensuring product quality, and provide a proper, different and valid option among contradictory (competing) suggestions. Technically, every time a marketing specialist creates a new name, logo or symbol for a new product, he has created a brand. However, many managers use the word brand only when this name could gain popularity and credibility in the marketplace for itself (Momeni & Mohammadi, 2018).

Brand development is a vital issue. A powerful brand that is considered a safe place for customers is basically a promise of future satisfaction that is a combination of what the company says about the brand, what others say about it, and how the company delivers the products, and all these things are from the customer perspective (Buil et al., 2013).

Brand is a part of operational and emotional characteristics that a customer attributes to a product or service and is a customers' assistant tool for decision-making and purchase (Madani & Roosta, 2017). A brand is like a floating iceberg. You can observe only a small portion of it above the water's surface that represents things linked to the brand over time. But the large and important section of it indicating brand power is out of sight and underwater (Gwinner & Swanson, 2014). In today's world, the main capital of many organizations is the brand (trademark) of that organization. Brand is considered as one of the important communication tools in the customer relationship management collection and is one of the effective signals in the market that the company uses due to information asymmetry in the market (Dehdashti et al., 2019).

Companies have witnessed a growing interest in brand-communities over the past decade. The brand-community is a concept related to the consumer relationship with the brand (such as attitude towards brand, brand personality, brand mental image) (Zhou et al., 2012). The brand-community is a powerful phenomenon that has emerged all over the world and brings many advantages for the company. By maintenance and protection management from brand-communities, companies can shape customer loyalty, and also increase their marketing productivity and their brand. Regarding the marketing planning process and in terms of brand equity, the brand-community has been a very important factor and has become one of the most encouraging developments in relational marketing in recent years (Sicilia et al., 2018).

A strong brand community can lead to stabilized social loyalty and commitment to the brand, and even lead to over-brand loyalty (Dubois & Westerhausen, 2016).

In the brand literature, Clare et al. (2016) have argued that the level of communication a brand can achieve with its customers is specified by its strength and weakness. In a state of intense communication, consumers who communicate with the brand are very loyal to the brand and feel connected to it; in addition, they experience strong relationships with the brand and this leads to recommend it to others. They feel emotional about it and know themselves as a part of the brand-community. Concurrent with this issue, the literature on brand-communities management has entered into the agenda of consumer scientific researches.

Every organization should try to create the brand-community as a big corporate strategy, not just as a marketing strategy to build a community around a brand (Chauhan & Pillai, 2013). The important point is that companies should keep in mind that brand communities are not the assets of large companies, so that they should only be supportive, not controller.

The brand-community also gives particular interest both to the marketing researchers and brand managers because it gives them new theoretical insights on key concepts and gives significant consequences for marketing strategies. In recent years, brand management is performed through the management of relationships with the brand-community. For effective management of these relationships, companies should identify and determine the brand-community and develop the commitment to the brand-community.

In order to build strong customer relationship, a company must create a relationship with the company's product (Terechshenko, & Radionova, 2011). Today's highly competitive world has made companies to embark on modern and operational innovations in the marketing domain to be able to, while establishing continuous relationship with their customers, prevent their being attracted by competitors. What is evident is that the brand-community is a phenomenon in which both organizations and companies are satisfied, as well as customers, and this point may have caused this phenomenon to have progress everyday more serious than the previous day (Dehdashti et al., 2019).

In current highly competitive markets, gaining the proper position in the consumer's mind, in a way that consumer is loyal to the company, is of utmost importance and one of the factors which is effective to achieve such a position in the minds of consumers is brand-community. The brand-community is a key and

determinant factor in company value and stock market value, and this is because of the power a brand has in acquiring new customer and maintaining existing customers. Perhaps the most obvious skill of a professional marketer is to be able to create a brand, protect, save, and strengthen it, and make customers loyal to it (Madani & Roosta, 2017).

Nowadays business environments are growing rapidly and are competition and a field for the activities of struggling companies to capture the minds of consumers, and they are facing with a huge amount of challenges such as constant innovation, competition, alternative emergence, and shortening of the product life cycle. Thus consumers tend to choose between products an option, because many alternatives are emerging in the market and replacement costs are also low. Therefore, companies are trying to invent methods to retain existing customers and acquire new facilities (Terechshenko, & Radionova, 2011).

The marketing managers of our country should consider the point that as much as the quality and service are vital, attention to the brand-community is also important and is effective in creating competitive advantage and customers' loyalty. Competition increase in the industry, production and services, and customers' knowledge and awareness increase have led to more attention for customers' retention. Regarding that acquiring a new customer is much more costly than establishing a broader and deeper relationship with current customers, the issue of brand-community and identifying the factors affecting it is of particular importance (Dehdashti Shahrokh et al., 2019).

In the present era, the competition intensity increase in the services sector has caused more attention to retain current customers and trying to attract new customers. In relationship marketing, the main focus is not just on attracting new customers, but on expanding relationships with current customers and maintaining their relationship with each other is more important. On the other hand, the cost of attracting a new customer is much higher than maintaining a loyal customer, in a way that researchers have reported that the cost of attracting a new customer is six times of the cost of maintaining a loyal customer. So companies can use this advantage as leverage for themselves. Highly likely, many variables can be effective on customer satisfaction feeling, more profit, and increasing the sales of a particular brand. In order to solve these uncertainties and remove ambiguities, in this research the variables of brand commitment, brand identity, commitment to brand-community, brand attachment and perceived brand-community similarity are investigated.

Brands are very vital for the services sector, as the intangible nature of services makes the qualitative evaluation of them difficult for customers. But despite the importance of brand in the sport service sector, little researches have been conducted in the field of brand-communities in Iran and abroad. Therefore, doing researches in the field of brand-communities creation, managing it, and investigating the role of communities in customers' commitment and loyalty and its impact on identifying the needs and production of new sport products and services is considered as a major concern, that conducting a research in this regard can help removing uncertainties and ambiguities.

Zhou et al. define the similarity between community characteristics and brand traits (members' personality, values, and styles) as brand-community similarity. Regarding the probability of the impact of this factor on the brand-community relationship and brand characteristics, in this research, in five questions, the similarity between brand-community members' personality and brand personality, similarity of brand-community values and brand values, similarity of brand style and brand-community style, similarity of feeling to brand-community and the brand were measured.

Considering that brand and its related components and variables are among the cases that have recently entered into the field of research, and regarding that the impacts of brand-communities on marketing performance have been investigated in recent years, but less researches have been empirically done about the immediate impacts of a brand-community on brand relationships. Regarding many benefits and advantages that companies can have from it by creating a strong brand-community and considering the impacts of brand characteristics on company's performance, the question is how the brand-community impacts on the identification and determination of brand identity, attachment, and commitment? Does brand-community similarity moderate the impact of brand-community on brand characteristics?

Method

In terms of purpose, the present study is among the developmental researches and in respect of the possibility of controlling variables is of non-experimental researches and of descriptive-survey researches. In this research, descriptive and inferential statistics were used to describe the data, and the SPSS20 statistical software and partial least squares technique were used by the aid of Smart PLS2 software. The statistical

population under study consisted of the customers of Iranian and foreign sport brands (among Iranian sport brands, the two active brands of Daie, Majid and among the foreign brands two brands of Adidas and Lanning) at Shiraz sport shops. The sample size, as the number of consumers was not specified, was estimated 384 people through the Morgan table, that regarding the probability of the samples being dropped, the researcher distributed 400 questionnaires among the consumers of the desired brands and finally 388 acceptable questionnaires were returned, so the sample size in this research is 388 people that was assigned by stratified random sampling. The measurement tool was a 24-question questionnaire in a five-point Likert scale that has been mentioned separately in (Table 1). It should be mentioned that the questionnaire was made qualitative using Delphi technique through semi-structured interview by snowballed method (Table 2) and the face and content validity of the questionnaire were investigated by several sport management professors and then the desired questionnaire was distributed among the population. The results analysis of this study has been conducted by using structural equation modeling with PLS method.

Table 1. Questionnaire Variables, Type and Method of Calculating Them

Variable	Items	Situation in the Model	Source
Identification and Determination of Brand-Community	1-6	Exogenous	Algesheimer et al. (2005)
Commitment to Brand-Community	7-11	External Endogenous	Mathwick et al. (2008)
Identification and Determination of Brand Identity	12-16	External Exogenous	Zhou et al. (2012)
Brand Commitment	17-19	Endogenous	Zhou et al. (2012)
Brand-Community Similarity	20-24	Moderator	Zhou et al. (2012)

Table 2. Results of Investigating Questions Using Delphi Technique

Question Number	Frequency (Agree)	Percent	Question Number	Frequency (Agree)	Percent
1	13	0.86	13	15	0.100
2	13	0.86	14	14	0.93
3	14	0.93	15	12	0.80
4	12	0.80	16	12	0.80
5	13	0.86	17	13	0.86
6	14	0.93	18	13	0.86
7	15	10.00	10	14	0.93
8	14	0.93	20	14	0.93
9	12	0.80	21	14	0.93
10	13	0.86	22	14	0.93

11	14	0.93	23	14	0.93
12	12	0.80	24	14	0.93

Research Findings

External Model Evaluation

To evaluate the external model, the composite reliability, Cronbach's alpha and convergent validity (mean variance extracted) are investigated. The composite reliability is to measure the internal correlation of the observable variables of each hidden variable. Cronbach's alpha indicates the ability ratio of questions in explaining properly the dimensions related to themselves, that is to say, to measure the internal consistency of observable variables. Convergent validity also refers to the ability ratio of one-dimensional indicators in explaining that dimension. The results have been presented in (Table 3).

Table 3. External Model Evaluation

Hidden variable	AVE	CR	A
Identification and determination of brand-community identity	0.47	0.84	0.77
Commitment to brand-community	0.43	0.79	0.67
Identification of brand identity	0.43	0.78	0.66
Brand commitment	0.63	0.83	0.70

As it is clear in (Table 3), all variables have high reliability in the model. Composite reliability and Cronbach's alpha higher than 0.7 indicate acceptable reliability of each research construct. Also the criterion value for acceptable convergent validity level is 0.4

As it has been presented in the table above, the AVE values related to each construct is higher than 0.4, indicating the point that the convergent validity of the present questionnaire is at acceptable limit.

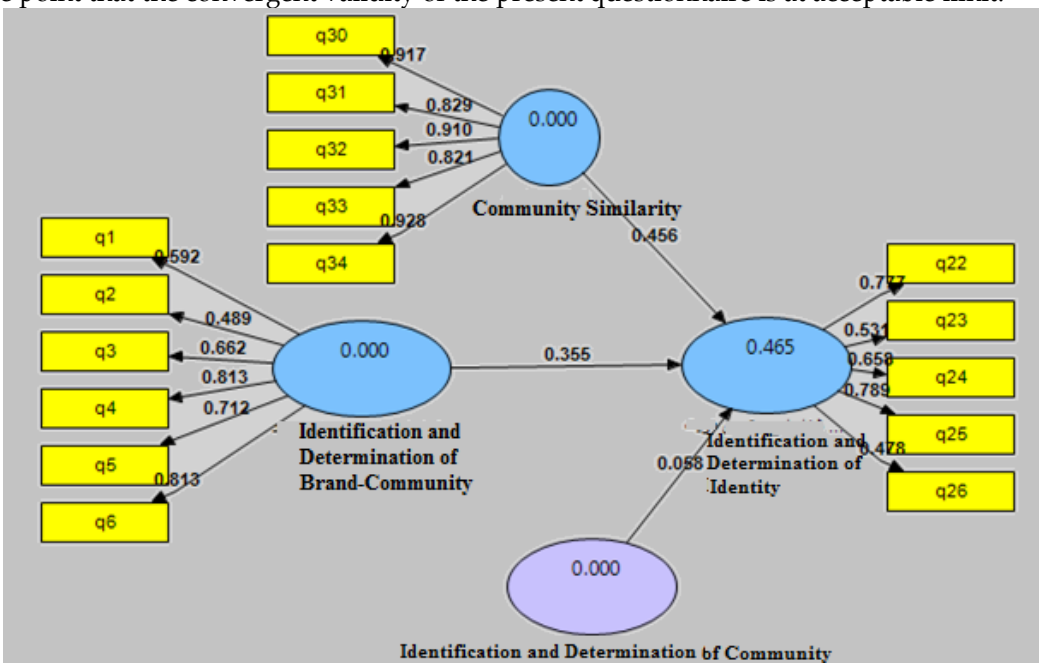


Figure 1. PLS Software Output of the First Hypothesis in the Standard State

To analyze the model in the moderator variable, all the criteria of investigating the model fitness including structural, the quality of measurement model and overall model, the moderator variable are not investigated, and the only application of this variable is in investigating the moderating impact of variables under investigation.

According to Figure 1, the R^2 value for the construct identification and determining brand identity has been calculated 0.465 which confirms the suitability of the fitness of structural model according to the three criteria values. According to the algorithm, several criteria are used to investigate the fitness of the structural model of research, that the first and the most basic criterion is the Z significance coefficients, or the same as t-values (significance state). According to Figure 2, the significance coefficient related to the moderating variable of brand-community similarity has been calculated as 1.57 which, due to being lower than the value of 1.96 at the level of 95%, the effect of brand-community similarity variable as a moderating variable cannot be confirmed. In other words, it cannot be confirmed at the 95% confidence level that the brand-community similarity variable moderates the relationship between the identification and determination of brand-community and the identification and determination of brand identity. According to the obtained results, the calculated f^2 value for the brand-community similarity variable was calculated as 0.34, indicating a large impact size on the desired route.

The way of calculating the impact intensity in the moderator variable has been obtained as below.

F^2 = (R^2 model with moderator - R^2 model without moderator) / (1- R^2 model with moderator)

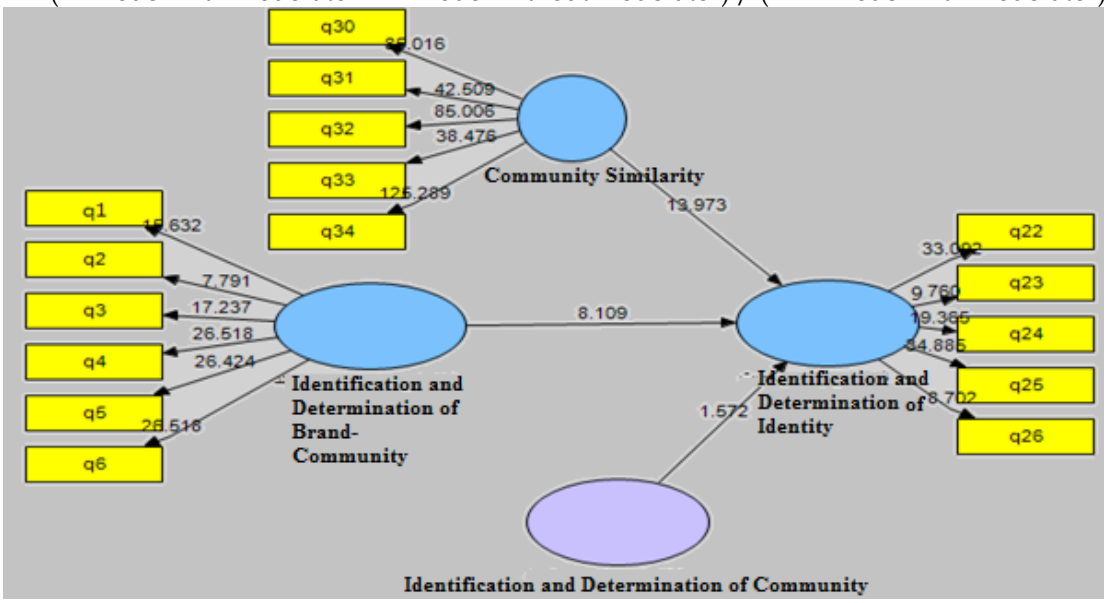


Figure 2.PLS Software Output of the First Hypothesis in the Significance State

Table 4: The First Hypothesis Results in the Presence of Moderating Variable Impacts

Relations	Moderating Impacts Model	T	Result
Identification and determination of brand-community → Identification and determination of brand identity	0.35	8.10	Confirmed
Brand-community similarity → Identification and determination of brand identity	0.45	19.97	Confirmed
Identification and determination of brand-community * brand-community similarity → Identification and determination of brand identity	0.05	1.57	Rejected

According to the results of (Table 4) at the confidence level of 0.95 the identification and determination of brand-community brand-community similarity – the identification and determination of brand identity, it can be said that with respect to the impact coefficient of 0.05, the brand-community similarity moderator variable had a positive impact on the desired relationship, but statistically the significance of this relationship was not confirmed since it was lower than 1.96.

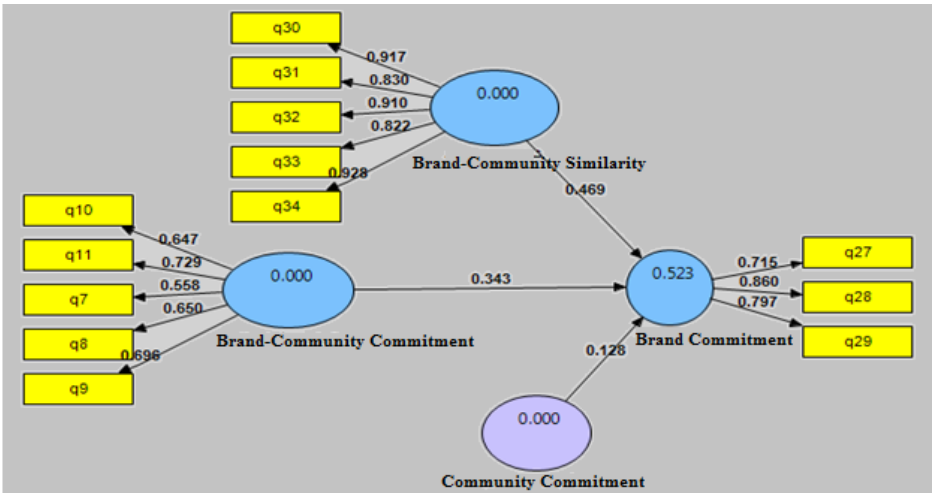


Figure 3. PLS Software Output of the Second Hypothesis in the Standard State

According to Figure 3, the R^2 value for the brand commitment construct has been calculated as 0.523, which confirms the suitability of the structural model fitness with respect to the three criteria values. According to the algorithm, several criteria are used to investigate the fitness of the structural model of research, that the first and the most basic criterion is the Z significance coefficients, or the same as t-values (significance state). According to Figure 4, the significance coefficient related to the impact of moderator variable of brand-community similarity has been calculated as 3.68 that since it has not been located in the range lower than 1.96, it can be said at 95% level that it confirmed the brand-community similarity variable as a moderator variable. In other words, at the 95% confidence level, it can be confirmed that the brand-community similarity variable moderates the relationship between brand-community commitment and brand commitment. According to the obtained results, the calculated f^2 value for the moderator variable of brand-community similarity was calculated as 0.12, indicating a large impact size in the desired route.

to the way of calculating the impact intensity for the moderator variable:

F^2 = (R^2 model with moderator - R^2 model without moderator) / (1- R^2 model with moderator)

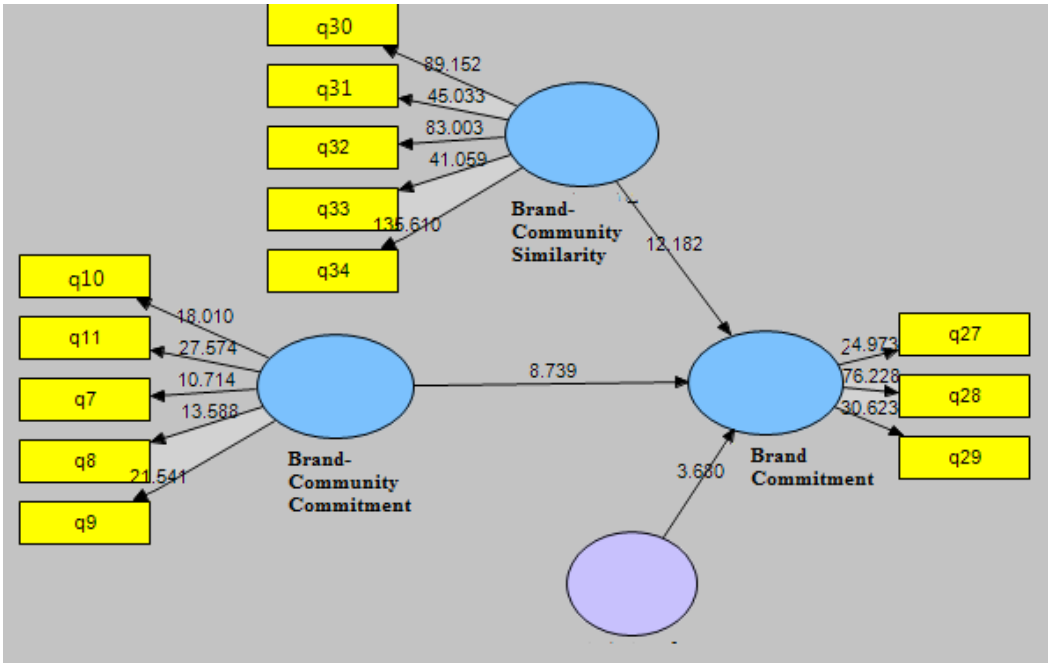


Figure 4. PLS Software Output of the Second Hypothesis in the Significance State

Table 5: The Results of the Moderating Variable Impacts in the Second Hypothesis

Relations	Moderating impacts model	T	Result
Brand-community commitment → brand commitment	0.34	8.73	Confirmed
Brand-community similarity → brand commitment	0.46	12.18	Confirmed
Brand-community similarity * brand-community commitment → brand commitment	0.12	3.68	Confirmed

According to the results of (Table 5) at the confidence level of 0.95 of the route of brand-community similarity * brand-community commitment → brand commitment, it can be said that regarding the impact coefficient of 0.12, the moderator variable of brand-community similarity had a positive impact on the desired relationship. Also, statistically the significance of this relationship was not located within the range of 1.96 either; in other words, this coefficient indicates the positive moderating impact of brand-community similarity on the relationship between brand-community commitment and brand commitment.

Model Extracted in the Sport Wearing Industry

The results of research hypotheses investigation indicated that brand-community commitment in Shiraz sport wearing industry did not have acceptable validity coefficient and also the moderator variable of brand-community similarity in sport wearing sector positively and acceptably moderated the relationship between brand community commitment and brand attachment (it should be mentioned that the route of brand-community commitment to the brand commitment was not an acceptable route, so the moderating impact on it, although was significant, was eliminated from the conceptual model extracted from the research). The model extracted by the researchers is presented at the end as follows.

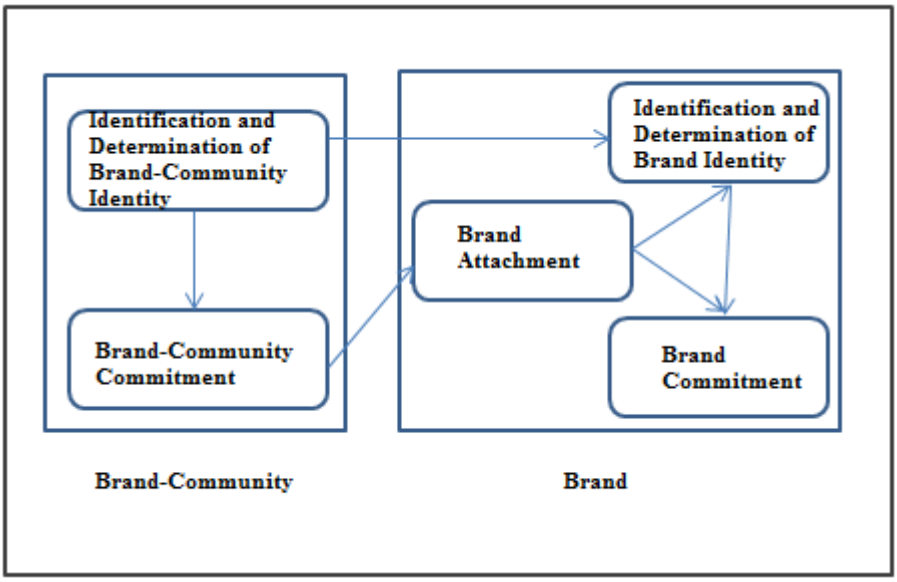


Figure 5. Extracted Conceptual Model

Discussion and Conclusion

Brand communities are tools that help strengthening brand and consumer relationship. A brand community can be proposed as a group of consumers with a shared passion and enthusiasm for the brand and a good developed community identity, that its members are jointly involved in its activities to accomplish collective goals or to express emotions and mutual commitments. The purpose of this research was to model the role of brand-community on brand characteristics with the moderating role of brand-community similarity in domestic and foreign sport wearing industry.

The R^2 value obtained for the endogenous identification and determination of brand identity was calculated as 0.465 which confirmed the suitability of the fitness of research structural model. According to PLS software output and the significance coefficient related to the moderating variable of brand-community similarity it was calculated as 1.57 which due to being lower than 1.96 at the level of 95% the impact of brand-community similarity as a moderator variable cannot be confirmed. In other words, at the 95% confidence level, it cannot be confirmed that the brand-community similarity variable moderates the relationship between brand-community identification and determination and brand identity identification and determination. Therefore, this hypothesis was not confirmed. The findings of this research are consistent with the results of other studies, in a way that Eghbali et al. (2014), Zhou et al. (2012) and Bagozzi & Dholakia with the same components as the present research and in different community in their researches have stated that the brand-community similarity does not play a moderating role between the identification and determination of brand-community and brand identity identification and determination, that this similarity has been due to the homogeneity of the components under investigation in these researches. Thus, the similarity between the characteristics of a community and brand traits does not have a positive mediating role in the impact of identification and determination of the brand-community on brand identity identification and determination. Therefore, the identification and determination of the brand-community is effective on the identification and determination of the brand identity and this relationship was not moderated by brand-community similarity.

Brand-community is a community of individuals loyal and committed to brand who know themselves dependent on all positive and negative aspects of the brand. This concept extends in the minds of customers and due to the commitment and interest they have in the brand changes them into the brand advertiser in others' minds. So the identity of a brand is, for the brand committed individuals, in a way that even affects their own identity too, and meanwhile the brand-community similarity which means the similarity of the brand characteristics and its consumption community cannot moderate this relationship. Accordingly, the brand-community characteristics have positive effects on the formation of brand identity that the combination of these conditions in today's marketing has manifested this concept with more importance, and it can be said that the brand-community characteristics will shape the brand identity.

The obtained R^2 value for the endogenous construct of brand commitment was also calculated as 0.523 which confirmed the suitability of the fitness of research structural model. Also according to PLS software output and significance coefficient related to brand-community similarity moderator variable it was calculated 3.680 which due to being higher than 1.96 at 95% level the effect of brand-community similarity variable as a moderator variable can be confirmed. The findings of this research correspond with the studies' results of Park et al. (2010), Bagozzi & Dholakia (2010) and Algesheimer et al. (2005), so that the similarity between community characteristics and brand traits has a positive mediating role in the impact of commitment to the brand-community on brand commitment and commitment to the community in respect of the consumer relationship, makes the intention and desire to continue the relationship. The results of this hypothesis are also inconsistent with the research of Eghbali et al. (2014) that this inconsistency is due to the difference in the population under study. Therefore, based on the results obtained from this part of the research, it can be stated that the brand-community similarity affects the relationship between the commitment to brand-community and brand commitment. The similarity that exists between a brand's characteristics and its customers can be the basis of many relationships between the brand and its customers in the brand-community. The formation of the brand-community can put the customer and the brand in the special and homogenous conditions to strive for brands success. Today, regarding the increasing importance of brands, special attention should be paid to the brand-community similarity at the first look, which in turn will provide the basis for the interrelationship between the brand and the customers. If the customers know themselves separated from the brand and do not find its characteristics to be the same as theirs, they will get away from it. This gap between the brand and the customer disrupts the brand-community and will make the importance of the commitment issue that is the basis of many of the brand-customer relationships less.

Therefore, the collection of these researches indicates the importance of brand- community in the business environment and especially in the sport brands-communities. Based on the results of this research and regarding the increasing competition between sport brands and the challenge of attracting new customers and retaining current customers, in order to create a brand-community in such a competitive environment, sport brands should seek to create and strengthen their brand characteristics on the perception of customers and provide the background for implementing the necessary strategies in this area.

Creating a customers' base that is intensively committed to the brand is the main and important and at the same time challenging duty facing marketers and managers in today's competitive world. By managing, maintaining and supporting brand-communities, companies can shape customer loyalty and attachment, and also increase their marketing and brand productivity. The brand-community is also created through customers' experience over many years. These evidences indicate that a successful sport brand-community can create attachment and be more effective if it is accepted in customers' perception. Creating a positive mindset in customers' perception also occurs when the brand-community is viewed by customers on the basis of purchase and satisfaction with it and having only a brand-community identity and a commitment to the brand-community will not be effective for creating an influencing and positive change.

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Interpretation of Land Geochemical Survey Data While Identifying the Lateral Boundaries of Oil-Bearing Geological Bodies

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Abstract

The relevance of the work results from the development of land geochemical petroleum exploration technologies, which allow conducting detailed surveys, but the lack of an adequate migration model limits the use of land geochemistry to detect promising areas. The work is aimed at developing principles for land geochemical field interpretation while delineating oil pools. To solve this problem, the authors use the results of geochemical surveys conducted at different stages of petroleum exploration. The work was carried out using the snow survey technique; CH4-C6H14 alkanes were used as the main measured parameter. The article shows how the land geochemical field structure depends on the reservoir fluid content and the vertical fluid permeability of overlying rocks. It also describes a particular role of cap rocks in petroleum accumulation within a reservoir. The authors discovered that at the oil pool periphery, there are local zones of vertical fluid migration caused by tectonic or stratigraphic factors. It was concluded that promising areas could be identified by detecting hydrocarbon anomalies on the surface, but oil pool delineation required data interpretation with the use of all available geological information to understand oil show genesis.

Keywords: Geochemical exploration, Snow survey, Hydrocarbon migration, Geochemical modeling, Urnenskoye field, Priobsko-Aypimskaya area.

Introduction

The theory on land geochemical petroleum exploration techniques (geochemical surveys) is based on the ideas about vertical migration of deposit fluid to the surface. Continued hydrocarbon migration forms anomalous zones of hydrocarbon concentrations in the surface environments. The task of geochemical surveys is mapping these anomalous zones and interpreting them in regards to potential hydrocarbon accumulation in the sedimentary cover.

Geochemical survey techniques vary depending on investigated samples and a set of detectable components. The investigated samples may be samples of soil, snow, bottom sediments, groundwater, etc. Currently, geochemists often employ the passive sorption method using artificial sorbent capsules instead of natural samples [1]. As a rule, gaseous, low-boiling hydrocarbons (saturated, aromatic) and other oil components are used as geochemical mapping parameters.

Geochemical surveys have a long history, and their methodology took shape by the beginning of the 21st century; in particular, their place and purpose in oil exploration were determined. Land geochemistry is traditionally used to detect promising zones in frontier areas; as maximum, it can be used to identify the fluid content of local traps before drilling. Most geoscientists believe that the problems of oil pool localization and its structure specification cannot be solved by land geochemistry [2].

However, modern analytical and digital technologies allow conducting areal surveys with a high density of observations. The use of a global satellite positioning system, high-resolution chromatography, digital systems for data bulk processing, etc. allows collecting and processing thousands of geochemical samples during a field season. These technologies provide an opportunity to cover large areas (hundreds and thousands of square kilometers) with 1:100,000 and 1:50,000 scale surveys. Nowadays, there are no technological problems with collecting, analyzing, mathematical and graphical processing of geochemical data.

The main obstacle to using detailed geochemical information for oil pool delineation is the insufficiency of theoretical grounds. Conventional models intended for interpreting the results of low-detailed works are inefficient in this case. The analysis of the results of detailed land geochemical surveys [3] shows that the relationship between the formation productivity and the geochemical field is much more complicated than a direct projection of the deposit to the surface in the form of a hydrocarbon anomaly. The search conception "anomaly = promising area" in the sense of "anomaly = oil deposit" is not confirmed practically.

In recent years, areal land gas-geochemical surveys significantly clarified the ideas about gas shows and driving forces of subvertical hydrocarbon migration. Fig. 1a presents a migration model that was the

most justified one at the end of the last century (O.L. Kuznetsov, A.V. Petukhov). In the case of a layer-uplifted reservoir, this model provides for the formation of a continuous areal anomaly over the entire field with concentric-oriented variations of hydrocarbon gases content with feebly marked maxima at the trap periphery within the productive area. In the case of a non-structural tectonically screened reservoir, the main geochemical signal is supposed to shift relative to the source upward along the uprising of overlying permeable layers; vertical migration is supposed to occur only if there are tectonic disturbances [4].

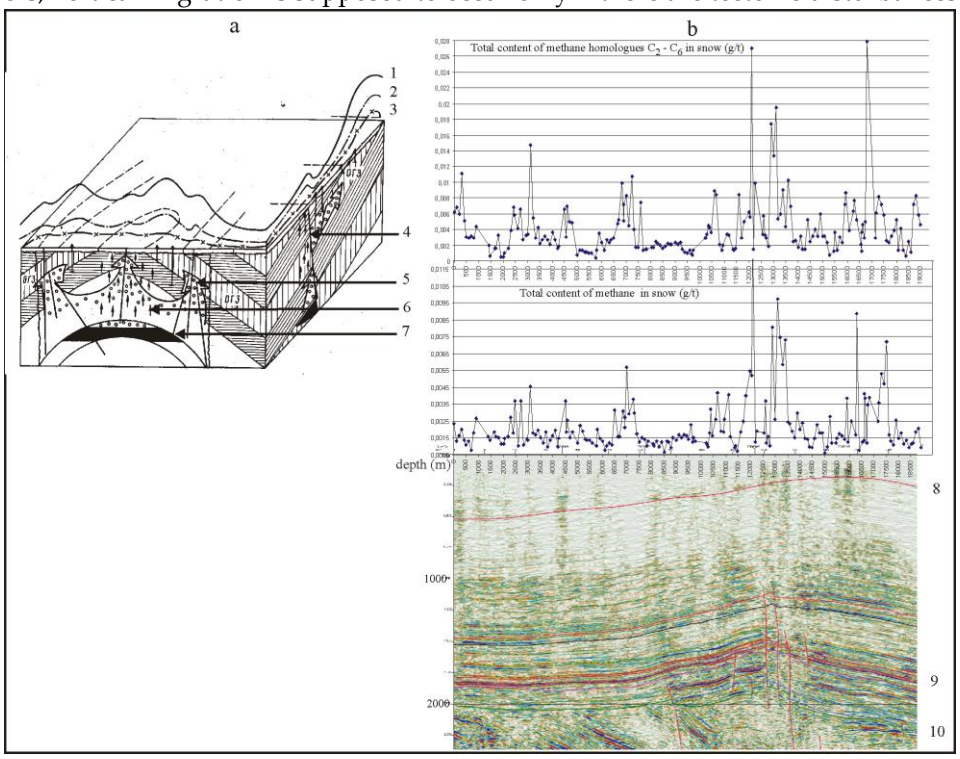


Fig. 1 Comparison of the conventional migration model with the real geochemical field over a local elevation. a – migration model (according to Kuznetsov and Petukhov, 1987); b – distribution of methane and its homologs along the research profile over a local elevation in the north of Western Siberia. 1 – methane distribution on the surface; 2 – distribution of the sum of methane homologs C_2 – C_6 on the surface; 3 – bitumoid distribution in the sediments overlying the productive formation; 4 – faults; 5 – migration plume; 6 – diffusion vector; 7 – hydrocarbon deposit; 8 – reflecting horizon G (roof of the Cenomanian sediments); 9 – reflecting horizon B (roof of the Jurassic sediments); 10 – reflecting horizon A (roof of the basement).

Such a model could result from generalizing the sparse observation grid data of sampling key geochemical horizons where the diffusion constituent of the migration flow could theoretically have a smoothing effect. Detailed land surveys show a slightly different picture. Fig. 1b presents the results of a geochemical survey of one of the anticlinal structures in the north of Western Siberia, which has oil-bearing strata in the Jurassic sediments and gas-bearing strata in the Cenomanian ones. The survey was carried out using the profile observation system with a sampling step of 100 m along a seismic profile "point to point". The distribution of concentrations of methane and its homologs in the snow cover relative to the cross-section structural features shows that:

- the geochemical signal is distributed contrastingly – at a distance of 100 m, the migrational hydrocarbon concentrations change by more than an order of magnitude, which indicates discrete and small-sized fluid-conducting channels;
- the most contrasting anomalies are confined to disjunctive disturbances at the structure dome, and there is no significant anomaly shift relative to faults, although from the depth of 1000 m to the surface they are not traced by the seismic survey.
- there is a high degree of correlation of methane and its homologs, which suggests that both Jurassic oil and Cenomanian gas use the same system of conductive channels in overlying sediments, although the local elevation domes of the Cenomanian and Jurassic deposits are strongly displaced relative to each other.

These and other [5] investigations show that, firstly, detailed geochemical work allow mapping different geological boundaries including boundaries of oil pools, secondly, the intensity of gas shows depends not only on the presence of hydrocarbon deposits but also on the structural features of the overlying strata. All above said allow defining the research problem – to develop principles for interpreting the results of land geochemical surveys applicable for identifying the most promising areas, as well as mapping the boundaries and detailing the structures of discovered deposits.

Materials and Methods

The research object is data obtained during long-term land geochemical surveys in Western Siberia in which the authors were directly involved. The main conclusions are based on a large amount of geological information collected over the entire period; however, this work presents in detail the results of two surveys: in the Priobsko-Aypimskaya area and at the Urnensko-Usanovskoye field. These surveys were conducted with different purposes: in the Priobsko-Aypimskaya area, the investigation was aimed at identifying sites for detailed exploration and at the Urnensko-Usanovskoye field, it was required to delineate a Jurassic oil deposit. All the works under consideration were carried out using the snow survey technique: at the observation point, a surface snow sample with a volume of 200 ml was collected, then in the laboratory this sample was subjected to thermal vacuum degassing, the extracted gas was analyzed using a chromatograph with a hydrocarbon detection threshold of no more than $1\text{-}10^{-7}$% in volume. Saturated hydrocarbons from methane (CH_4) to hexane (C_6H_{14}) were determined. Before degassing and analysis, the sample was stored under refrigeration. The terrestrial positions of observation points were determined using either a compass topographic binding (until 2000) or a satellite topographic positioning system GPS (in 2000 and later) with an error of no more than 5 m.

Results

The use of land geochemistry for identifying promising areas. In 1990-1991, 3600 km^2 of the Priobsko-Aypimskaya area (Khanty-Mansi Autonomous District) were investigated by a snow survey (1603 observation points). Sampling was carried out on a grid of seismic profiles with a distance of 5 km between the profiles.

At the time of the survey, the area was relatively untouched by exploration – only four wells were drilled there (well No. 10 of the Labatyuganskaya area, which gave an inflow of water with oil; well No. 15 of the Ay-Pimskaya area, which proved to be unproductive; productive oil well No. 6 and water well No. 7 of the Severo-Kamynskoye field).

The survey detected dispersed hydrocarbon gases in most of the snow samples. Some samples contained gasoline range hydrocarbons. It was discovered that the presence of clay beds did not guarantee a reliable seal and the sedimentary cover was permeable for microfluid migration.

The works were aimed at detecting promising areas. Such areas were identified by a direct quantitative indicator – an increased content of methane homologs (CMG) in the snow cover. Later, a number of oil deposits were discovered within the area by the subsoil user Surgutneftegaz (Fig. 2). The boundaries of the geological features in the figure are taken from the exploration company Surgutneftegaz from a 1:1,000,000 scale map of oil-bearing territories; the data was compared graphically – on the hydraulic network; therefore, the comparison error can reach 100 m. Almost all areas identified as promising were drilled and now are parts of oilfields. Such-scale works were carried out for the first time, and the interpretation technique was little-developed; however, the oil-and-gas potential of the territory was proved and the most promising areas were localized.

The above example shows that promising areas can be detected using only land geochemistry findings without any additional geological information. A simple quantitative indicator (increased petroleum hydrocarbon content on the surface) is sufficient for achieving this goal. This indicator points to active hydrocarbon migration in the sedimentary cover and, therefore, if there is a trap, a petroleum deposit may form. This information is sufficient for recommending an area for detailed geological exploration – a seismic survey succeeded by drilling.

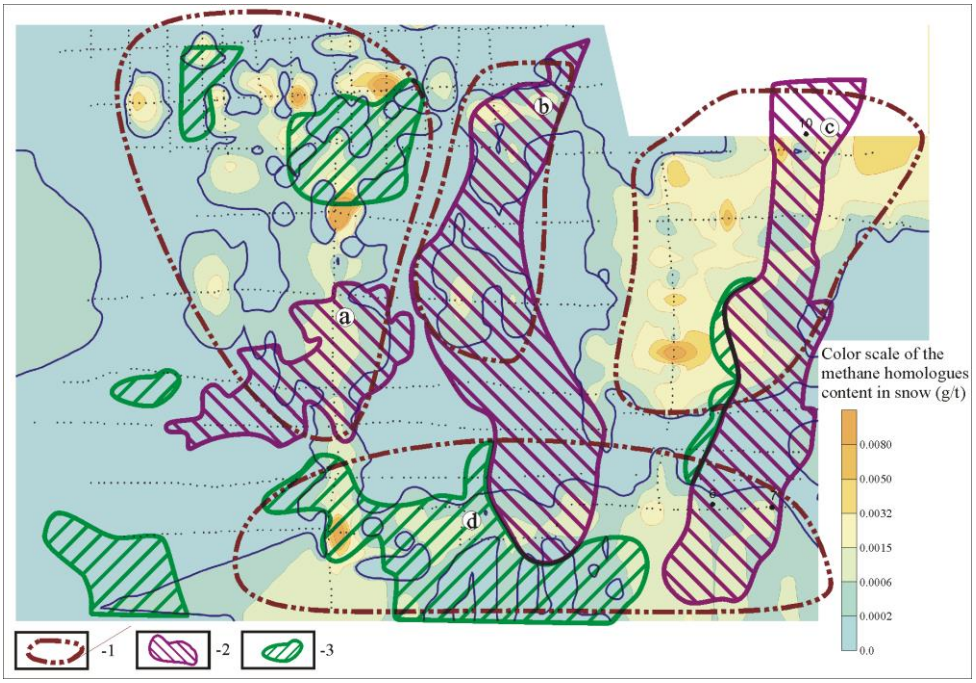


Fig. 2 Oil and gas potential of the Priobsko-Aypimskaya area according to the results of land geochemical petroleum exploration. 1 – highly promising zones according to the geochemical survey data; 2 – discovered deposits; 3 – prepared traps. Deposits: a – Mytayakhinskoye; b – Vostochno-Mytayakhinskoye; c – Severo-Labatyuganskoye; d – Zapadno-Aypimskoye.

The use of land geochemistry for delineating oil pools. In 2000 for the first time in petroleum exploration, a land geochemical investigation using the snow survey technique was used for delineating the Urnensko-Usanovskoye field.

By the time of the work start, the area was explored by a 2D seismic survey and drilling of 27 wells. According to the data of the exploration company "Novosibirskgeologiya", the commercial oil-and-gas-bearing capacity of the field was known to be associated with the J_1 Jurassic stratum and the basal horizon located on the pre-Jurassic basement. To the domes of the local elevations (Urnenskoye, Usanovskoye, Severo-Usanovskoye), the J_1 horizon is pinched out, and the basement is covered with the Kimmeridgian-Tithonian sediments. Two petroleum deposits were discovered in the J_1 stratum within the Urnenskoye and Usanovskoye local elevations.

The main deposit on the Usanovskoye local elevation was discovered by nine wells at depths of 2358-2391 m. This is a stratigraphic structural deposit complicated by a reservoir absence zone.

The survey purpose included identifying external and internal boundaries of oil and gas occurrence in the deposit territory, recommending an alternate layout of drilling exploratory wells, assessing oil and gas prospects of the area adjacent to the field in the east. The sampling density was one observation point per one km^2 within the deposit, and one observation point per two km^2 outside the deposit.

Already during the initial comparison, the authors detected a regular distribution of the geochemical parameter (CMG value) relative to the structural features of the J_1 oil and gas-bearing formation, although the absolute maxima of gas content were outside the main oil and gas-bearing zone – on the hypsometrically submerged areas (Fig. 3).

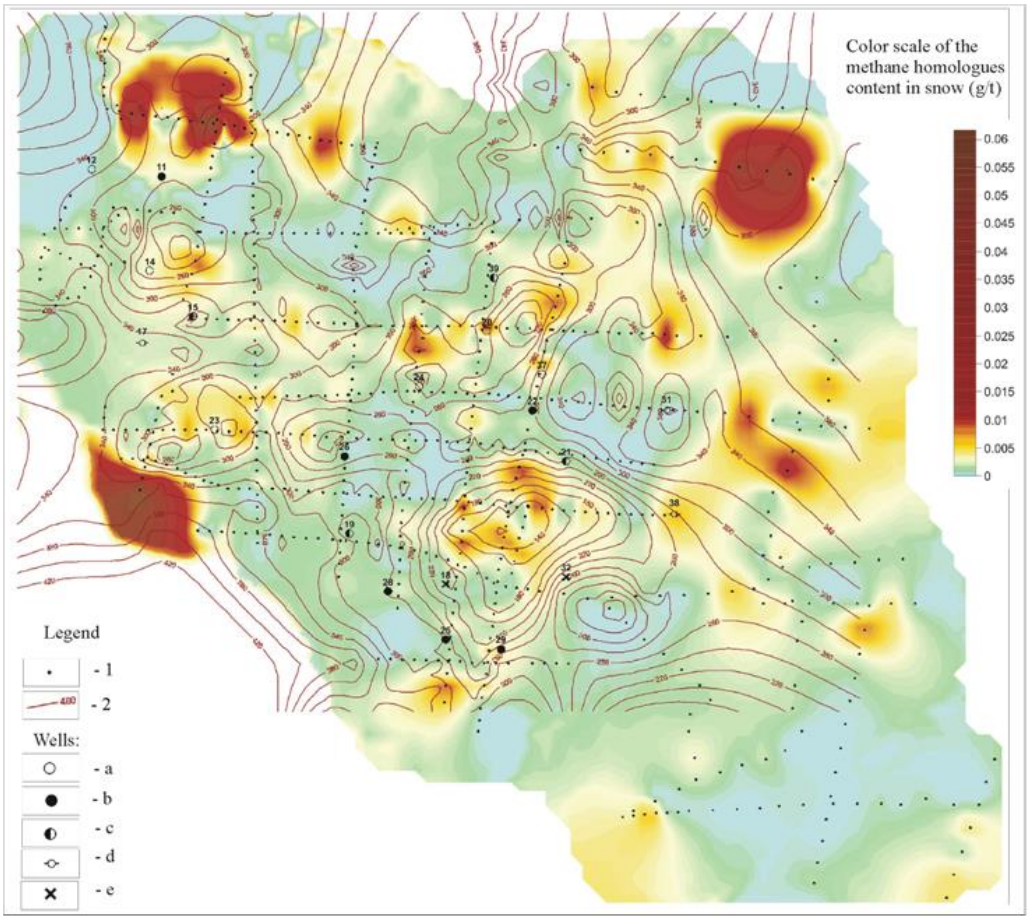


Fig. 3 Distribution of the total content of methane homologs (C_2H_6 – C_6H_{14}) relative to the $J_{1+basal}$ oil-bearing formation structure. 1 – sampling point; 2 – isohypses of the $J_{1+basal}$ formation roof. Wells: a – dry; b – oil; c – oil and water; d – water; e – no data.

Within the field, the most intense gas shows are confined to the domes of the local elevations and the minima – to the bottom sections of the structures. This zonality is most pronounced at the largest Usanovskoye local elevation.

Regular geochemical field zonality allowed identifying geological factors that determine its quantitative characteristics: a) replacing oil in the reservoir with water reduced the gas signal to zero; b) anomalies of the productive complex distribution were accompanied by vertical superconductivity of the overlying layers.

To determine the possibility of predicting oil and gas occurrence boundaries, a geological and geochemical cross-section was built (Fig. 4) through a series of wells with different saturation characteristics (Nos. 26, 20, 39, 36), which confirmed the peculiarities of reflection of the productive formation structure in the geochemical field at the local level. Both the internal deposit boundary caused by the pinching out of the productive formation and the external one determined by water-oil contact were reflected in the profiles of geochemical sampling with an accuracy equal to the sampling frequency – 500 m.

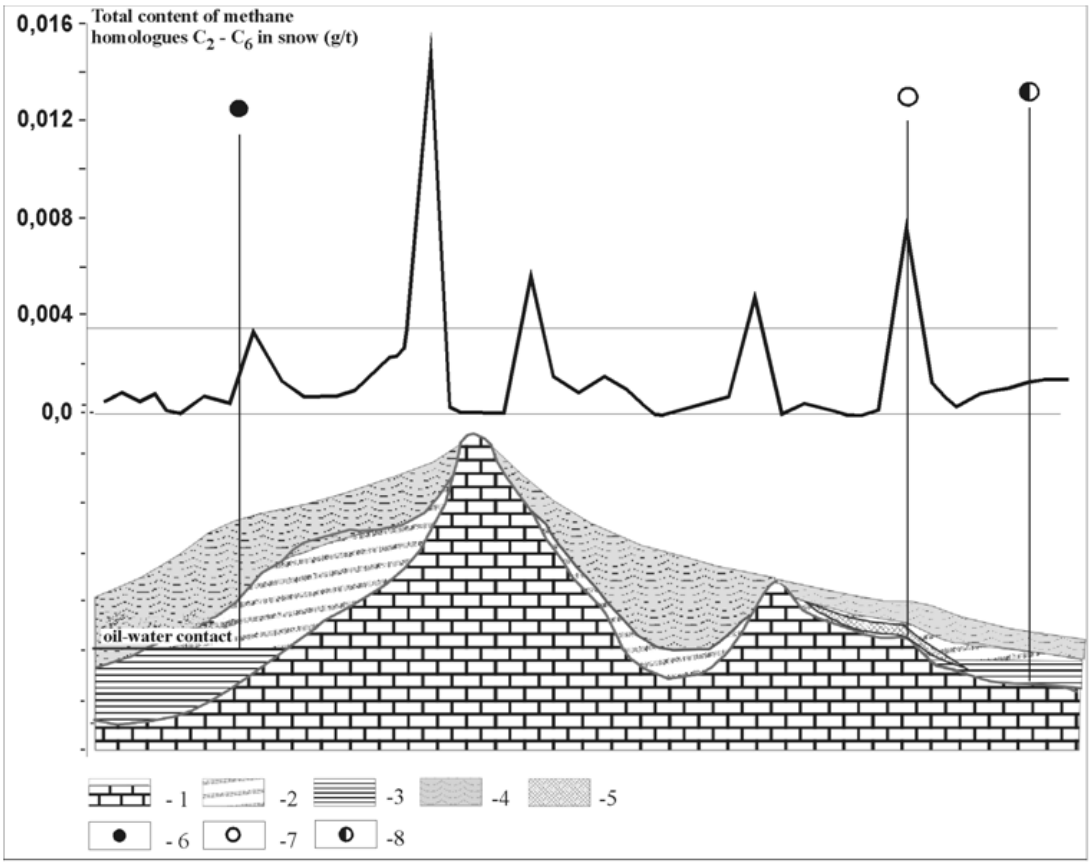


Fig. 4 Response from the oil-bearing capacity of the J_1 layer + basal horizon in surface gas shows in the Urnenskoye oilfield. 1 – basement, 2 – oil-saturated reservoir; 3 – water-saturated reservoir; 4 – effective cap; 5 – claying zone. Wells: 6 – oil, 7 – water; 8 – oil and water.

The research at the Urnensko-Usanovskoye field allowed establishing a number of regularities in the land geochemical field distribution relative to the productive formation structure.

Watered reservoirs give a zero hydrocarbon gas content in the land geochemical field, but one can observe local (represented by discrete points) gas shows in trace amounts, and the samples are often poor in light (propane, butane) components; the same is observed in the absence of reservoir rocks, for example, their clay alteration.

High-contrast anomalies of gas content in the snow cover are often confined to pinched productive complexes, basement highs, fractures, and other complications of the sedimentary cover structure.

Often, such anomalies are not confined to the identified (for example, by the seismic exploration) geological features. They indicate through zones of increased conductivity of unexplained genesis in the sedimentary cover. Exploratory wells drilled in such geochemical environment, as a rule, prove to be non-productive. Productive zones are characterized by low, but stable gas content in the snow cover over the entire territory.

Taking into account the discovered regularities, the work area was zoned by the content of methane homologs. The authors identified the following geochemical zones:

1.Zero and background hydrocarbon content (0-0.0006 g/t) indicating a water-saturated reservoir or its absence.

2. Low hydrocarbon content (0.0006-0.0025 g/t) indicating the optimal combination of an oil-saturated reservoir and an efficient seal.

3.High hydrocarbon content (0.0032-0.005 g/t) indicating zones of increased vertical conductivity of cap rocks.

4.High-intensity gas shows (over 0.005 g/t) indicating local zones of fluid migration, degradation of cap rock sealing properties.

The boundary values of the CMG in the snow cover were determined by statistical methods [5].

According to the results of geochemical zoning, and taking into account the seismic plan of the productive horizon, the authors forecasted the external (determined by water-oil contact) and internal (along the boundary of the productive layer pinching to the basement high) deposit boundaries in the Jurassic sediments.

Seven years later, the subsoil user "TNK-Uvat" carried out a detailed 3D seismic exploration at the Urnensko-Usanovskoye field. The obtained data confirmed the high degree of correlation between the geochemical signal and the cross-section structure, as well as the fact of pinching out of the oil and gas complex (Fig. 5).

These and other [5] investigations, on the one hand, confirmed the Kuznetsov–Petukhov model [4] in terms of the dependence of the land geochemical field on the stratigraphic, tectonic and lithological features of the structure of the productive complex and overlying layers, on the other hand, showed that:

- high-intensity geochemical anomalies are markers of oil and gas occurrence boundaries. In the rock superconductivity zones covering oil and gas reservoirs, petroleum accumulation in commercial quantity is impossible;
- the geochemical signal from the deposit on the contact of the lithosphere and atmosphere varies along the observation profile discretely, which indicates microfluid hydrocarbon migration;
- the verticality of conductive channels in the sedimentary cover is sufficient to restore the boundaries of oil and gas-bearing geological bodies by surface gas shows with an accuracy determined by sampling density;
- within the distribution of oil and gas-bearing strata, high contrast gas shows may occur that are not directly related to oil and gas content in commercial quantity.

Summarizing the obtained data allows developing a working model of hydrocarbon migration explaining the greatest amount of factual material and suitable for interpreting the data of areal geochemical surveys. This model can be presented in the following way.

An oil pool is a system in dynamic equilibrium: on the one hand, there are processes leading to an increase in the formation pressure (water-oil emulsion inflow, thermal cracking of hydrocarbons, and hydrothermal injections), on the other hand, the overpressure is released causing a decrease in the rock pressure, i.e., generally vertically upwards. The most intensive migration occurs along the zones of overlying rock decompaction of different genesis. This may be a zone of tectonic activity, zones of stress maxima of the layers overlying the anticlinal fold, zones of hydrothermal activity, etc. In any case, cap rocks lose their sealing properties, which means that oil and gas accumulation is impossible directly in one or another section, along the whole cross-section. Fluids also migrate through the cap rock, but in a much smaller quantity; in some cases, the difference in flow intensity reaches two-three orders of magnitude. Some data [6, 7] suggest a fundamental difference between these two processes: if through the pressure relief zones water (the main component of the sedimentary basin fluid system) transports oil which does not allow hydrocarbons to accumulate, then passing through an effective cap rock, water leaves the bulk of hydrocarbons on the semi-permeable capillary screen bringing to the surface only the residual amount of the most migratory components [8].

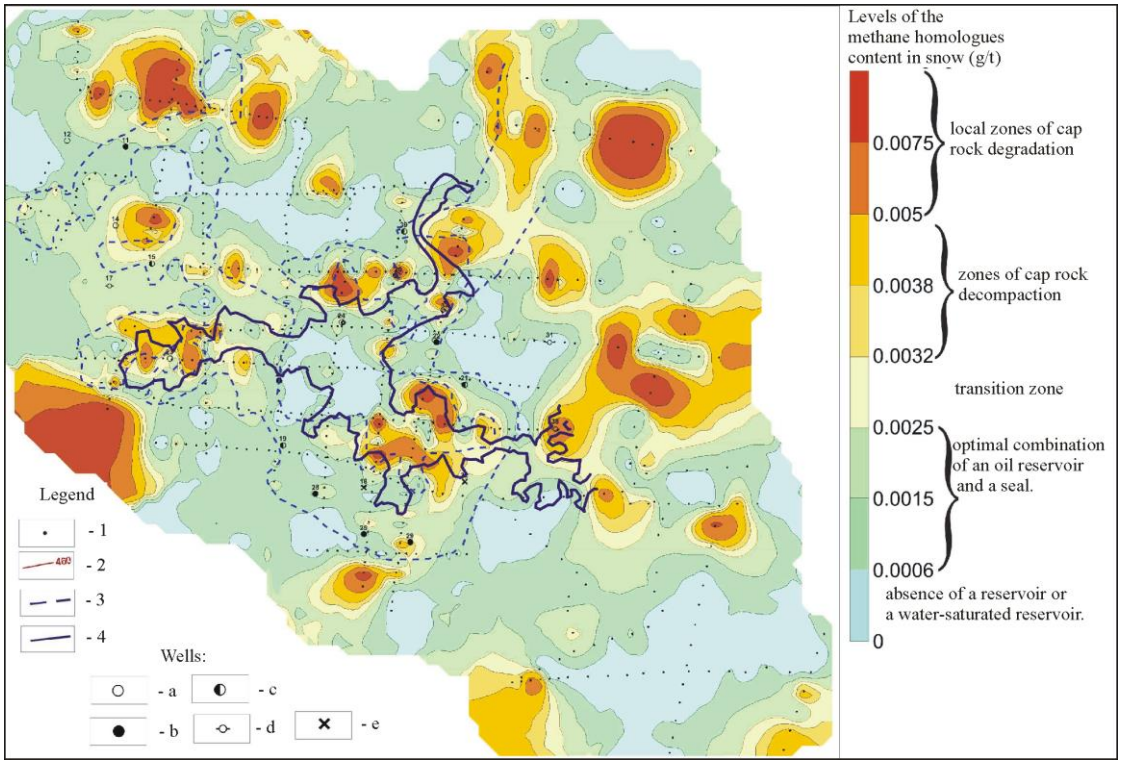


Fig. 5 Data of geochemical zoning of the Urnenskoye field territory according to the results of the works in 2000 relative to the boundary of the J_1 productive formation pinching out according to the results of the 3D seismic survey and drilling (TNK-Uvat, 2007). 1 – sampling point; 2 – isohypses of the $J_{1+basal}$ formation roof; 3 – forecast of the oil occurrence boundaries of the $J_{1+basal}$ formation according to the geochemical survey data; 4 – forecast of the boundaries of the $J_{1+basal}$ formation pinching out according to the data of the 3D seismic survey and drilling (TNK-Uvat, 2007).
Wells: a – dry; b – oil; c – oil and water; d – water; e – no data.

The data of detailed land surveys show that the geochemical field indicates not only hydrocarbon presence in the cross-section but also the conductivity of the overlying rock, which is an important factor of petroleum accumulation. The land geochemical field varies discretely, so the boundaries between the consolidated zones with different quantitative and qualitative characteristics are identified with high accuracy. The obtained data allow stating that each zone of the geochemical field must have its own geological interpretation, and the boundaries of these zones reflect the lateral boundaries of various geological environments.

The proposed model of hydrocarbon migration not only explains most of the observed facts of surface gas shows, but it is also a tool for interpreting data of detailed geochemical surveys aimed at identifying oil pool boundaries and structure. At this stage of petroleum exploration, geochemists already have access to the results of the seismic survey and exploratory well testing; therefore, the geochemical data should be interpreted using all available geological information.

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Applying Simulation for the Development of Active All-wheel-drive Systems

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Abstract

Following the digitalization trend, passive torque control systems of all-wheel-drive vehicles give way to systems with an electronic control unit (ECU), or, in other words, active torque control systems. Such systems operate usually with the help of a multidisc friction clutch and there are patterns without inter-axle and even inter-wheel differentials. In this case, not only the performance of the main task strongly depends on the software but also the durability of all driveline components and tires. Earlier algorithms had a lot of problems, which were detected already during exploitation. Today, simulation tools are widely used to improve the performance and reliability of control systems. The purpose of this work is to show an example of applying simulation, which will allow avoiding some defined problems already at the starting development stage. For this purpose, earlier patents of the active torque control algorithm were explored; some problem was founded and reproduced with the help of a simulation tool. At the next step, some variants of solutions to these problems are presented. Specifically, two cases are considered: the case of hunting during moving on a low-friction road surface and the case of vibrations if the engine was shut off after a stop during cornering.

Keywords: Driving torque distribution control, Four-wheel drive, Active torque control, Control algorithm, Simulation.

Introduction

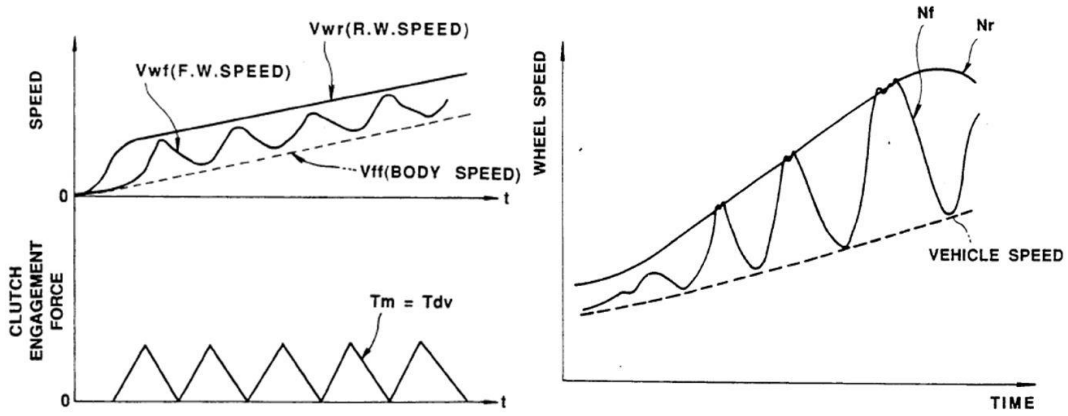
First active torque control algorithms were primitive and led to some problems during exploitation. When a new problem was detected, the developers issued an update with a solution and patented it. Today, due to these patents, one can see which problems were met by the first developers of such algorithms. The main reasons for problems during development were inexperience and lack of possibilities for testing, tuning and debugging the software [1].

To exclude these problems, during the development of a new algorithm, it is necessary for the active torque control system to reproduce the defined cases with the help of a modern simulation tool. For this task, LMS Amesim was used. Using simulation models, it is possible to check some solutions to the problem, compare them and choose the optimal one for further development.

Hunting. One of the first publications devoted to the solution to this problem was made by Nissan. It was for a vehicle with a continuously engaged rear axle and a front axle connected by the friction clutch. The control algorithm was very simple and in the case of slipping represents a proportional regulator, which uses the difference in rotation speed between the front and rear axles as an input argument.

Hunting occurs because of the feedback loop, especially in a starting operation or at medium acceleration on a low friction coefficient road surface. When the front or rear wheels undergo a wheel spin (overspeed rotation) in such a situation, it readily affects the wheel speed difference by affecting the output of the wheel speed sensor and results in the undesirable oscillation of the clutch engagement force of a torque distributing transfer clutch. This oscillation, that is, hunting, causes unpleasant noises and vibrations [2, 3].

Immediately after the start, as shown in Fig. 1, the rear wheels fall into a wheel spin, which causes an increase in the wheel speed difference. In response to this increase in the wheel speed difference, the control system increases the clutch engagement force and increases the engine torque transmitted to the front wheels. By receiving the engine torque, the front wheels increase their speed rapidly because the inertia of the front wheel drive system is smaller than that of the rear drive system, and the front wheels also fall into a wheel spin.



a b

Fig. 1 Hunting pocess: a – source [2], b – source [3].

This front wheel spin causes a sharp decrease in the wheel speed difference, and the control system sharply decreases the clutch engagement force. With the sharp decrease in the clutch engagement force, the front wheels of the smaller inertia regain their gripping ability, and the wheel speed difference is sharply increased again. In this way, the conventional control system causes the clutch engagement force to swing upwardly and downwardly as shown in Fig. 1.

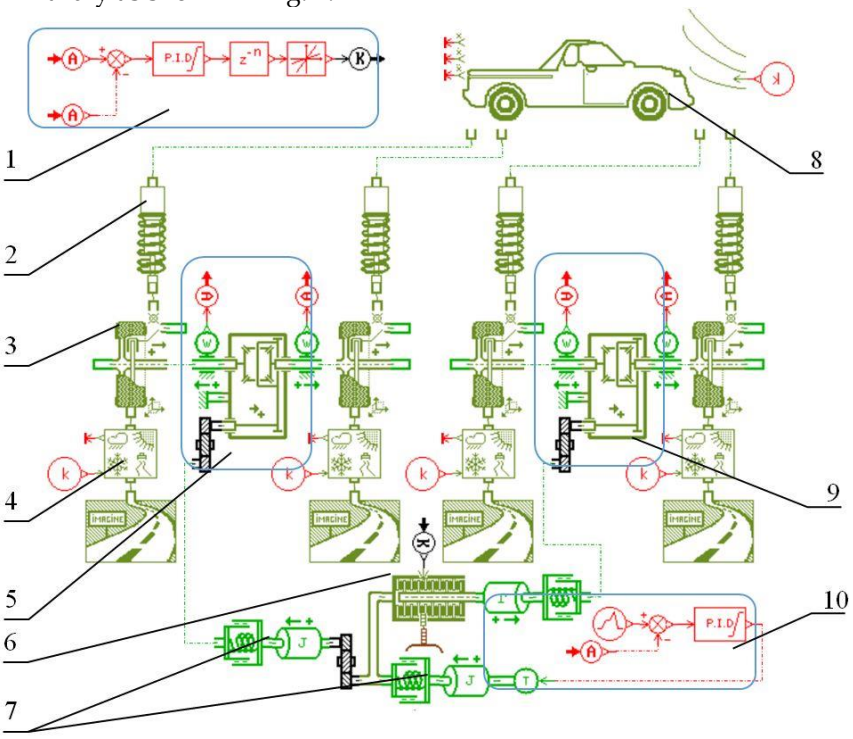
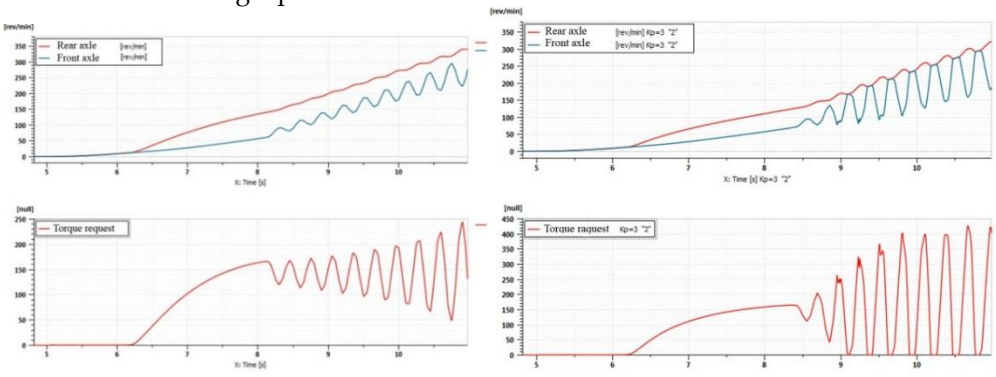


Fig. 2 Simulation model sketch.

During this hunting state, the front wheels of smaller inertia alternate between the state of wheel spin and the state of grip in response to the oscillation of the clutch engagement force, while the rear wheels of greater inertia remain in the wheel spin state [2, 3]. One of the tasks of this research is getting similar results with the help of simulation. For this purpose, a simulation model was developed on the base of the standard component library LMS Amesim. A model sketch presented in Fig. 2 includes: 1 – simplified schema of clutch control; 2 – suspension, defined by the stiffness and damping coefficients; 3 – tire model, defined by Pacejka's "Magic formula"; 4 – sets the road surface adhesion coefficient; 5 – rear final gear with a differential; 6 – interaxle clutch represented by the dry friction tangential model; 7 – stiffness and inertia of driveline parts; 8 – sprung mass and aerodynamic characteristics; 9 – rear final gear with a differential; 10 – torque source represented by a combustion engine. With the help of this model and parameters tuning, the

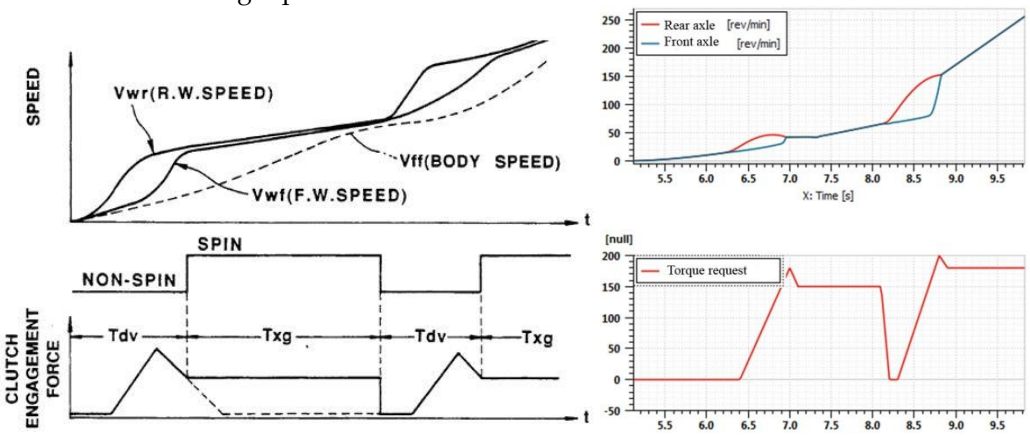
target result, which is illustrated in the patents described above, was got successfully. The first conclusion based on the simulation results, which are shown in Fig. 3, is that difference between two illustrations of hunting (Figs. 1a and 1b) can be explained by the different proportional coefficient k_p in the control algorithm, other conditions being equal.



a b

Fig. 3 Simulated hunting: a – k_p=2.1; b – k_p=3.

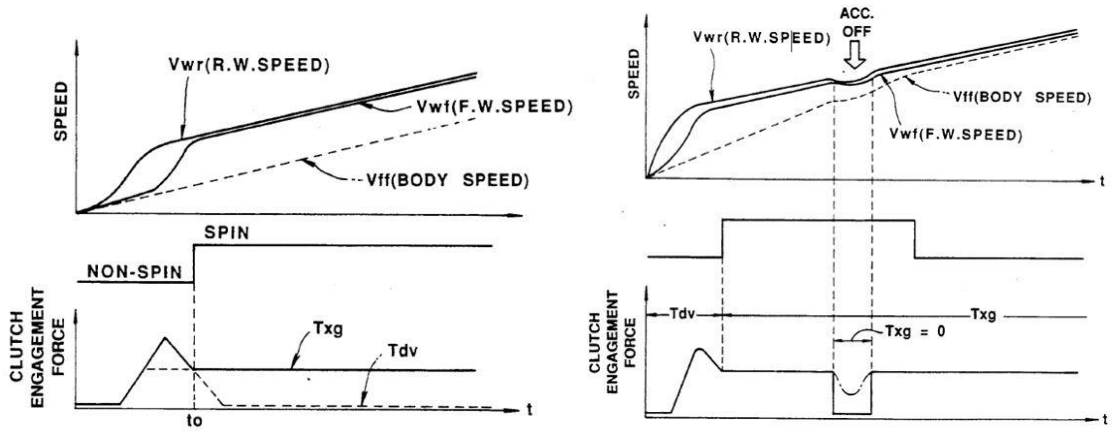
The first solution, suggested by Nissan, is to hold the clutch engaging pressure until the wheel spin ends; this process is illustrated in Fig. 4. This way has an essential fault – clutch disengaging after the end of the wheel spin can lead to the repeating of the wheel spin cycle. In such a manner, the process retains cycling, albeit occurs with a larger period.



a b

Fig. 4 Hunting prevention by the way of engaging pressure holding until wheel spin stops:
a – illustration from the source [2]; b – simulation result.

According to the second solution variant, the front axle torque is calculated by two independent ways. By the first way, the front axle torque value is the function of the front-rear wheel speed difference, and by the second way, it is the function of vehicle acceleration. By default, the first way is chosen, but if hunting is detected, turning to the second way occurs, and this method allows avoiding hunting completely. The result of this solution result is shown in Fig. 5a.



a b

Fig. 5 Counter-hunting process. a – by choosing the calculating method; b – by preventing action.

One more solution is preventing action before hunting. During accelerating on a low-friction surface, after synchronizing the front and rear axles, engaging pressure is held before hunting starts, and is reduced only after reducing the gas pedal action. The result of this solution is shown in Fig. 5b.

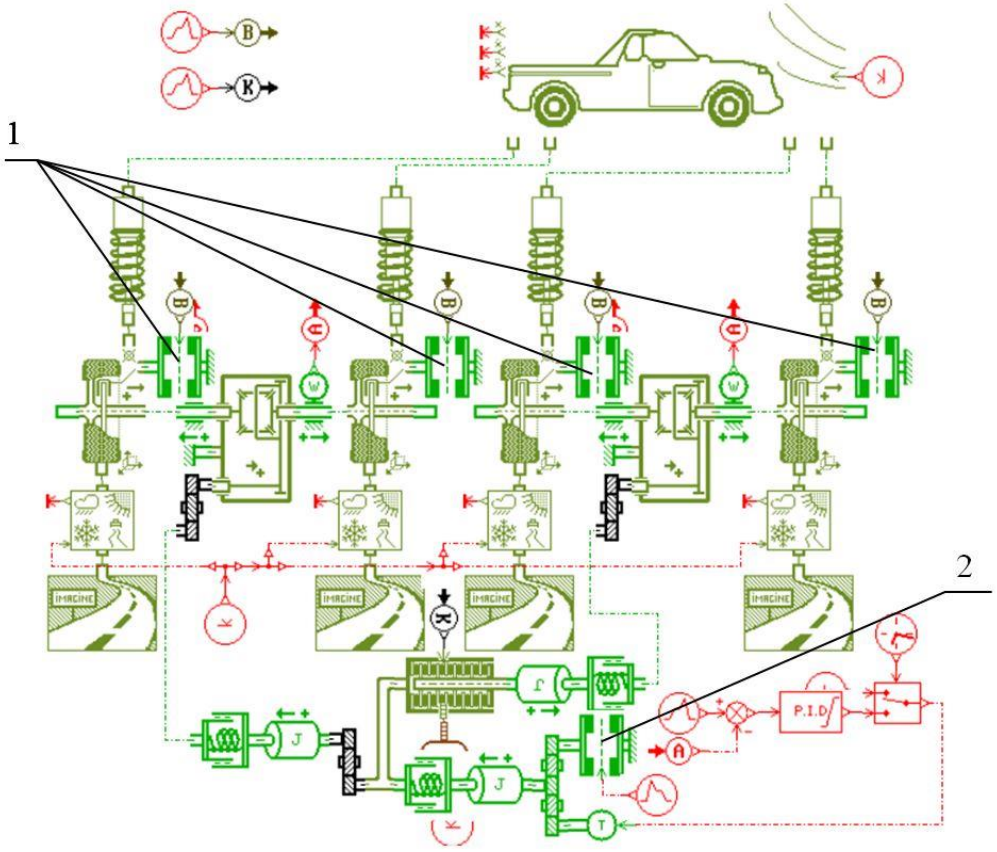


Fig. 6 Simulation model sketch.

Today, preventing methods are widely distributed, but current active torque control systems actuate one step earlier, before wheel spin starts, as a reaction to gas pedal action. There are several conditions for reducing engaging force: reducing pedal gas position, vehicle speed threshold, turned the steering wheel, etc.

Vibrations after a stop during cornering. The second problem within the framework of the current paper is vibrations in the case of engine shutoff after a stop during cornering. These vibrations appeared due to the next reason. The engine drive torque is distributed to an extra wheel at a predetermined distribution ratio. When the vehicle makes a turn at a low speed and when the torque distribution ratio to the extra drive wheel is high, torsion is produced in the vehicle body, suspension and tires, etc., due to a rotation radius

difference between the main and extra drive wheels. After the vehicle has stopped, and the engine is stopped, torque is no longer distributed to the extra drive wheel, the torsion is suddenly released. The release of this torsion causes the vehicle body to vibrate and oscillate in a top/bottom and front/back direction, and this gives an uncomfortable feeling to the driver and passengers of the vehicle. In addition, torsional oscillation influences driveline durability [4, 5].

For the simulation of this case, the same model was used as in the previous case, but with some changes. As can be seen in the simulation model sketch in Fig. 6, a wheel brake 1 and a transmission brake 2 were added. In addition, as this model allows simulating straight line motion only, rear/front rotating speed difference was realized by the way of setting different wheel radii for the front and rear axles.

The simulating test includes several sequential acts shown in Fig. 7:

- vehicle acceleration;
- interaxle clutch engaging leading to wind-up;
- braking by wheel brakes until the vehicle completely stops;
- switching the transmission to the parking mode;
- release of wheel brakes;
- disengaging the interaxle clutch leading to the release and torsion oscillations of driveline parts.

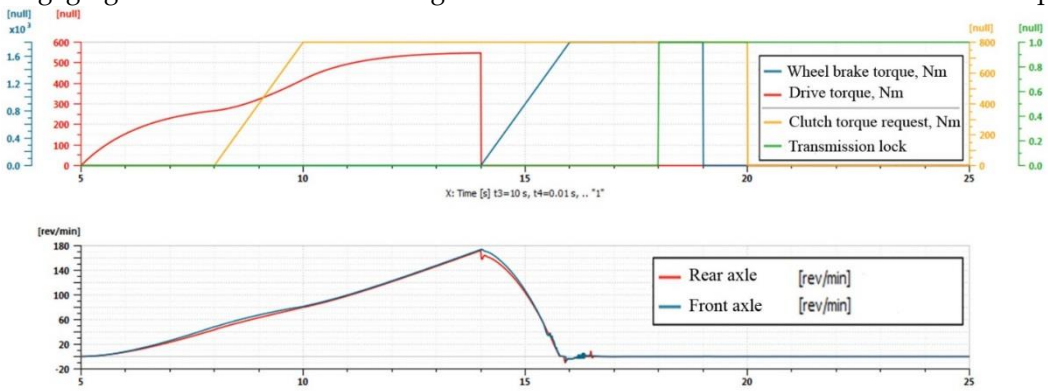


Fig. 7 Sequence of acts of the simulated test.

According to the results of the simulation shown in Fig. 8a, one can see a torque surge in the driveline with following decaying oscillation induced by the clutch release. In the presented simulation results, the max torque value of the transmission parking brake topped around 200 Nm. But this value can vary depending on the vehicle weight and adhesion limit in the tires contact patch. Supposedly, it is the shown torque surge that passes through the gearbox housing and suspension elements that is a reason for vehicle body vibrations, which gives an uncomfortable feeling to the driver and passengers.

As a solution to this problem, "Nissan Motor Co" patented the method based on slowly reducing the interaxle clutch pressure when vehicle speed reduced under the defined threshold and determining the pressure value which allows a transmission release without torsion oscillations [4].

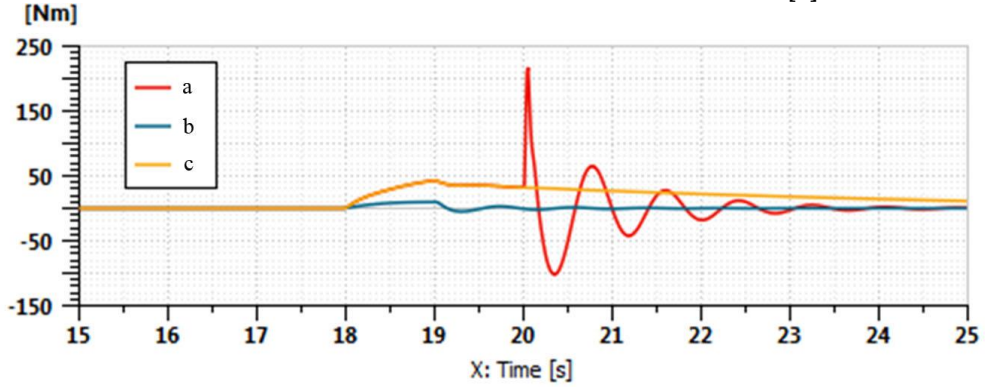
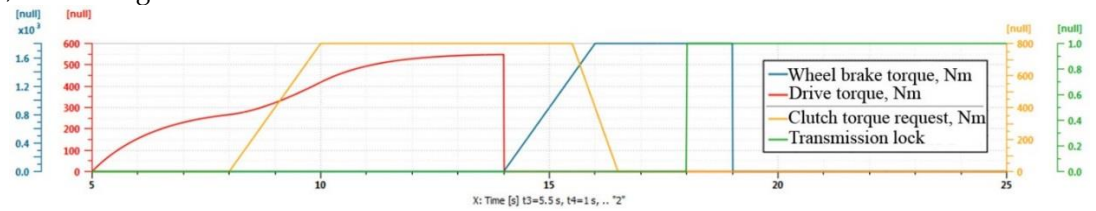


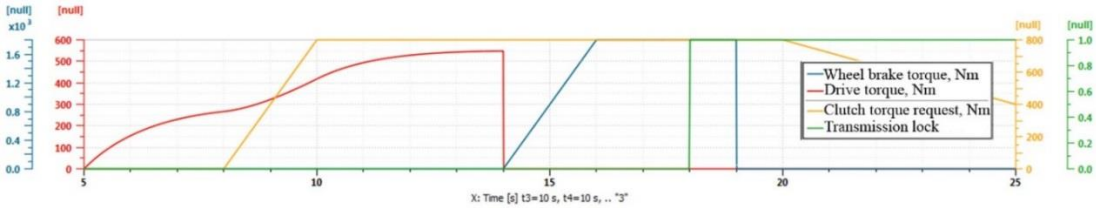
Fig. 8 Torque which passed through the gearbox housing: a – with a sudden transmission brake release; b – with a slow release during motion; c – with a slow release after stop.

For testing of this solution, the simulation was fulfilled with reducing the clutch pressure during vehicle deceleration, as shown in Fig. 9a. As shown in Fig. 8b, the max torque value falls off in times, which indicates the efficiency of this solution.

Another possible solution is a slow reduction of the interaxle clutch pressure after stopping the vehicle and turning off the engine. This solution may be put into practice in different ways, for example, through installing a valve which would allow slowly reducing pressure in the booster in the case of a hydraulic actuator. Also, it is possible to slowly reduce engaging force, using engine independent actuator kinds, for example, electromagnetic or electromechanical.



a



b

Fig. 9 Prevention of vibrations: a – reducing the engaging force during vehicle deceleration; b – slowly reducing the engaging force after stopping the vehicle.

The sequence of simulated test acts is shown in Fig. 9b. As a result, by tuning correctly the gradient of engaging force decrease, transmission release without a torque surge and oscillations was achieved, as can be seen in Fig. 8c.

Both supposed methods are effective for preventing vibration after transmission release, so it is acceptable to apply any one of them for new development. But in the case of upgrading of an existing system, if it is possible to solve the problem by upgrading the software; this way is more preferable as in general, it is faster and more cost-effective than hardware upgrading.

Conclusion

The article demonstrated the way of applying simulation for the development of complex technical systems. Some problems, which should be taken into account in the case of development of an active torque control system, were simulated. Further, some solution to the simulated problem was tested by means of simulation. The next step of applying simulation may be determining the algorithm characteristics, for example, optimizing the engaging force decrease gradient for an individual vehicle.

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The Potential of a Regional Culture in the Process of the Value Worldview Forming of Primary Schoolchildren

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Abstract

The article deals with the potential of a regional culture in the process of the value worldview forming of primary schoolchildren, the relevance of the work is seen through the prism of the system of cultural development in the educational process. The essence of the development of the child's personality at the present stage is considered not just as a process and the result of qualitative and quantitative changes, but as a goal and result of cognitive and moral development, the process of its "rotation" in human culture.
Keywords: regional culture, educational sphere, continuity of generations, value worldview, value attitude, primary schoolchildren, primary school.

Introduction

There are many concepts, technologies, partial programs, in which civil, patriotic education of children is represented in different volumes. At the same time, these programs cannot solve the problems of the upbringing, education and development of children based on local history material, considering the specific features of a region.

The whole history of human society development right up to the beginning of the third millennium showed that childhood is the most important period of the personality formation, when the background of civic qualities is laid, ideas about a person, society, culture are developed. The urgency of the problem of the children's cognitive and moral development in the twenty-first century is reflected not only in the narrow pedagogical sphere, but also influences the entire society.

Main material

The "National Doctrine of Education in the Russian Federation until 2025" emphasizes that "the education system is designed to ensure ... historical continuity of generations, preservation, dissemination and development of national culture, education of respect for the historical and cultural heritage of the peoples of Russia" [9]. In addition, "The strategy for the development of education in the Russian Federation for the period up to 2025" among the priority areas in the field of parenting determines the development of a highly moral person who shares Russian traditional spiritual values, having relevant knowledge and skills to realize their potential in today's society. [3]

In this regard, let us turn to the art of Kostroma artist, writer, author of fairy tales and poet Efim Vasilievich Chestnyakov. As he believed, love for children is the key to all creative activity and the idea of awakening creativity in every person. All his work permeates the didactic note expressing the main idea: the good attitude of a person to a person, the victory of good over evil, the benefits of a common activities and work, about the general welfare achieved only by collective efforts. Having devoted all his life to building the peasant folk culture, E.V. Chestnyakov understood it as the enlightenment of the mind and soul, which does not need to be rebuilt: you should take advantage of the accumulated in people's everyday life, beliefs, folklore, ritual, and introduce "artistry" into it, that is, an element of aesthetic organization [2; 6].

Ensuring the implementation of the regional component of the upbringing, education and development of children's creative abilities based on the E.V. Chestnyakov's creative heritage assumes the implementation of the project, which solves the following tasks: first, the introduction of the children of

senior preschool age to the culture and traditions of the Kostroma region through the E.V. Chestnyakov's work, based on cooperation of teachers and parents; secondly, formation of aesthetic culture, artistic and creative abilities; social development of children of senior preschool age in artistic and aesthetic activities (visual, musical, theatrical) based on the E.V. Chestnyakov's creative heritage; thirdly, developing by teachers new approaches and available technologies that contribute to the formation of artistic and creative abilities, the aesthetic and social development of children of senior preschool age.

The project included several interrelated steps aimed at solving the set tasks. At the first stage, search and accumulation of material on the works of E.V. Chestnyakov, colleagues' work experience in this direction, searching for partners and establishing business contacts, were performed. The initial survey of the pupils' parents showed that they have little knowledge of the work of the artist, poet, storyteller E.V. Chestnyakov, but at the same time, are interested in the kindergarten's activities to familiarize children with his work, they see the directions of activity. The need for educational work with parents on this issue, as well as the need to organize joint events, including excursions to exhibitions, was identified. The next step was creation of a mini-museum of Yefim Chestnyakov, clarification of calendar-thematic planning, development and implementation of mini-projects on the artist's creative heritage.

The excursions to the exhibition of paintings by the master, to the cultural and educational center named by Efim Chestnyakov, watching the play "Efimkin Festival" in the puppet theater were organized for the children. Meeting with E.V. Chestnyakov's creative work was the richest source of cognitive and moral development of each child's potential, contributed to the formation of a sense of belonging to the artistic heritage of the past, and allowed them to captivate the visual arts. In a joint activity, children met with fairy tales, poems by E.V. Chestnyakov, painted and sculpted according to fairy tales "The Wonderful Apple", "Ivanushko", "Sergyushko", by creating "glinyanki", drawing pictures they learned to convey their impressions. In the merry festive performances, the children and the audience with them were active participants in the "City of Universal Prosperity," as their author, E.V. Chestnyakov.

An important stage was involvement of parents in the group's life, active use of the family potential in the formation of cognitive-moral values. A parent meeting was held on the topic "The role of the fine arts of the native land in the aesthetic development of children"; consultations: "How to visit a museum with a child". "To acquaint children with the work of E.V. Chestnyakov," literary and musical room "Artist of Fabulous Miracles"; the album "E.V. Chestnyakov, artist, storyteller, poet", mini-gallery of E.V. Chestnyakov; family reading of fairy tales by E.V. Chestnyakov.

In the new millennium, approaches to a variety of values and ideals are revised, but culture and morality remain in essence the main pivot in educating the younger generation, culture has its own roots, its own traditions, and it drives to some extent the process in morality itself, drives everything that happens in society and specifically with a person, namely in the environment where he mostly lives, first of all, this is of course the family and this is his main focus, where he allows to some extent some relaxation, some weakness for himself, but he must understand that the culture remains a priority aspect in the process of upbringing and teaching the child. The whole family experience goes from generation to generation. That is, by inheritance, the transfer of accumulated experience by adults is carried out, a kind of continuity in the cultural dimension is performed.

Only cultural values can be the measure, even in politics, economy and, of course, the family. In the 90s of the twentieth century economic and socio-cultural values in modern Russia have changed dramatically and not for the better. This was reflected in the law of the Russian Federation. The educational process in the formation of the schoolchildren's personality began to lose its relevance. The chaotic component lowered its significance, namely, because of the lack of concept, social-economic and psychological anxiety appeared among the population, including fears among parents and their children, and morality and spirituality dropped sharply [5]. In this regard, aggressiveness and cruelty began to appear, the percentage among students with deviant behavior increased. In the process of educating and training the younger generation, the so-called formalism, which today has been noticeably transmitted into the consciousness of the younger generation, has infused itself. "Personality" is a diagnosis where one is treated only by one spirit, "conscience", "justice", "honesty", love of neighbor. Formalism was reflected in the spiritual and moral education and training of children in school. In particular, the spiritual and moral potential in the child's development, and in the cultural space in general, was ignored.

Currently, moral culture is at the interface of ethics and morality [10]. Now two aspects can be considered in the essence itself: "Moral culture" and "Culture". This is a generic concept. The second main aspect is "Morality".

The very idea of moral culture lies in the etymology of the word "Culture." The ancient world tells us that culture originated from the Latin word "cultura", i.e. "Cultivation of the land", its cultivation to produce a change in nature under the influence of man. Afterwards they "began to understand everything created by man as culture." From time immemorial, culture itself, its specific way of forming in human activity, is a product of material and spiritual labor that is embedded in spiritual values, in the relationships of people, in people themselves, in the nature, in the family and in transferring the best to the process of raising a child, in upbringing and in additional education.

At the beginning of the twenty-first century the process of spiritual and moral upbringing of a child and a worthy "Personality" in future lies on the spiritual and moral layer of culture, as a teacher, parent of a child, and the child himself must also participate in his cultural educational process where the process of inculcation and accumulation of spiritual and moral education and self-education of schoolchildren takes place. V.A. Sukhomlinsky has made a huge contribution in his works, into the education of schoolchildren through morality and culture. The main pedagogical task of the famous great teacher was the formation of a moral culture of a child that would be represented higher than Western and European cultures and would not lose its essence and tradition, so that children themselves and with the help of adults would achieve it, namely: "as self-awareness, acceptance of the most universal morality norms; education of emotional feelings; management of emotions, desires, the formation of impulses during their activities". Evaluation of your actions [5]. According to many scholars, the moral culture of a person is an edge and the social essence of the personality itself, reflecting the entire moral and ethical act, in the process of communication with people, with the world as a whole, also being in specific situations, mastering and reproducing moral relations. Spirituality and morality do not depend on the epoch, on the time frame, or guidelines, on the values and measure of all, which in this world requires the most significant results for its formation, on which human life depends. At the same time, youth education is the main and priority task in the Russian Federation, a specific political component is formed on the basis of state policy, where the state system itself is created, aimed at educating the economic and effective personality formation at the heart of which is a social order in the Russian society aimed at preparing young professional managers.

Today, the main task falls on the cultural and intellectual potential of young people, as the main reserve in society is the very quality of life in society where young people themselves live and the whole fate of Russia itself depends on its development. Studies have shown that in the 21st century, spiritual and moral education is the basis of the modern education of schoolchildren. The professional orientation on the acquisition and development of basic values for the whole moral and cultural potential of schoolchildren lies in the accumulation of cultural education and the development of potential in the educational environment and in society. Based on this, the moral attitude of schoolchildren in educational activities for spiritual moral education is formed [8].

The main source of formation in moral relations at school is objective relationships that help to acquire knowledge in the process of activity and communication between the student and the teacher. In the educational process, moral relations are transferred to the moral qualities of the individual, that is, the teacher is a mentor and organizer in the development of moral priorities directing the student to the knowledge of cultural values. The spiritual and moral upbringing of a child largely depends on the means and forms of organization, on the character, his act, on the moral state of the child, on satisfaction in obtaining knowledge [9]. All aspects that are involved in spiritual and moral education should have their own goals and objectives, without which the result, which is aimed at shaping the child's personality in the most spiritual direction, cannot be seen.

According to experts, the educational process in modern conditions remains controversial. The indicator of the irreplaceability and part of the negative phenomena in the youth environment, like alcoholism, smoking, drug use, increased crime, remains; new forms of antisocial behavior among young people, called "extremism", appear. Considering the socio-economic potential of personal formation as a genetic gene pool in the formation of a spiritual and moral personality, it is alarming and remains negative in the twenty-first century. The President of the Russian Federation paid attention to the issue at the X Congress of the Commissioners for Children's Rights in the regions of the Russian Federation. The topic is "Formation of state policy in the field of parenting." The main task and its priorities are the family and the society in which we live and form our moral spirituality. Speaking of spiritual and moral values and their priority relations "Protecting the rights and interests of children, raising the younger generation in the spirit of patriotism and not passing spiritual, moral values is the basis of moral well-being in Russian society and the confident development of our country". According to B.T. Likhachev, it is the basis for the formation of

personality, ideology, spirituality, and conviction: the main internal component. According to B.T. Likhachev this is a dictate of conscience: autonomy of thoughts and opinions. The state itself and the priority, conscientiousness and loyalty to convictions, is to assess themselves as the main spiritual and socio-psychological responsibility in the formation of the personality [10]. On this basis, tolerance of dissent and spiritual opposition to delusions will be educational.

Flexibility is important in the process of moral perception, thinking and memory. After all, moral consciousness specifies the ideas of truth, justice and goodness in the personality of a child. Moral convictions serve high and humane principles. This makes an individual a highly spiritual person, forms self-esteem for himself. In this regard, the moral potential of a person is organized into a philosophical product, as a material, spiritual and social being of a person with an achievement into the "Personality" [4].

Conclusions

The formation of the spiritual and moral personality of the child on the basis of the potential of the cultural development of the modern school's educational environment is based on the spiritual core, which every person has, which organizes the moral potential of people and constitutes the main core and is expressed in the process by the very principles of intellectual, moral, free and conscientious activity and responsible person as such. The continuity of interaction between the educational organization and the family to develop knowledge of the native land in children based on the creative heritage, ensures the consistency of efforts, the unity of the requirements necessary for the formation of universal human values and the implementation of the regional component.

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Principles of An Alternative Theory of Kinematic Surface Formation Based on New Geometric Concepts

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Abstract

50 years ago, the classical theory of gears was formed based on kinematic methods. Half a century later, Integrated Gear Design (IGD) was formed based on non-differential methods. The advantages and disadvantages of kinematic methods are defined in comparison with non-differential ones. The arti-cle outlines the basics of a new kinematic method for computer modeling of kinematic shaping processes. The method has the reliability of non-differential methods; requires less computation; allows finding curvatures in links. The fundamentals of the method are new basic geometric concepts, images and indi-cators: a) breaks of teeth surfaces; b) elements of breaks (edges, vertices); c) a set of normal lines (sector, prism, pyramids) generated by breaks of teeth surfaces. A system has been created for representing teeth and gear rims, as well as reeling tools in the form of a continuous smooth surface, differentiable at all its points (including when there are breaks on them, for example, cutting edges on tools). A special meth-odology has also been developed for introducing and using curvilinear coordinates — continuous and uniform for the entire toothed gear wheel or gear cutting tool. Examples of the implementation of the new kinematic method in computer modeling of the processes of kinematic shaping of teeth in gears are given.

Keywords: alternative theory, kinematic surface formation, new geometric concepts

Introduction

Definitions, Designations and Abbreviations

The following definitions, designations and abbreviations in tooth gears and machine gearings are used in the article:

1.**N** – normal line and **n** – unit normal vector: vectors perpendicular to the surface (profile) of the tooth at the point in question; they are always directed *outside the body of the tooth*.

2.Σ_1, Σ_2 – surfaces (profiles) of the teeth. The *tooth surface* has two curvilinear coordinates (u and v), the *tooth profile* – one of them (u or v).

3.Σ – surface or line of gearing.

4.TGT – **T**ooth **G**earing **T**heory. We distinguish: classic TGT based on classical geometric and kinematic concepts of mathematics and mechanics; and alternative TGT, using also new geometric and other concepts, such as: break of the body surface; sectors, prisms and pyramids of normal lines and tangents; speed and acceleration of implementation and others.

5.KS (**K**inematic **S**haping) – formation process of Σ_2 border on the solid body 2 by the surface or line Σ_1, located on the solid body 1.

6.KST (KS **T**heory) – an important element of TGT.

7.IIS (**I**nitial **I**nstrumental **S**urface) – generating surface Σ_1 in the machine gearing (it is sometimes designated by Σ_0).

8.EG (**E**quation of **G**earing) – an equation of $F(u,v,t) = 0$ type, connecting the curvilinear coordinates u,v of the generating surface Σ_1 и bending parameter t. EG is solved to find the contact points of Σ_1 and Σ_2.

1. Problem definition

The main task of KST and TGT, which must be repeatedly solved during analysis of geometry of gearing and instruments:

1) The movements of the links (for example, tool and workpiece) are given, as well as the generating element Σ1 (for example, IIS).

2) Find the surface formed on the second link.

There are two groups of methods for solving this problem: differential and non-differential.

The basis of differential methods [1-6] is finding the tangents and normal lines to the generating element by differentiating its equations. The basis of non-differential methods [6,7] is the direct tracking in time of the position of the generating element relative to the link on which the surface is formed.

Differential methods require less computation and allow curvature to be determined. But when there are special points on the generating element (for example, a corner point at the intersection of the lateral and vertex cutting edges), then by all the canons of differential geometry at such a special point on the line or surface you cannot find a tangent or normal lines to them. From this it is concluded (see, for example, [6, p. 464 and Fig. 14.21]) that for specific points of the generating element the bending line does not exist at all, and that part of the real surface on the product, which is formed by special points, cannot be found by differential methods basically. Another drawback of differential methods is that it does not give a real surface formed on the product, but some abstract "thin film", which can be self-intersecting and located partially or completely inside the body of the generating element.

Therefore, differential methods are considered less reliable and in recent decades they have been strongly suppressed by non-differential methods.

An urgent problem in the gearing theory is the creation of methods for analyzing shaping with the reliability of non-differential and the advantages of differential ones.

2. Basic Provisions of Alternative Theory of Shaping

The creation of such methods becomes possible if we use a system of new geometric concepts-primitives [9, 8, 10], not previously used in classical mathematics and geometry (saggital fan; two-dimensional points and lines and others). In this case, the introduction of unified curvilinear coordinates proposed in [11] is also very useful.

Below in this section the main provisions of such an alternative theory of shaping are described, combined in: postulates, axioms, approaches and algorithms.

2.1. Postulates

2.1.1. The first postulate (on the geometry of bodies). The surface of any gear wheel or tool, which is a conglomerate of various geometric elements (pieces of surfaces, edges and vertices), can always be represented as a single continuous surface with 2 continuous curvilinear coordinates on it. From a mathematical and computational point of view, it is a smooth surface, differentiable at all its points.

The first postulate is based on the concept of the real surface of the body, (see [8, p. 532]), as a geometric conglomerate with two continuous curvilinear coordinates, covering the entire surface of the body, changing which you can get anywhere on the tooth or ring gear. An example of how to present in the form of such a surface a discrete set of cutting edges of a worm cutter with front and rear surfaces adjacent to them, is given in [10].

2.1.2. The second postulate (the fundamental position of shaping). With all methods of forming surfaces mechanically using solid-state tools — both by cutting and pressure — with any relative movements of the tool and the product, the surface on the product is finally formed only by those points of the initial instrumental surface (IIS) and at that time when the penetration rate [12] of this point IIP in the volume of the workpiece is zero:

$$VN = V12 \cdot n = 0, \text{ where } n - \text{unit normal vector to IIS [11].}$$

That is, the finally formed surface of the product is always a subset of the bending line of real producing surfaces family. Consequently, the phenomenon of trimming, cutting off part of the formed profile in the secondary cutting zones or when approaching and retracting a tool, etc., are all processes that can be analyzed by the same mathematical models of an alternative theory of shaping.

2.2. Axioms on the geometry of solids

For simplicity, we set out part of the axioms in terms of plane links and illustrate only plane drawings.

Axiom 1. Any solid body, including a generating element, is limited to one continuous closed surface. We call it the real surface of the body. Its topology is usually a sphere or a torus (Fig. 1).

Axiom 2. The body surface is always the boundary of two media: body material and void. Therefore, the body surface at all its points is oriented. We indicate it by the normal vector, which we always direct from the body of the part (Fig. 2).

Axiom 3. At any point on the real surface of any solid body, a normal line to it always exists. Even at special points in terms of classical mathematics. In them, the normal vectors turn into a sector (Figs. 2 and 3), a prism or a pyramid of normal lines.

Axiom 4. On the gear parts there are always edges - the lines of intersection of two adjacent sections (for example, the working surface of the tooth and the surface of the vertices), and also the vertices - the intersection of three surfaces. We consider such lines and points not as special points of the surface, but as

breaks of the body surface. In mathematical models, surface breaks are considered two-dimensional - these are continuous surfaces with two curvilinear coordinates u and v on them. When the curvilinear coordinates u and v change, the Cartesian coordinates x, y and z of the vertex remain unchanged, but the projections nX, nY and nZ of the normal vector to the body surface at this "special" point change - see Fig. 3. On it, point A of a profile break is a line, judging by the equations of Fig. 3. Table 1 gives its computer representation as well as lines. Note: from the coordinate equations (Fig. 3), the unit normal vectors cannot be found by differential geometry methods, since derivatives of coordinates with respect to curvilinear coordinate = 0.

2.2. Axioms about shaping process

Let us explain them in three examples of analysis of plane machine gears (Fig. 4, 5 and 6):
cam profiling (Fig. 4);

- machining of a gear part with a rolling cutter (rim) - (Fig. 5);
- processing the gear wheel with a trapezoidal rail (Fig. 6).

These examples were chosen because, in our opinion, they allow us to illustrate quite clearly all the main features of the processes of shaping. At the same time, the parameters of machine gears were taken "bad" to show the troubles that may arise when analyzing the processes of shaping by differential methods.

Axiom 5. The main criterion for the analysis of the shaping process is the speed of VN implementation, proposed by V. A. Shishkov [12]. It is used in mathematical models to find the contact point and thickness of cut layers. The rate of introduction of VN is the projection of V12 on the normal line to the generating element: VN = V12 · n. Where: V12 is the velocity vector of the point of the generating element Σ1 relative to the link on which the surface Σ2 is formed; n is the unit normal vector to Σ1 (directed outward from the body of link 1). With a positive penetration rate - the tool is introduced into the body of the workpiece from the running-in movement, with a negative one - the tool at this point moves away from the body of the workpiece.

Axiom 6. An additional criterion for the analysis of the shaping process is the acceleration of the introduction of aN, proposed in the 1970s by the author. It is used in mathematical models to find the boundaries of cutting zones [13] and in the calculation of curvatures [14,15]. The sign of an depends on where the surface is formed: outside or inside the body of the producing element. This is a simple and very meaningful rule:

1) for aN <0 - in this place the bending surface Σ2 is formed outside the link body 1.

2) for aN> 0 - in this place the bending surface Σ2 is formed inside the body of link 1. Physically, such a touch is impossible (it is impossible to touch the plane of the table with the inner surface of the bowl). Where aN> 0, a self-intersection loop is usually formed on the bending surface Σ2.

3) for aN = 0 - in this place on the envelope surface Σ2 there will be a singular point with the curvature of the surface Σ2 equal to zero (often, this is a point on the return edge on Σ2).

Axiom 7. The surface of the body of the producing element, in general, is divided into zones (Fig. 4 and Fig. 5b):

- shaping zones F1 and F2;
- non-shaping zones N1 and N2.

Axiom 8. Each shape-forming zone on the manufacturing element Σ1 (in Fig. 4-5 they are designated F1, F2, ...) is isolated from the others and generates one surface on the workpiece (marked S1 and S2), which:

- is continuous (connected) - see Fig. 4, 5c, 5d;
- sometimes self-intersecting - see Fig. 4, 5c, 5d, 5e;
- may have return points - see S1 in Fig. 5d, 5e, 5f;
- it is possible, in whole or in part (see loops in Fig. 4), to form inside the body of the producing element;
- sometimes intersects with another surface formed by another shape-forming zone of the same producing element - see S1 and S2 in Fig. 5e, 5f.

Thus, the conjugate profile formed by the full shape-forming zone is almost always a closed line - see Fig. 4 and S1 with S2 in Fig. 5c, 5d, 5e. An exception is for a progressively moving producing element, when the formed profile rushes to infinity (when the producing element moves to infinity).

Axiom 9. The line of engagement for each complete shaping zone is almost always a closed curve - see Fig. 4, and lines L1 and L2 in Fig. 5c, 5d, 5e. An exception is for a progressively moving generating element when the gearing line rises to infinity. On the gearing line there can be convex, and concave, and straight sections. A closed gearing line may:

• be smooth (see Fig. 4, and L1 with L2 in Fig. 5c, 5d, 5e);
• be a line with breaks (see L in Fig. 6) - a break at the points where the junction of two sections of the profile of the generating element Σ1 with different radii of curvature contacts;
• intersect itself (see L1 in Fig. 5f and L in Fig. 6);
• not intersect itself (see Fig. 4 and L2 in Fig. 5c, 5d, 5e).

Axiom 10. Any incomplete part of the shaping zone gives rise to either one open piece of the conjugate profile, or several disconnected segments of such profiles. Note that the teeth of rack tools almost never have a complete shaping zone. An exception is racks, at some points of which the normal line to the profile is parallel to the rack velocity vector, which is extremely rare. Therefore, almost all rails form one continuous piece of a conjugate profile.

Axiom 11. The gearing line for an incomplete part of the shaping zone is a segment, i.e. this is generally an open curve. But when shaping teeth, when a portion of the shaping element is taken not less than the length of the entire profile of one tooth, the link line looks like a closed line (see the link lines L1 L2 in Fig. 5e and L in Fig. 6). We note that the topology of the engagement line always repeats the topology of the shaping zone of the producing element. Moreover, all lines defined by the equation in parametric form, from a computational point of view, have a straight line topology.

Axiom 12. Each of the shaping zones of the gearing element in each of the positions of the links is divided in turn into alternating sections (Fig. 6). In them, the rates of introduction of the gearing element into the body of the shaped one are either positive or negative. The boundary between these sections is the line where the penetration rate is VN = 0 and where the machined surface is formed. This is the line of contact of the gearing surface with the bending line; it is called a characteristic.

Axiom 13. Forming zones are those areas on the gearing element (parts of pieces of surfaces and breaks) in which the penetration rate at certain break-in times becomes equal to zero: VN = 0. Thus shaping zone is that part of the surface of the gearing element along which the "boundary" between the sections considered in the previous axiom "walks".

Axiom 14. Non-shaping zone - areas on the gearing element in which the rate of penetration during the entire time of shaping remains either positive or negative. An analytical sign of the location of a point on a non-forming section - it is impossible to find the movement of the generating element at which VN = 0 at a given point. Usually this leads to mathematical complications when solving the linking equation:
• dividing by zero during the translational movement of the generating element,
• negative radical expression - during the rotational movement of the generating element.

Axiom 15. An internal break can be form only at areas within the body of the producing element; external break - only areas outside (Fig. 6).

Axiom 16. In many cases, on each of the simple geometric primitives, at any given time, the number of profile points (where VN = 0) is not more than one.

In gearing in a plane, this is true for primitives: a) any break, b) straight line segment, c) arc of a circle with a central angle less than 180^{o}. Exception: if the break or center of the circle falls into the gear pole, then at this moment all points of the primitive are profiling. In this way stationary profiles are formed on the teeth.

In spatial gearings, this (not more than one contact point on a segment of a typical line) is valid for: a) any flat line located in a break of the surface, i.e. on (edge or top); b) any segment on any generating surface Σ1 that is a plane.

Axiom 17. When gearing on each of the teeth of the tool, there is almost always only one incomplete shaping zone (tools in which there is a non-working area between the cutting sections - nonsense). Therefore, almost always the cavity of one tooth, machined by one gearing surface, is one continuous surface - a bending line to the real surface of the gearing element. It can be self-intersecting, part of it can form inside the body of the gearing element, it can go beyond the workpiece, but this is one continuous surface (Fig. 6).

Axiom 18. The surface of the gear body contains only:
• fragments remaining from the surface of the workpiece;
• pieces of bending lines to the gearing element;
• breaks of the surface of the gear body arising from:
the intersection of the bending line with the surface of the workpiece,
self-intersection of bending surfaces,
intersections of the bending lines with each other (when there are several shaping zones on the gearing element)

Thus, everything that is really formed on the product when it is processed by the bending method can be found by differential methods. If we consider that surfaces by the bending method are formed not only by smooth sections of the gearing element, but also by breaks on its surface.

2.3. Main approaches and algorithms

Below, in the form of abstracts, the basic principles are outlined on which, in our opinion, it is reasonable to build algorithms for finding the bending line and its transformation into the real surface of the gear body.

Thesis 1. To get the actual surface of the gear body from the bending surface:

- replace by breaks of the self-intersection loop, while removing everything formed inside the gearing element;
- remove areas located outside the body of the workpiece;
- add fragments of the surface of the workpiece remaining on the part after processing;
- insert breaks from the intersection of the bending line with the surface of the workpiece;
- insert breaks from the intersection of bending line formed by different zones of the gearing element.

Thesis 2.

It is advisable to use simultaneously two systems of curvilinear coordinates: continuous (computational) and discrete (graphic). The computational coordinates u and v allow you to move along the surface to any point on it and calculate for it: coordinates, unit normal, curvature, and other indicators. Discrete coordinates - NU and NV point numbers on surfaces. We suggest introducing them for the following reasons:

- Simplify the organization of cyclic computing.
- Allow you to build graphs of quality indicators with breaks of the first kind (see. Fig. 6). For this, at all joints of the profile, two points with adjacent numbers are always put. They have the same not only Cartesian, but also curvilinear coordinates, as well as the normal to the profile. But different radii of curvature: For example, at the end of a rectilinear section, curvature = 0, and at the beginning of a break, curvature = ∞.
- They allow you to quickly change the number of points and their location on any of the sections of the investigated surface during calculations and on graphic images. For example, in Fig. 6 points on the gearing line and inside the sections of the gearing element are uneven so that they do not thicken on the formed profile from one edge of the section. This becomes especially important when using 3D graphic systems (for example, OpenGL) to display high-quality gearing indicators.

Thesis 3. As continuous curvilinear coordinates (Fig. 7), we propose using uniform normalized coordinates [11]. For the first tooth: $0 \le u \le 1$; for the second tooth: $1 < u \le 2$; etc. We believe that normalization of curvilinear coordinates with the following values for the characteristic points of the profile could become a "standard" for computer programs (see Fig. 7):

0.30 – for the main profile;

by 0.05 – for vertices and cavities sections;

by 0.075 – on a transition curve and on a break of a profile.

Thesis 4. When using discrete curvilinear coordinates (point numbers), they need to be connected by a functional dependence with a continuous one. We believe that a quadratic dependence is quite suitable for this purpose. It includes:

- K1 – coefficient of linear influence;
- K2 – coefficient of quadratic influence.

Functional dependence was chosen so that:

- when K2 = K1 = 1 – the points are evenly spaced;
- when K2>1 и K1 > 1 – points were condensed at the end of the section;
- when 0<K2<1 и 0<K1<1 – points were condensed at the beginning;
- when 0<K2<1 и K1>1 – points were condensed in the middle of the section (or, on the contrary, at its edges).

At the bottom of Fig. 8 it is shown how the user can control the setting of the number of points and their placement in all parts of the producing profile. At the top of Fig. 8 - placement of points on the gearing rack shown in Fig. 6.

Thesis 5. When a producing element with kinks on its surface is given, the mating surface is found by

the methods of the theory of gearing according to one of two options:

Option 1 (almost pure classic). Set two curvilinear coordinates u and v on the generating element; calculate the coordinates of a point on it and the unit normal vectors; find the displacements of two links at which the point becomes a contact (the solution of the classical gearing equation) and so on. An important note: if a point hits a break, then the normal line is still uniquely calculated for given u and v (see the equations in Fig. 3). This is the difference from the classics.

Option 2. (significantly different from the classics). Set the movement of the links and one of the curvilinear coordinates (v) on the gearing element; set the number of the section on it; check if there is a contact point on this section; if "no" - go to the next section; if "yes" - calculate u for the contact point on this section. Distinctive features of option 2:

• It is necessary to have equations by which it is checked whether a given fragment of a gearing element is shaping at a given time (this is not the case in the classics).

• Finding a contact point on a gearing element is specific: at the beginning, the unit vectors nx, ny, nz of the contact normal line are calculated in the breaks, and only then the value of the desired curvilinear coordinate is calculated. (In the classics, the calculations are carried out according to a different scheme: they set v; solving the gearing equation, find u; calculate the coordinates x, y, z, etc.)

Thesis 6. The criterion for finding out how the bending surface is formed at a given point: outside or inside the body of the gearing element (see Fig. 4) there is the sign of the relative curvature: > 0 is coutside, <0 is inside, = 0 is a singular point. (See the formulas in [14,15], where special attention is paid to signs).

Thesis 7. When eliminating the self-intersection of the profile (see Figs. 4 and 5), the "cut-out" range of curvilinear coordinate changes in accordance with Fig. 9a.

Thesis 8. What to do when inserting a break, Fig. 9b shows. It shows how a one-to-one mapping between points on a conjugate curve and on a real profile is performed. Thus what is the relationship between the curvilinear coordinates on the gearing and shaped elements: at points with the same numbers there will be the same values of curvilinear coordinates: namely: u1=0, u2=0.025, u3=0.1, u4=0.4, u5=0.475, u6=0. 5. (See also Fig.7).

3. Implementation of theoretical developments

3.1 Examples of calculated equations

3.1.1 Break equations on lines and surfaces

Break on the line (for example, at gearing on the plane) is a line, that is, a one-dimensional set. Equations are shown at Fig.3.

Break on the surface (edge, vertice) is a surface, that is, a two-dimensional set. Fig. 10 shows the break parameters on the helical surface of a constant step (helical gear, worm, etc.):

R is the distance of the kink from the axis,

az is the offset of the starting point,

β is the angle of inclination of the tooth on the edge of the break (ß> 0 is the right screw),

λ is the angle of inclination of the "front face",

v0 is the initial angle of the saggital fan,

vK is the final angle of the saggital fan.

• The system of parameters for the break is chosen so that:

• when define β=0 and λ = 90°, get an edge on the spur wheel;

• when define β = 90° and λ = 0, get an edge on the solid of revolution (grinding wheel, disk or finger mill, etc.);

- when define v0 ≠ 90° and vK ≠ 90°, we get an edge not on the surface of the vertices of the generating element.

The curvilinear coordinates on the break edge: v is an angle lying in the plane perpendicular to the break edge (v0≤ v ≤vK), and u is the linear distance along the break edge to the current point K.

The equation of a break edge and unit normal vectors to it:

$x = R \cdot \cos(k \cdot u)$, $nX = \sin v \cdot \cos(k \cdot u) + \cos v \cdot \cos\beta \cdot \sin(k \cdot u)$,

$y = R \cdot \sin(k \cdot u)$, (1). $nY = \sin v \cdot \sin(k \cdot u) - \cos v \cdot \cos\beta \cdot \cos(k \cdot u)$, (2)

$z = aZ + u \cdot \cos\beta$, $nZ = \cos v \cdot \sin\beta$

Unit vector cU of the tangent line to the break edge, that is, to the u-line:

$cUX = -\sin(k \cdot u) \cdot \sin\beta$, $cUY = \cos(k \cdot u) \cdot \sin\beta$, $cUZ = \cos\beta$. (3)

In equations (1) – (3) the coefficient $k = \sin\beta / R$ (4)

3.1.2 The equation for checking whether the place on the break edge given by the u-coordinate is shaping. For a given position of the links, the sign pF depends on two scalar products of three vectors:

$$pF = (VOTH \cdot n0) \cdot (VOTH \cdot nK) \quad (5)$$

where

VOTH – relative velocity vector at a point in space with coordinates calculated by formulas (1) for a given curvilinear coordinate u.

n0, nK – the unit normal vectors at the beginning and end of the break (read according to equations (2), respectively, for u = u0 and u = uK).

If the sign pF <0, then this break section is now shaping.

3.1.3 Equations for calculating the unit vector normal to the shaped surface when it is created by the break. Calculated through the vector product:

$$n = (cU \times VOTH) / VOTH \quad (6)$$

If the scalar product n = (n ·(n0+nK))>0, then n = –n

Note that normal lines to the formed and shaping surfaces are directed towards each other.

The breaks at the edges and at the vertices are considered in more detail in [16]. More detailed calculation schemes and corresponding calculation equations are given there.

3.2. Concerning computer implementation

To check the basic principles of the developed theory and to develop algorithms, a program was created in Excel MS Office, the diagrams of which are included into this article. In Fig. 11 - the main "window" of the program. It includes:

- complete gearing profile Σ1 of one tooth.
- closed self-intersecting line (not all in the frame);
- five contact points with normal lines passing through the gearing pole.
- continuous conjugated profile Σ2 for one full cavity. Four loops were obtained on Σ2, of which two were sloping dovetails (due to undercutting), and two were abrupt dovetails (they were caused by internal breaks at the legs of Σ1).
- curves of theoretical cut thicknesses (shown on Σ1).

To control the program, there are 50 buttons and fields for entering the main source data (bottom and right in Fig. 11). The buttons allow you to: turn the profile into a real one, control the content of the picture and the movement of links, scale, etc.

In Fig. 12 it is shown on an enlarged scale two loops with Fig. 11. The sloping dovetail is thus stretched horizontally approximately 6 times.

The program also gives graphs of quality indicators: implementation speed; reduced radius of curvature; the radius of curvature of the conjugate profile (they are not given).

4. Results and discussions

Finding real surfaces formed by bending methods is not an easy task. Kinematic methods of classical TGT [3,4], which have several advantages (speed, versatility, calculation of curvatures), turned out to be unreliable. Creating reliable and fast programs for modeling the processes of shaping during gear processing and gears is unthinkable without proper theoretical development. In this paper, the direction of improving the kinematic method is described, which allows to solve the problems of reliability, speed and universality. The article lays out the fundamentals of the theory of how to lead to unified mathematical models of a complex shaping process in which smooth surfaces, edges on them, and vertices are simultaneously involved. This allows you to create more reliable programs for the analysis of gear geometry and tools.

The author does not think that, having read this article, everyone will immediately begin to urgently compose new - "alternative" - programs. But I am convinced that it makes sense for specialists in the geometry of gears and tools to make at least some (and small) additions to their programs. We will name a few, in our opinion, useful and not expensive additions.

Addition 1. Probably, there are no programs for studying the geometry of gears and tools in which there would be no procedures (methods) for obtaining points and normal lines for typical surfaces: a cone, a torus, etc. It can be recommended to supplement your programs with a procedure for one more typical surface: break edges on a helicoid - see Fig. 10 and equations (1) - (4), as well as article [16]. The equations in these works are suitable not only for the break edges on the helicoid, but also for the break edges on the surface of rotation, and on the spur gear. And you can use the new procedure in the same way as the old procedures for standard surfaces are used. With the help of such a new surface - break - it is convenient to

find transition surfaces on the teeth of the wheels. Complications during their use should not be, because the break edge will form the entire transition surface (the ribbon from the cavity to the main lateral surface of the tooth) if, when performing calculations using formulas (1) - (6) (plus coordinate transformation formulas), the curvilinear coordinate u is from и0 to иК (Fig.10). It should be noted that such an addition was tested in Izhevsk by Professor E.S. Trubachev in the SPDIAL + system for the design of worm gears. At the same time, the calculation time of the transition surface on the wheel tooth leg was reduced by 3 orders of magnitude compared with the non-differential method.

Addition 2. When analyzing kinematic shaping processes, it is important to know where Σ2 is formed — inside Σ1 or outside Σ1. We can recommend this Addition 2: calculate the acceleration of implementation of aN and, using the sign of aN, clarify this question for any point on Σ1 and for any position of Σ1. Calculation schemes and formulas for calculating the acceleration of the implementation of aN are given in [14, 11].

Addition 3. You can also display in normalized coordinates (Fig. 7) the qualitative characteristics of the contact interaction of gear teeth and machine gearings.

Addition 4. You can create a procedure for a surface of 2-3 three gearing elements: one piece of a smooth surface (forms the working surface of the tooth or cavity) with 1-2 breaks at the edges. What gives such an addition can be illustrated in Fig. 13, which shows the formation of a cavity and two transition curves — lines that are conjugated to a line segment that has breaks at its ends. It is amazing but having defined only 6 numbers about the gearing segment (the coordinates of the two ends and the two angles of break), we get according to the main program that all three curves conjugated to the segment, are joined. And this, without solving any additional equations for finding the conjugation point of the transition curve with the main profile (which must be done with the classical approach).

Note. The author is ready to collaborate with individuals or organizations who have decided to master or test the basics of the new kinematic method based on the use of new concepts: geometric (breaks), geometric-kinematic (speed and acceleration of implementation, etc.), multi-parametric gearings and more [11, 13,16,17].

Source of financing. Acknowledgments

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Conclusions

1. The fundamentals of the developed theory of kinematic shaping, based on the representation of the gearing element as one continuous surface with breaks, which from the mathematical point of view is a surface that is smooth and differentiable at all points (even if there are breaks of different origin), are described.

2. It is shown that the complete shaping zone of any gearing line always has as its conjugate an inextricable curve that does not have extreme points. The gearing line is continuous and has no extreme points.

3. It is proposed to use simultaneously two systems of curvilinear coordinates: continuous for calculations and discrete for control. Continuous curvilinear coordinates u and v are the same for the entire gear rim; one of them is organically linked to the number of the tooth.

4. The principles of turning the bending surface into a real surface of the body by removing virtual sections and introducing breaks instead of them, are given. It stores single inextricable curvilinear coordinates, as an unambiguous display of the curvilinear coordinates of the gearing element.

5. Equations are presented that show how the calculation formulas look when representing a break edge in the form of a two-dimensional surface, as well as formulas for finding the contact point and the unit normal vector to the surface formed by this break.

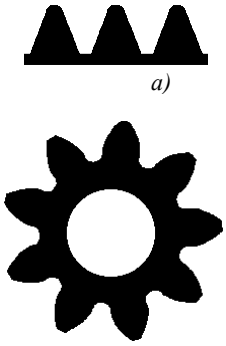
6. Research is being performed to refine and improve the kinematic methods of gearing theory. The focus of recent years is new approaches to the optimization of tooth surfaces synthesis and gear design methodology [18–22].

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Figures:



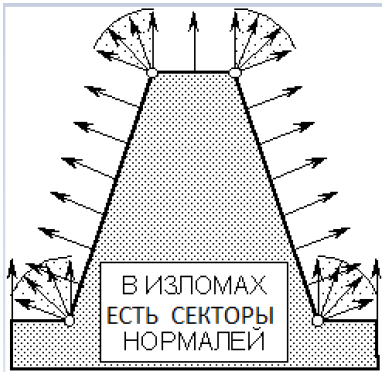


Fig. **2. Unit normal vectors**

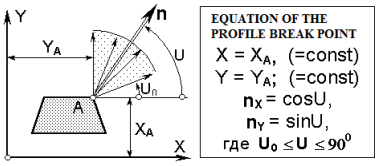


Fig. **3. Points of the line break is also a line**

TABLE 1

MACHINE PRESENTATION OF THE BREAK POINT

№	X	Y	n_X	n_Y
1	10	50	0,939693	0,342020
2	10	50	0,906308	0,422618
...	10	50	...	...

Fig. 1. Topology of the

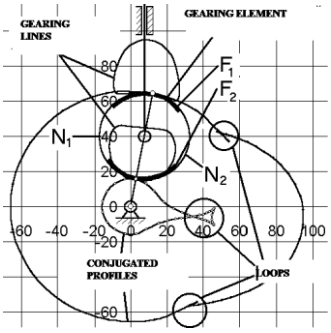
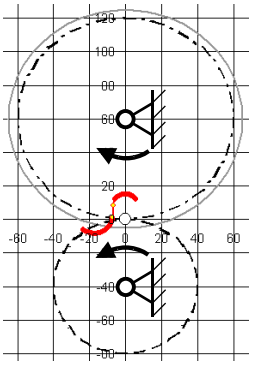
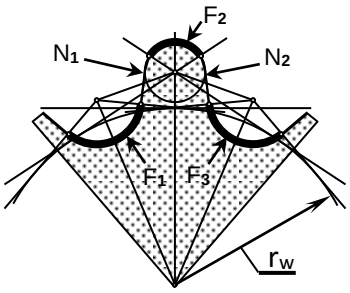


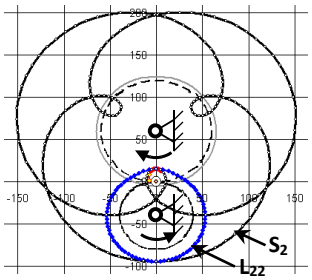
***Fig*. 4. Zones of the gearing element (roller) in the**



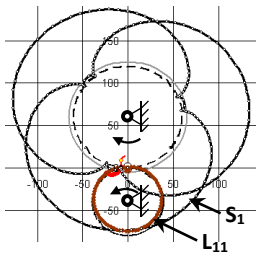
a) Gearing



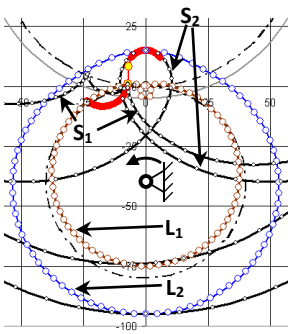
b) Gearing element and its zones



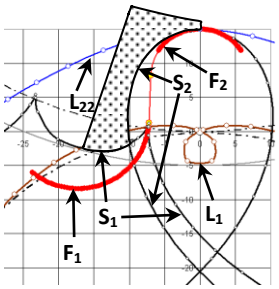
c) Cutter head shapes the profile



d) Cutter leg shapes the profile



e) Two closed gearing lines



f) Two shaped closed curved lines S_1 and

Fig. 5. Shaping with rotating links

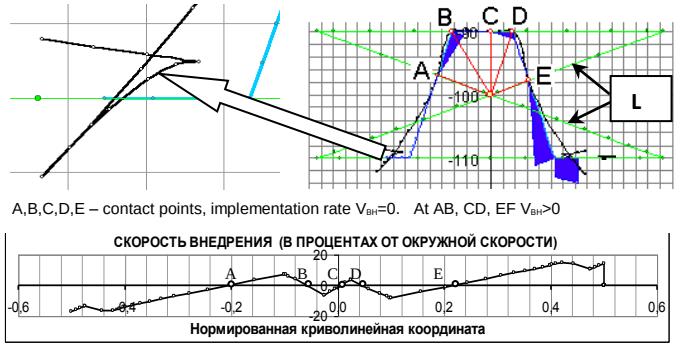


***Fig*. 6. Alternating sections within the zone of the gearing element**

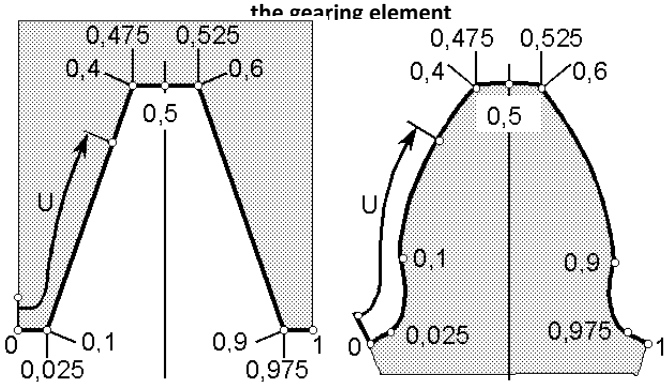


Fig. 7. Normalized curvilinear coordinates for the first tooth

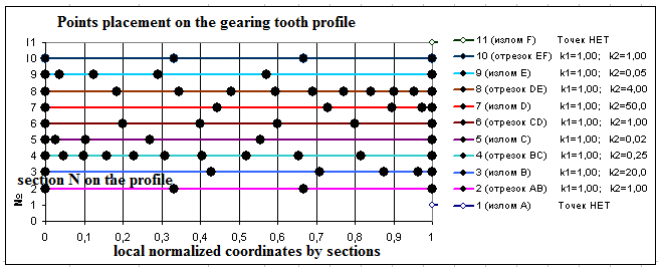
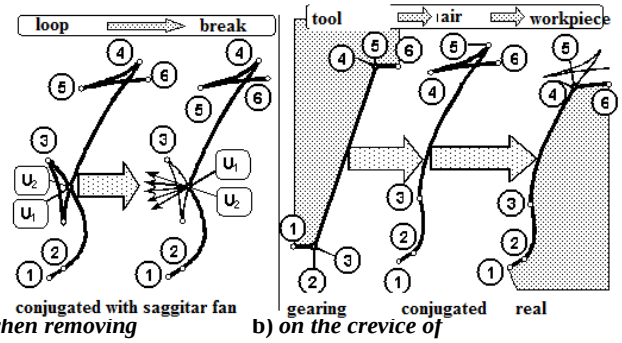




***Fig.* 8. Discrete curvilinear coordinates (setup and result)**



) when removing looping ***b) on the crevice of the shaped tooth***

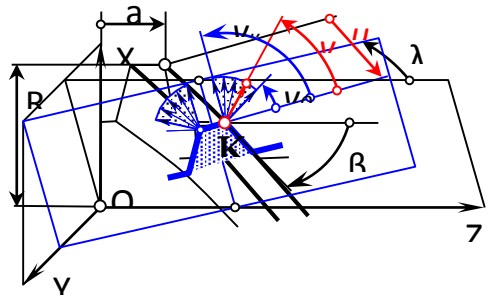
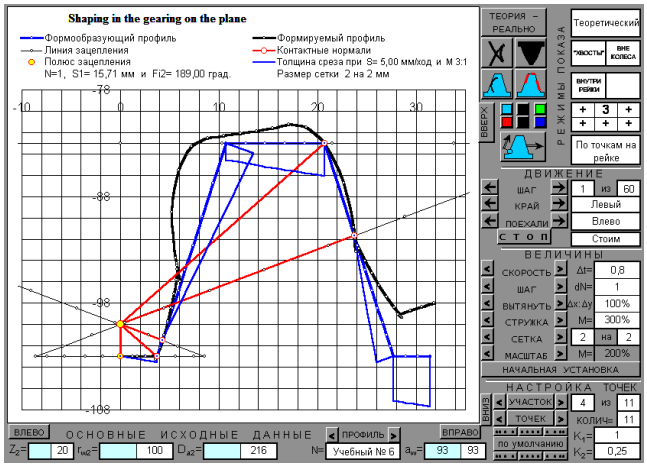


***Fig.* 10. Break parameters (edges) on a helicoid**



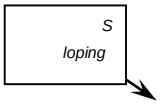
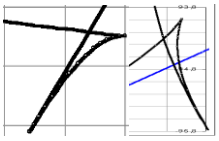


Fig. 11. “Main Window” Of The Program



a) Abrupt б) Sloping

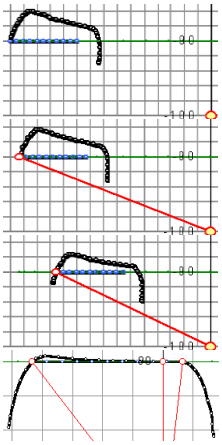


***Fig. 13*. Profiles a segment with breaks**

Effective Implementation of the Social Role "Parent" as a Condition of Successful Adaptation of a Child to the Educational Organization

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5.Arzamas branch of Lobachevsky State University of Nizhny Novgorod, Russia.
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7.Federal State Budgetary Educational Institution of Higher Education «Privolzhsky Research Medical University» of the Ministry of Health of the Russian Federation.

Abstract

The article reflects the results of an experimental study of parent-child relationship influence on the adaptation process of children of primary preschool age to a preschool educational organization. Based on the results of research of V.V. Bogoslovsky, D.P. Derbeneva, I.K. Kryazhevoy, P.S. Kuznetsova, A.A. Nalchajyan, A.V. Petrovsky, G. Selye, G.I. Tsaregorodtseva and many other scientists, we believe that it is relations in the family, its microclimate and the style of communication between parents and children that are the factors determininig adaptive capabilities of children of primary preschool age. In order to confirm or refute this assumption, an empirical pilot study was designed and implemented. We included two interconnected blocks of techniques into the diagnostic program. The first diagnostic unit is focused on the study of the children's adaptive capabilities. The second diagnostic unit is aimed at studying both the nature of the parents' relations to their children, and the process of their adaptation to the preschool educational institution. The empirical data we obtained, including the use of mathematical statistics method, objectively proved the validity of our hypothesis.

Keywords: adaptation, adaptive capabilities, adaptation process, parent-child relationship.

Introduction

The problem of adaptation remains one of the fundamental problems for a whole range of human sciences. As noted by A.G. Maklakov [10], the relevance of studying both the adaptation process itself and the adaptive capabilities of a person is objectively stipulated by the fact that it is the ability to adapt that allows a person, regardless of the age and social status, to adapt to conditions of cardinally and rapidly changing environment, remaining, at the same time, successful in their activities. According to G.I. Tsaregorodsky [24], the study of the adaptation problem is one of the promising areas in the comprehensive study of man.

From our point of view, this conclusion was not made by scientists by chance. As shown by our analysis of the works of B.G. Ananyeva, M.P. Budyakina, O.S. Ivlyushkina, V.G. Krysko, T.S. Novitskaya, V.N. Savina, S.S. Stepanova and some other scientists, since adaptation is complex and multicomponent education, its success is objectively determined by the full-fledged functioning of the physiological and psychological levels of personality that are closely related to each other.

Based on the fact that both the development of an organism and its adaptation to the surrounding reality are processes that take place throughout a person's life, many scientists (works by N.M. Aksarina, V.G. Alyamovskaya, N.P. Badina, M .V. Belkina, D.N. Isaev, G.V. Pantyukhina, K.L. Pechery, etc.) objectively prove the importance of the adaptive capabilities and abilities effective development of children of early and preschool age with their studies.

The purpose of this research is to study the parents influence (namely, their interaction with children of the first years of life) on the formation of adaptive resources and capabilities of the child.

Literature Review

What is "adaptation"? Summarizing the approaches of scientists to the definition of this concept (the work of D.P. Derbenev, I.K. Kryazheva, P.S. Kuznetsov, A.G. Maklakov, A.A. Nalchadzhyan, G. Selye and others), under this phenomenon we incline to understand the specific form of the organism's response to internal and external influences that objectively ensure that the body achieves balance, equilibrium and, as a result, adapts to the changes that occur in the human environment [17]. We consider it important to

emphasize the idea that it is precisely through adaptation that the regulation of human behavior is carried out in new, unusual (not typical for him) conditions of society, which, according to the author of the stress concept, the outstanding Austrian scientist G. Selye, is carried out thanks to the readiness for not only getting used to new environmental conditions, but also to mastering them, developing new ways and forms of behavior, which is impossible without the inclusion of such mental formations as motivation, will, thinking, abilities and experience [16].

As we noted above, the opportunities, patterns and mechanisms of effective social adaptation of children of early and preschool age are of particular interest, that is, those age categories when adaptive capabilities are not developed enough, but the baby often has to face new life situations and conditions. environment (works by V.A. Doskin, L.I. Lokteva, Yu.A. Nikitina, D. B. Elkonin, etc.). Thus, Lokteva [9] in her study draws attention to the fact that a certain type of social behavior, reflecting the requirements of the microsocium in which the child grows and develops, begins to form almost in the first months after the birth of the baby. At the same time, the immaturity of the nervous system structures and the lack of complex mental processes and functions due to this leads to a state of tension in the system of adaptive mechanisms, "adaptive syndrome", psychophysiological stress, the indicators of which, in the first place, are presented by a cardinal change of physiological (child loses weight, takes food poorly, he has a sleep disturbance, he is often sick, etc.), and behavioral manifestations of the child (the baby is naughty for no reason, refuse to contact with a close adult, etc.) (V.A. Doskin's study results) [3].

The study of the nature and duration of the children social adaptation course in their first years of life (works by N.M. Aksarina, L.G. Golubeva, N.V. Kiryukhina, K.L. Pechory, R.V. Tonkova-Yampolskaya, etc.) allowed to identify the following factors that influence the process of social adaptation of children: features of the higher nervous activity of the child, the child's age and state of health, the specifics of the methods of raising a child in a family, etc.

Researchers also pay attention to the fact that difficulties in the adaptation period arise in the child even in those cases when he encounters misunderstanding in the family, communicating with his closest adults - parents (the results of a study by V.V. Abramenkova [1]). As objectively proved by scientists (research by A.Ya. Varga, L.S. Vygotsky, A.I. Zakharov, O.A. Karabanova, A.N. Leontiev, A.G. Leaders, I.M. Markovskaya, A. S. Spivakovskaya, EG Eidemiller, TV Yakimova, etc.) a family is a model of society for any child. Having no life experience, the baby perceives the world around him by analogy with his family. Through his family, close adults, he learns and interacts with the social environment, as a result of which he develops a system of relations not only with the outside world and in relation to the surrounding reality, but also his attitude to himself in this world. Not by chance I.V. Dubrovina notes that the family is the main source of socialization of the child [4], paying attention to the fact that it is in the family that the baby is socialized most naturally and painlessly.

In the process of interpersonal relations in the family, the child learns the system of knowledge and skills, norms and rules of behavior, values of national and social culture, which has a positive impact on the entire process of subsequent socio-cultural development and will ensure optimal social adaptation.

Our theoretical analysis of studies by revealing the influence of the nature of family relations and family upbringing on the effectiveness of a child's adaptation to society (works by J. Bowlby, W. Bronfenbrenner, D. Winnicott, M. Klein, V.N. Oslon, A. Freud, M. Ainsworth, E. Erickson; V.P. Anisimova, N.D. Vatutina, L.N. Galiguzova, S.V. Parshukova and others) allows us to identify the following most important, from our point of view, factors affecting the success of adaptive opportunities of the child in the first years of his life:

- a child's affection for a close adult (first of all, for the mother),
- the nature of communication with the child in the family,
- style of family education.

Also, based on the foregoing, we consider it possible for ourselves to conclude that the responsible attitude of parents to their children and their responsibilities to effectively and fully realize their social role as a "parent", is of particular significance for forming adaptive capabilities and possibilities of children, primarily, of their successful social adaptation.

Summarizing the results of foreign studies (D. Bernardes, A. Burrington, C. Bost, C. Galvin, D. Gittins, M. Mead, B. Strong, W. Taman, D. Tweng, X. Helms-Erickson, R. Heiner etc.) and domestic researchers (A.A. Abramova, N.V. Vakhnyak, N.A. Gushchina, S.Yu. Ninth, A.V. Isakova, M.N. Klintsova, M.V. Mayevskaya, V.V. Neklyudova, S.P. Pelmeneva, K.N. Polivanova, A.F. Radchenko, Yu.V. Seppenen, etc.) on the problem of family, family education and parenthood, we formulate the hypothesis that the

nature of family education influences the socio-psychological adaptation of children of preschool age to the conditions of the preschool educational establishment. Favorable impact on the adaptive capabilities of children of primary preschool age have such educational settings as a low level of conflict, the exclusion of family negative (overwhelming) effects on the child, partnerships with the child, the desire to optimize the development of the child, symbiotic interaction with the baby. Such factors as the lack of satisfaction of the needs of the baby by the parents, punishment, instability of the style of parenting, family conflicts, irritability and excessive severity of the parents, the exclusion of one of the parents (usually the father) from the upbringing of the child, authoritarian hypersocialization and some other factors, will on the contrary, do not contribute, but impede the process of adaptation, burden it.

Research Methods

In order to verify our assumptions, a pilot study was organized in which 16 families with children from 3 to 4 years old took part, who are newly enrolled in the preschool educational establishment and at the stage of adaptation to the preschool educational establishment.

All families are complete, urban, non-ethnic, officially married.

The experimental research program we developed [19] involves two interconnected blocks of diagnostic techniques.

1 block of diagnostic methods was focused on determining the adaptive capabilities of children and included:

- the methodology "Study of the level of child's adaptability to the conditions of a preschool educational institution" by M.V. Korepanova [8] and E.V. Kharlampova [8]. Using this technique, the researcher performs focused scientific observation of the child's behavior in different life situations. In this case, the child's behavioral manifestations are recorded according to the following parameters: emotional behavior background; cognitive and game activity; relationship with adults; relationship with children; reaction to a change in a familiar situation. Using this technique will allow us to identify the overall level of adaptability and thereby identify the main difficulties in the adaptive process of children of primary preschool age.

- the methodology "Study of the psychophysiological adaptation of children to the conditions of a preschool educational institution" by A. Ostroukhova [13], which allows to study the behavioral reactions of children, based on a simultaneous assessment, and the factors that determine their adaptation. The most important parameters that are fixed within the framework of this technique are the emotional state of the child, his social contacts, sleep and appetite, as well as the number of days that the child attends / misses the preschool. The level of psychophysiological adaptation is evaluated depending on the points scored:

- easy adaptation (absence up to 5 days - 1 week and behavioral reactions in the range from +12 to +8),

- average level of adaptation (absence up to 15 days - 3 weeks and behavioral reactions in the range from + 7 to 0),

- complicated level of adaptation (absence up to 25 days - 5 weeks and behavioral reactions in the range from-1 to -7),

- the level of maladaptation (absence of more than 5 weeks and behavioral reactions in the range from -8 to -12).

The use of this technique allowed to establish not only the general level of psychophysiological adaptation of children to the conditions of the preschool educational institution, but also the main difficulties of each baby within the framework of the accommodation of the adaptation process.

- the methodology "Diagnostics of communication forms" by M.I. Lisina [20], focused on determining the leading form of communication between a child and adults. In the framework of using this technique, the child is invited to choose the stimulus material that interests him at a given time from the toys and books provided to him for active interaction with an adult (experimenter). When the child made his choice, the experimenter helps to organize the activity that the child preferred. If the child cannot make a choice on his own, the researcher helps him, offering a choice of playing, reading or talking. Moreoverthe researcher records the behavioral manifestations of the child in a special form, according to the following parameters: the procedure for choosing situations; the main object of attention in the first minutes of the study; the nature of the child's activity in relation to the object of attention; comfort level during the experiment; speech manifestations of children;

duration of activity. Counting the total number of points scored by the child, allows you to assess the level of formation of his communication activities.

We used the 2nd block of diagnostic tools to study not only the attitude of parents to their children as a whole, but also to the process of their adaptation to the preschool educational institution. As part of the implementation of this diagnostic unit, we used:

- the methodology "Questionnaire of parental relationship" by A.Ya. Varg [15] and V.V. Stolin [15]. As part of the use of this technique, each parent was offered a form containing sixty one question. When processing protocol data using a key, they are compared with test standards, which is an indicator of the level of parental attitude: rejection, social desirability, symbiosis, hypersocialization, infantilization.

- the methodology "Strategies of family education" by S.S. Stepanova, in the modification of I.I. Makhonina [21]. The purpose of this technique is to determine the style of family education. As part of the use of this technique, parents are invited to answer ten questions. When processing protocol data, the selected answer options are counted, which allows one to assess the parenting style of education (authoritarian, authoritative, liberal, indifferent).

- the methodology "Questionnaire of parental attitudes" (PARI) by E.S. Schaefer and R.K. Bell, adapted by T.V. Nescheret [14], focused on the study of the most general principles and models of education used by parents, as well as family relations. The use of this technique allowed us to identify the dominant parental attitudes, as well as the peculiarities of the parents attitude to their child (including the stress zones in these relationships, which can affect the adaptive abilities of the child and his adaptation to a preschool education institution).

- The method "Measure of care" by I.M. Markovskaya [11], which allowed to determine the degree of manifestation of parental care in relation to their own child. Using this technique allows us to determine the measures of parental care in relation to our child, as well as to identify the relationship between the measure of care and the adaptive capabilities of children.

We believe that the integration of information obtained collectively by all methods will allow us to identify both the main difficulties in the process of adaptation of children of primary preschool age to the preschool educational institution, as well as the peculiarities of child-parent relations, the style of parenting in the family, the attitudes and reactions of parents that contribute to/ hinder/ the effective manifestation of the adaptive capabilities of children and, as a result, their adaptation to the conditions of a preschool educational institution.

Results And Discussion

The presentation of the results of the obtained diagnostic data analysis will be performed in the same logic as described above for the experimental research program.

Thus,

• Implementation of the methodology "Study of the level of child's adaptability to the conditions of a preschool educational institution" by M.V. Korepanova [8] and E.V. Kharlampova [8], allows us to conclude that a high level of adaptation to the preschool educational institution is typical only for two children. These are the kids who demonstrate the predominance of a joyful (or steady-calm) emotional state. They are actively in contact with both adults and children, and with surrounding objects; quickly adapt to new conditions (unfamiliar adult, new premises, communication with a group of peers). The respondents referred by us to the average level of adaptation to the preschool educational institution (the majority of respondents according to the results of our research are 9 people) are characterized by an unstable emotional state; a new (unfamiliar) stimulus in children causes persistent negative emotional reactions. At the same time, with the emotional support of an adult, such children tend to be cognitive and behavioral activity and the process of their adaptation proceeds smoothly. The respondents whom we attributed to the low level of adaptability to a preschool educational institution (5 such respondents according to the results of our study) are characterized by a predominance of aggressive and destructive reactions aimed at overcoming the situation (motor protest, aggressive actions), stable emotions of negative modality (crying, indignant scream), or their activity and initiative is completely absent against the background of persisting negative emotions (silent crying, whimpering, refusal of active movements, lack of attempts to resist, passive subordination, depression, tension).

• Analysis of the data obtained by us after the implementation of the methodology "Study of the psychophysiological adaptation of children to the conditions of a preschool educational institution" by A. Ostroukhova [13], indicates that an easy (high) level of psychophysiological adaptation to the conditions of

preschool education is typical only for 1 child, who is characterized by a calm deep sleep and good appetite; steady positive mood; the presence of a large number of friends with whom the child eagerly makes contact and enjoys playing. The respondents who we assigned to the average level of adaptation to the conditions of preschool education (the majority of respondents according to the results of our research are twelve people) are characterized by a certain isolation and restraint in organizing social contacts (the child may ask into arms, plays reluctantly with his peers, sleeps generally, but not long and falls asleep with difficulty, the appetite is selective, but unsaturated). The respondents who we attributed to the complicated (low) level of adaptation to the conditions of a preschool educational institution (three people were identified by the results of our research) are characterized by tearfulness, the prevalence of negative emotional mood; these children do not contact their peers, even if they are involved in a joint game; the process of falling asleep for these children is difficult, the children cry for a long time, their sleep is disturbing, eating is also difficult for them (they reject some dishes, are capricious, etc.).

The results of the implementation of the methodology "Diagnostics of communication forms" by M.I. Lisina [20], focused on determining the leading form of communication between a child and adults, indicates that only 1 respondent found a high level of activity in communication with adults. This child is quite actively taking the initiative in organizing and making contacts with adults (he brought the book, asked to read it; sat down at the table in the play corner and invited the teacher, etc.). The speech utterances of this child are of a non-situational and personal nature. During communication, the baby felt relaxed and confident, his activity in relation to the object of attention (toy, book, teacher in case of conversation) was shown in active speech (statements, questions). The duration of the interaction was five minutes or more. The respondents who we attributed to the average level of activity in communicating with adults (six ones according to the results of our study) are characterized by a certain inertia in organizing contacts with adults (they show their contact only in response to an adult's initiative). Moreover, during the communication itself, such children feel quite calm. The speech contains statements of an evaluative nature. Preference is given to considering various objects (books, toys) and interacting with them. At the same time, the object of attention of the child often changes - the baby, having barely concentrated, switches from a person to books, then, to toys. The duration of the interaction is up to five minutes. The respondents whom we attributed to the low level of formation of the communication activity with adults (according to the results of our study, the majority of respondents are nine people) are characterized by lack of willingness to communicate with adults. During the interaction, these children feel constrained, tense. The main object of their attention is toys. However, the child's activity in interacting with toys is limited only to a cursory glance at them. During the interaction, these children do not answer the adult's questions, do not ask for help, do not show verbal activity themselves. The duration of their interaction is up to 3 minutes.

Thus, having performed the first stage of an experimental study focused on studying the adaptive capabilities of children of the 4th year of life, we conclude that the majority of respondents (10 people) are at an average level of adaptive capabilities. Some difficulties in general adaptation to the conditions of the preschool educational institution are typical for them, manifested in an unstable emotional state, but with the support of an adult, they tend to manifest cognitive and behavioral activity; disturbances in the psychophysiological adaptation, expressed in the difficulty in establishing social contacts with other children, difficulty to fall asleep, but they sleep calmly, eat only selective foods, are not inclined to take their own initiative in communicating with adults and only come into contact with stimulation of the latter. In the process of communicating with an adult, they feel calm, but their attention constantly switches from an adult to other objects.

At a *high level* of adaptive capabilities, as our study showed, there is the smallest number of respondents (one person). Typical for him is good adaptability to the conditions of early childhood care. He predominantly dominates a stable, calm emotional state, he actively interacts with both adults and peers. Violations of psychophysiological adaptation are not observed. Sleep and appetite are good. He is inclined to take initiative in communicating with adults, during which he feels quite relaxed.

At a low level of adaptive capabilities, as the results of our study showed, there is a small number of respondents (five people). Typical for them is the predominance of aggressive-destructive reactions aimed at overcoming the situation, an active emotional state in the form of crying or an indignant scream. Also in this group of children there are disorders of psychophysiological adaptation, manifested in tearfulness, a negative emotional background of mood, these children try not to contact with other children, fall asleep with difficulty and often with tears, and are anxious in a dream. Also, these children are not ready to make

contact with an adult. In their speech, they use separate speech utterances - monosyllabic answers to questions of an adult. During the interaction they feel constrained, tense.

Turning to the assessment of the data obtained, based on the results of the implementation of a diagnostic techniques package focused on the study of parents and their relationship to their children, we draw the following conclusions:

• the methodology "Questionnaire of parental relationship" by A.Ya. Varg [15] and V.V. Stolin [15] shows that nine out of thirty two parents give preference to a cooperative type of relationship with their children, showing sincere interest in their child, positively assessing his abilities, try to be on an equal footing with the child, encouraging his independence and initiative.

Four parents give preference to such a type of relationship as control, setting the child a fairly strict disciplinary framework and demanding unconditional obedience from him, often imposing his will on the baby.

Most parents (nineteen people) give preference in terms of organizing contacts with their children to such a type of relationship as acceptance-rejection, demonstrating a willingness to accept their child as he is, approving and supporting his interests, recognizing his personality. However, this positive is unstable and is situational in nature. A negative mood of mom or dad can change the positive attitude towards the child to the diametrically opposite - negative, which cannot but affect the development of the child, and the process of its adaptation to the preschool educational institution.

• the methodology "Strategies for family education" by S.S. Stepanov, in the modification of I.I. Makhonina [21] showed that five parents give preference in terms of family education strategies to an authoritarian strategy: they have a good idea of how their child should grow up, and make every effort to this. In their requirements, they are very categorical, inclined to limit the independence of the child, accompanying the actions of the baby with tight control, severe prohibitions, reprimands, and even physical punishment.

Eleven parents (which makes the majority of our sample) give preference to an authoritative family education strategy, recognizing both their role in the formation of the child's personality and recognizing their own right to self-development. They understand what requirements a child can and even need to dictate, and what should be discussed with him, explaining why he is not allowed to do something. These parents, taking into account the age-related capabilities of children, encourage their personal responsibility and independence, requiring meaningful behavior from children and trying to help, being sensitive to the needs of the baby. These parents are even ready to reasonably review their views on this or that situation of the child's development, while showing firmness and taking care that the children observe the rules of behavior and discipline, which objectively forms the correct, responsible social behavior of the child.

Eight parents give preference to the liberal strategy of family education, highly appreciating their child, consider any of his misbehavior and pranks to be excusable, and do not limit him to anything.

Another eight parents give preference to the indifferent family education strategy, without considering the problems associated with raising children as paramount.

•The methodology "Questionnaire of parental attitudes" (PARI) by E.S. Schaefer and R.K. Bell, adapted by T.V. Nescheretom [14], indicates that the majority of respondents (twenty two parents) have such an attitude towards their child as "over authority of their parents", showing a desire to tightly control all the manifestations of their children.

Ten respondents have such an attitude as "verbalization", striving to discuss with children not only all the requirements that are formulated with respect to them, but also problems that arise in children, which is a clear indicator that these parents seek to overcome joint efforts with the child difficulties arising.

• The method "Measure of care" by I.M. Markovskaya [11] showed that there were no respondents with a high level of parental care measures for their children in our sample of respondents.

According to the results of this methodology implementation, a majority of respondents with an average level of care measures were identified (twenty two people). Although these parents are prone to caring for their children, they can even pamper them, but all these manifestations are dosed, and they are not ready to encourage all the manifestations and freaks of children. It can be concluded that these parents give their children sufficient, but not excessive, attention.

We rated ten respondents by a low level of care measures. These parents underestimate themselves as an educator, and rely too much on chance and favorable circumstances. At the same time, they are often distracted from their own child by problems in business (at work) or marital relationships.

Summarizing the data that we obtained from the results of the diagnostic program for parents implementation, we conclude that the majority of respondents from our sample (twenty two people) are at an average level of development of child-parent relations. Although typical of them is a positive attitude towards their own child, these parents are not ready to devote all of themselves to their children; they spend insufficient time with their child, which cannot but negatively affect the development of their baby. Showing willingness to support the independence and initiative of their child, they do this from time to time, selectively, often depending on their mood and situation. Showing interest in their child and adequately assessing his abilities, encouraging his independence and initiative, these parents are not inclined to establish a psychological distance between themselves and the child and are even ready to satisfy their needs situationally (first of all, without prejudice to their own interests and needs). While controlling their child, they are not inclined to totally limit his freedom. The failures of their child are, again, situational, focusing, first of all, on their mood. In the educational process, these parents prefer to choose an authoritative management style, realizing attitudes as verbalization and their own super-authority, and at the same time showing an average level of care for children.

At a high level of development of parent-child relations, as our study showed, there are only five respondents. These are parents for whom it is typical to adopt their own child as he is. They respect and recognize his personality, approve of his interests, support plans, spend a lot of time with him and do not regret it. They show a sincere interest in what interests the child, appreciate his abilities, encourage independence and initiative, try to be on an equal footing with the child. These parents try not to establish a psychological distance between themselves and the child, try to always be closer to him, to satisfy his basic reasonable needs. Parents control their child and his behavior, but do not limit his freedom. They treat their child's failures adequately, not trying to minimize or exaggerate them, but rather try to find a possible reason for it in order to try to help their child achieve greater success in the future where he has now failed. These parents also prefer to choose an authoritative leadership style. They are more typical of such attitudes as verbalization, fear of offense, partnerships, development of the child's activity and equal relationships. The measure of care they have is at a fairly high level.

Based on the results of a generalized analysis of empirical data, five respondents were assigned to the low level of development of child-parent relations. These parents demonstrate negative feelings towards their child (irritability, anger, annoyance, etc.); often they perceive their child as loser, do not believe in his future, and value his abilities low. They are not inclined to encourage the initiative and independence of their child and basically prefer to do something and make decisions for him. They require unconditional obedience from children. At the same time, their level of care for the child is low.

In order to determine the objective connection between the nature of parent-child relationships and the adaptive capabilities of a child of primary preschool age for a preschool educational institution, we used methods of mathematical statistics. Namely,

- calculation of the average value and standard deviation;
- Spearman correlation analysis to establish the connection between parent-child relationships and the level of emotional well-being of preschool children.

Mathematical statistical processing of data was performed using the statistical system "SPSS 20" and showed that objective connection was found between parent-child relationships and the level of adaptability of children of primary preschool age.

Positive correlation connections are established between:

- adoption by the mother ($r = 0.796$; $p \leq 0.01$) and the father ($r = 0.624$; $p \leq 0.01$) of the child and his level of adaptability;
- the image of the social desirability of behavior in the mother ($r = 0.611$; $p \leq 0.05$) and father ($r = 0.516$; $p \leq 0.05$) and the level of psychophysiological adaptation and the level of adaptation ($r = 0.860$; $p \leq 0.01$) of the child , as well as its general level of communication skills ($r = 0.755$; $p \leq 0.01$);
- symbiosis in the mother ($r = 0.729$; $p \leq 0.01$) and the father ($r = 0.847$; $p \leq 0.01$) and the level of adaptability of the child, as well as his overall level of communication skills ($r = 0.674$; $p \leq 0, 05$; $r = 0.558$; $p \leq 0.05$);
- verbalization in the mother ($r = 0.562$; $p \leq 0.05$) and the father ($r = 0.780$; $p \leq 0.01$) and the level of psychophysiological adaptation of the child, the level of adaptation ($r = 0.750$; $p \leq 0.01$), and the general level of communication skills in a child ($r = 0.636$; $p \leq 0.01$);

- the exception of intra-family influences in the mother (r = 0.563; p≤0.05) and the father (r = 0.627; p≤0.01) and the level of adaptability of the child, as well as the general level of communication skills in the child (r = 0.668; p ≤0.01);

- partnerships in the mother and the general level of communication skills in the child (r = 0.673; p≤0.01);

- extraordinary intervention in the child's world and the level of psychophysiological adaptation of the child (r = 0.526; p≤0.05), as well as the general level of communication skills in the child (r = 0.592; p≤0.05);

- dependence on the mother's family, perceived by the father, and the level of adaptability of the child (r = 0.720; p≤0.01);

- fear of offending the father, the level of psychophysiological adaptation (r = 0.553; p≤0.05) and the level of adaptability of the child (r = 0.594; p≤0.05);

- the desire to accelerate the development of the child in the father, the level of psychophysiological adaptation (r = 0.766; p≤0.01), the level of adaptability (r = 0.734; p≤0.01) and the general level of communication skills in the child (r = 0.577; p≤ 0.05);

- the father's perception of the mother's lack of independence, the level of psychophysiological adaptation (r = 0.649; p≤0.01) and the child's adaptability level (r = 0.698; p≤0.01);

- a measure of mother and father care and the level of psychophysiological adaptation (r = 0.588; p≤0.01; r = 0.597; p≤0.05), the level of adaptability (r = 0.683; p≤0.01; r = 0.710; p ≤0.01), as well as the general level of communication skills in a child (r = 0.621; p≤0.05; r = 0.611; p≤0.05).

We also revealed negative correlation connections between:

- authoritarian hypersonalization of mother and father, psychophysiological adaptation (r = -0.646; p≤0.01; r = -0.542; p≤0.05), level of adaptability (r = -0.859; p≤0.01; r = - 0.689; p≤0.01), as well as the general level of communication skills in a child (r = -0.694; p≤0.05);

- the development of the child's activity by the mother, psychophysiological adaptation (r = -0.528; p≤0.05), the level of adaptability (r = -0.499; p≤0.05), as well as the general level of communication skills in the child (r = -0.590 ; p≤0.05);

- a sense of self-sacrifice of the mother by the father and the level of adaptation (r = -0.690; p≤0.01);

- family conflicts in the father, the level of adaptation (r = -0.628; p≤0.01), as well as the general level of communication skills in the child (r = -0.599; p≤0.05);

- irritability of the father and psychophysiological adaptation (r = -0.757; p≤0.01);

- excessive strictness of the father, psychophysiological adaptation (r = -0.684; p≤0.01) and the level of adaptability of the child (r = -0.670; p≤0.01);

- super-authority of the father and the psychophysiological adaptation of the child (r = -0.555; p≤0.05);

- father's evasion of conflicts, psychophysiological adaptation (r = -0.717; p≤0.01), level of adaptability (r = -0.785; p≤0.01), as well as the general level of communication skills in the child (r = -0.603 ; p≤0.05);

- indifference of the husband, psychophysiological adaptation (r = -0.535; p≤0.05), level of adaptation (r = -0.853; p≤0.01), as well as the general level of communication skills in the child (r = -0.733; p ≤0.01);

- suppression of the husband's sexuality, psychophysiological adaptation (r = -0.5395; p≤0.05), level of adaptation (r = -0.562; p≤0.05), as well as the general level of communication skills in the child (r = -0.710; p≤0.01);

- extraordinary interference in the child's world by the mother, perceived by the father, psychophysiological adaptation (r = -0.584; p≤0.05), level of adaptability (r = -0.747; p≤0.01), as well as the general level of communication skills in a child (r = -0.665; p≤0.01).

Conclusions

Thus, our study objectively showed that there is a close connection between parent-child relationships and the adaptability level of children of primary preschool age.

We have established that a beneficial effect on the adaptive capabilities of children of the 4th year of life, has parent-child communication, namely: verbalization, exclusion of family influence, partnerships, the desire to accelerate the development of the child, a measure of care, an image of social desirability of behavior, symbiosis.

However, we believe that most parents do not fully realize their potential as parents in organizing and maintaining contacts with their children. The consequence of this fact is a decrease in the adaptive capabilities of their children and a longer and burdened period of their adaptation to the preschool educational institution.

A specially designed program of psychological and pedagogical support of the family will help parents in the implementation of effective interaction with their children, and, as a result, will help to optimize the adaptation process of children to new environmental conditions.

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Features of Parental Relationships in Families with a Child Diagnosed with ICP

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Abstract

ICP is a very common disease. There are many medical studies on the treatment and rehabilitation of chil-dren diagnosed with ICP, the reasons for its occurrence are being investigated, and strategies for its overcom-ing are proposed. There are almost no studies on the effect of this child's disease on the child-parent relation-ship.

According to the National Association of ICP Experts, most children with this diagnosis have a favora-ble outcome with timely rehabilitation. The desire of mothers to bring their children to the generally accepted "norm" as soon as possible greatly affects the quality of relations with children. We investigated mothers who have 6-7-year-old-children diagnosed with ICP and mothers with children who are 5-7 years old and not di-agnosed with ICP. The following methods have been used: Varga-Stolin parental relationship questionnaire, the questionnaire of parent disciplines styles by Shvedovskoy A.A., the parent essay in the form of unfinished sentences by Shvedovskaya A.A. The results showed that the behavior of mothers towards children with ICP depends on the emotional acceptance or denial of the child, the desire to cooperate with them or the desire to get results in the form of "corrected" deficiencies. It is difficult for mothers to distinguish the child's behavior if it is caused by the disease or their character. Mothers of children with ICP pay more attention to the criterion behavior of the child, orient them towards overcoming the disease, pay more attention to the physical devel-opment of the child and their personal qualities.

Keywords: ICP; parental attitude; parental behavior.

Introduction

The family is under great stress when it finds out about the diagnosis. As a rule, the main burden of the child's care falls on the mother who becomes their primary caretaker. Because of the care demanding a 24-hour working day from the mother, long-term child's rehabilitation, and the presence of not always quick and obvious results, mothers experience great tension and stress, which affects their relationship with the child and their behavior towards them. This is stipulated by the peculiarities of the parents' adaptation to the child's disability [1,2]. Studies show that, regardless of the nature of the pathology, mothers of children with developmental disabilities have personality problems [3,4,5]. They are often depressed and experience feelings of guilt, experience social isolation. Excessive immersion in the education of a child with a disability leads to frustration of the basic mothers' needs. Depression, intrapersonal conflicts, neurotic reactions, distortion of parental relations and distortion of attitude towards the child indicate an adjustment disorder to the situation. The behavior of an adult in relation to the child is of great importance in the process of meeting their needs. Parental attitude is considered as the fundamental basis for the development of a child's personality. In modern science there is no generally accepted definition of a parental attitude. Parental attitude is "a system, or a set of parental, emotional attitudes toward a child, the child's perception by the parent and ways of behaving with them" [6] (p. 704). In the structure of the parental attitude, various parameters are distinguished: the level of protection, the completeness of meeting the child's needs, the degree of making demands, the degree of forbiddenness, the severity of sanctions, the sustainability of the educational style [7]. There are two main parameters of the parental attitude: parental warmth as a degree of emotional closeness to the child and parental control as a way of regulating the child's behavior [8] (p.436). The connection between parental attitude and parental behavior was shown in the works of Smirnova E.O. [9]. The author emphasizes that there are always two opposite beginnings in the parental attitude: the personal and the subject one. The predominance of the personal principle will be manifested in sympathy, the desire to help, empathy for the child and orientation to their psychological comfort, in a non-judgmental attitude towards them. The predominance of the subject principle presupposes the existence of strict requirements of the parent to the child, the external judgmental position of the parent, a rather rigid strategy of the behavior of the parent aimed at educating the child's qualities that are valuable from their point of view.

Consequently, the parental attitude is the most important of the factors that influence the psychological state of the child and the development of their personality. Parental attitudes include the emotional component, which is realized in accepting or denying the child, the cognitive component, which includes the assessment of the child, their abilities, the comparison with peers, and the behavioral component, which is realized in the joint activity of the mother and the child.

This article presents the results of a study of the peculiarities of the parental (maternal) attitude towards children with ICP. The features of mothers' reactions towards the "good" and "bad" behavior of children, the causes of conflicts in the mother-child dyad, reactions to difficulties and differences in the educational attitude towards the child depending on the emotional acceptance or denial of the child and the desire to interact with them are highlighted.

There have not been conducted any research on the peculiarities of the parental position in bringing up a preschool child with ICP in Russia.

2. Research overview.

The survey respondents were mothers of children undergoing rehabilitation treatment at the Scientific and Practical Center for Pediatric Neuropsychiatry in 2017-2018. The study is voluntary. Mothers with preschool children of 6-7 years old, 33 people altogether have been interviewed. The comparison group has been made of mothers with healthy children of 6-7 years old, only 25 people. All mothers who participated in the study were not married. The children's age of 6-7 years is of great importance, since all children from the age of 7 should have started the first year of the regular school. The success of rehabilitation action influences on the child's ability to attend a general school, otherwise they will need a Remedial School. That is, mothers who have children diagnosed with ICP at that moment are in a very heavy emotional strain associated with the choice of the life journey of their child.

3. Purpose.

The purpose of this research is to study the peculiarities of the parental attitude of single mothers to a preschool child diagnosed with ICP, and her parental educational attitude towards the child (methods of encouragement, punishment, identification of sources of positive and negative forms of the child's behavior, and the peculiarities of mother's reaction towards the child's difficulties).

4. Methods.

The following methods to detect the peculiarities of parental attitude have been used: Varga-Stolin parental relationship questionnaire, the questionnaire of parent disciplines styles by Shvedovskoy A.A., the parent essay in the form of unfinished sentences by Shvedovskaya A.A.

The questionnaire of parental attitude has been developed as a psychodiagnostic tool for parents with children of preschool age. It contains 61 questions and allows you to determine the peculiarities of the features degree on the scales: acceptance / denial, cooperation, symbiosis, authoritarian hyper-socialization (control), small loser (attitude to difficulties). questionnaire of parent disciplines styles by Shvedovskoy A.A. highlights the features of parental behavior in interaction with the child. Each scale has its own response options. The questionnaire contains the following scales: ways of encouragement ("If you find out that your child has done something good, then you do..."); methods of punishment ("If your child has done something unacceptable, then you .."); monitoring ("You usually find out that something has happened to your child when ..."); sources of positive behavior ("Your child behaves well because .."); sources of negative behavior ("If your child is naughty, disobeys, misbehaves, this is due to the fact that .."); assistance ("If your child cannot cope with something themselves, you think that ..."); sources of conflict ("If you have conflicts with your child at home, they usually occur about ..."); reaction to difficulties ("If your child finds themselves in a situation unpleasant for them and experiences heavy strain, anxiety, they usually do ...") [10].

The questionnaire Parent essay in the form of unfinished sentences also presents the scale allowing to reveal the parental position, the prevailing image of the child, the nature of relationships and interactions with the child. The method contains the following scales: "Open", "Comparative assessment of the child", "Significant characteristics of the child", "Positive features of the child", "Ideal expectations", "Possible fears, concerns", "Real requirements", "Causes of difficulties "," Anamnestic data "," Interests, preferences of the child "," Situation "We are interactions" [11].

4.1. Statistics methods.

The data were processed using the STATISTICA v.6.0 Rus program. According to the parental attitude questionnaire, the following results have been obtained. To test the statistical significance of the differences between the groups, the Mann-Whitney U-test has been used. As a result of checking the statistical significance and reliability, it has been revealed that the differences in the samples are statistically valid ($p < 0.01$) according to "acceptance-denial" and "cooperation" scales, statistically significant – according to the "attitude to failures" scale ($p < 0.05$), and both scales "conttrol" and "symbiosis" are neither statistically significant nor statistically valid.

The acceptance / denial scale expresses an emotionally positive or emotionally negative attitude towards a child. The scale "cooperation" expresses the desire of adults to cooperate with the child, their sincere interest and participation in their affairs. The scale "attitude to failures" shows the attitude of an adult to the child's abilities, strengths and weaknesses, successes and failures. Mothers of children diagnosed with ICP attach great importance to the successes and failures of the child, as their life trajectory largely depends on this.

According to the questionnaire of parent disciplines styles, we obtained values on 61 scales, plus another 8 values on individual answers that have been presented by the survey respondents. Each scale can score from 0 to 4 points. We assume that if the number of points from 0 to 2.5 (not including), then the scale is not evident, and from 2.5 to 4 –it is evident. The presence of fractional points is due to the fact that there can be several sentences related to one scale in the answer to one question. Further, the average values on the scales have been calculated. We looked at the differences between the groups on each scale using the Mann-Whitney U-test. The results are shown in Table 1.

Table 1. The scales analysis results of the parent disciplines questionnaire

№	Block	Differences in evident scales (scales and questionnaire sentences related to them)	
		Mothers of children with ICP	Mothers of healthy children
1	Ways of encouragement	No significant differences	
2	Ways of punishment Question: if your child has done something unacceptable, you:	Formal verbal punishment: admonish the child and forget about it.	Discussion: surely remember similar cases from the life and tell about their consequences.
3	Monitoring Question: how do you usually find out that something has happened to your child?	No contact: never tell themselves, it is always done by people around them	Первый рассказывает о случившемся, активно жалуется/хвалится They are the first who tell about what has happened, actively complain / boast
4	Sources of positive behavior forms Question: Your child behaves themselves because:	Physiological make-up: they are often in a good mood, hardly ever get tired or feel under the weather Stimulatory effect: they hardly ever get bored and always have something to do.	Personal choice of a child: Consider themselves to be like this. Characterological peculiarities: they have such a character.
5	Sources of negative behavior forms. Question: if your child is naughty, disobeys then:	Physiological make-up: they are allowed a lot.	Negative example: this occurs because they copy someone's misbehavior.

6	Helping Question: if your child cannot cope with something themselves, you think that:	Independence restriction: everything shall be done for the child in order not to be difficult for them	First, it's necessary to estimate the situation and them decide when and how to help; It's necessary to wait until the last moment and then to help; It's necessary to help for the first time, then they should cope themselves
7	Sources of conflicts Question: if you have conflicts with your child at home, they usually occur about:	Criterion manifestation: food (eat badly, are fussy about their food); personal neatness (do not look after themselves, dirty things, furniture)	Child's interests: child's request to buy something; specific interests or hobbies ребенка (reading, games, TV, i-pad)
8	Reaction to difficulties Question: If your child finds themselves in a situation unpleasant for them and experiences heavy strain, anxiety, they usually:	Emotional response through grief: They cry and feel sad. Confession, liberation from guilt: they tell someone about it, ask for forgiveness.	Search for social support: asking someone for advice, help. Avoiding activity: moving away from communication, unwilling to talk, shrinking into themselves.

Questionnaire Parent essay has been analyzed by us using content analysis. The results are shown in table 2.

Table 2. Content analysis results of the parent essay based on the unfinished sentences

№	Scale	The most evident scales	
		Mothers of children with ICP	Mothers of healthy children
1. Open scale			
	Categories	Temporary (I think always, constantly). Positive and negative emotions (joy, happiness, heart breaks) Health (the desire for the child to be healthy)	Temporary (I think always, constantly). Characterological traits (real man, honor) Positive emotions (joy, happiness) Estimation (the best child in the world)
2. Comparative assessment of a child			
	Categories	Developmental status (lags behind in development, cannot run, cannot read and write, cannot do a lot of things) Personal qualities (active, kind, conform with the age, remember things well) Personal mother's attitude (I feel sorry for them, I feel bad that they are not like others)	Personal qualities (active, smart, best, independent, leader, comes up with games, commands) Developmental status (they outgrow, can do more, are ahead of age Personal mother's attitude (I bloat with pride)
3. Significant peculiarities of a child			
	Categories	Child's positive qualities: Stubbornness, kindness to others, tenderness, purposefulness, simplicity, naivety	Child's qualities: Stubbornness, kindness, leadership, desire to learn something, loyalty

		Negative qualities: Demands attantion	
4. Positive peculiarities of a child			
	Categories	Emotional state (cheerful, in a good mood, not naughty) Activity (learns something new, communicates with peers, helps, obeys Characterological traits (seriousness, sociability, not proneness to conflict, stubbornness, persistence, immediately calms down)	Activity counts, draws, reads, eats well; shares with me, analyses their acts, Emotional state Hugs me, happy, smiles, calm Joint communication interest, knows how to enter into conversation, good manners, sense of humor, Characterological traits judgement, sincerity, shyness, calm, persistence, kindness
5. Ideal expectations			
	Categories	Health (diseases) Development (falls behind peers) Characterological traits (gullibility) Social adaptation (will not fit into society) Nervous system (hyperactivity, irritation, tearfulness) Behavior (naughtiness, unsociability) Causing pain to others, Physical abnormalities Self-fulfillment	Health (diseases) Nervous system (nervousness, irritation) Hobbies (computer games) Characterological traits (shyness) Causing pain to others, Anxiety about future profession (study)
6. Possible fears, concerns			
		Possibility of socialization (will not fit into society, it will be hard, will not realize themselves in life, will be offended at school) Personal traits (irritation, excessive emotionality, gullibility to people, remoteness, restlessness, shyness, stubbornness, impressionability) Health (will be ill, retardation in language) Developments (falls behind peers, I want abilities to appear) Nervous system (hyperactivity, irritation, tearfulness) Behavioral (naughtiness) Parental incompetence	Personal traits (shyness, isolation, restlessness, emotionality, irritation, indifference, laziness, fear) Causing mental anguish to others Nervous system (nervousness, irritation) Parental incompetence (will not be able to pay for Education, will not be able to bring them up in a right manner, I am afraid to lose them) Hobbies (computer games) Health (eyesight)

		(will not be able to help)	
7. Real requirements			
	Categories	Education, training (reading, writing, drawing, Personal changes (stopped acting flaky, ceased to stop being afraid, stopped being naughty) Neurotic manifestations of anxiety (gnaw nails, scream, act flaky, overeat; cry when doing homework; pick a nose; tell lies)	Neurotic manifestations of anxiety (gnaw nails, gnaw pens; hide from me; tell lies; bite lips) Education, personal development (reading books, Mathematics, homework, sport, music, self-fulfillment, creative pastime) Emotional reaction (to be afraid, to be stubborn, to pretend a baby)
8. Causes of difficulties			
		Personal traits of a child (does not listen, does not hear, aches, becomes naughty; is lazy, inattention; lack of brain; lack of self-confidence) Disease (disordered motor function, weak mental alertness, ICP, hyperactivity, Parent's behavior (I try to take a hold on myself, my hyperprotection) Emotional expressions (behaves naughty, emotions) Behavior (argues) Other people	Personal traits (indecision, shyness, modesty, lack of confidence in their abilities, bullying, laziness, stubborness) Fears (fear in front of difficulties) Behavior (does not obey, begins to misbehave, hurry, argues
9. Interests, preferences of a child			

		Objects (toys, technical appliances, Spiderman, toy cars, computer, smartphone) Types of activity (football, drawing, singing, dancing, watch pictures in books, play with dolls; play plot games; compose stories; swimming pool; watch cartoons; do nothing; run) Interaction with other people (play with sister; run at the children playground; likes mothering, attention; to be with me; communicate; play with children; communicate with relatives)	Types of activity (Music, languages, football, dancing, drawing, modelling, hockey, Medicine, History, historical films, traveling, use computer, travel a lot, sport, play football) Interaction with other people (communicate, help me, like warm relations between relatives; go for a walk; play with friends Objects (toys, toy card, books, computer) Food (sweets, soup)
10. We-interaction			
	Categories	Joint activity (play together, go for a walk, train) Emotional expression (laugh, play, «hugging»)	Joint activity (play together, go for a walk, train) Complex creative activity (cooking food)

5. Discussion.

There are differences in parental attitude and behavior of mothers bringing up healthy children and mothers bringing up children with ICP.

If a child has done something unacceptable, mothers of children diagnosed with ICP tend to limit themselves to a formal verbal punishment, while mothers of healthy children are characterized by reasoning or explaining the situation to the child, intended to convey the fallacy of their behavior to them. Mothers of healthy children are more likely to initiate guilt feelings in a child in case of unacceptable behavior of the child than mothers of children with ICP. This can be explained by the fact that mothers of healthy children see the possibility of self-regulation by the child of unacceptable behavior, while mothers of children diagnosed with ICP see the source of the child's behavioral difficulties in their physiological peculiarities, counting it as a result caused by the manifestation of the disease and they cannot take an inculpatory stance.

If a child behaves themselves, then the mothers of healthy children consider the source of such behavior to be a positive example, the personal choice of the child and their character. Mothers of children with ICP consider their physiological peculiarities (they hardly ever get tired) and the presence of stimulation (the child always has something to do) as sources of good child behavior.

If a child cannot cope with something, before assisting them, mothers in both groups preliminarily assess the need for such assistance, try to cope with the child together or refuse to help. For mothers with children with ICP, characteristic behavior is also a restriction of the child's independence, which is manifested in excessive assistance (everything must be done for the child so that it is not difficult for them), which may cause overprotective behavior that blocks the child's independence.

The sources of conflict in the mother - child dyad in both groups are intrafamily (to eat on time, sleep; clean up after themselves) and extrafamily responsibilities (homework, visiting kindergarten, project group, activities) of the child. In a dyad with a child with ICP, the source of conflict is also the normative behavior of the child, and in a dyad with a healthy child are their interests.

The greatest difference in the perception by mothers of the children behavior in both groups has been found in reactions to difficulties. If a child gets into an unpleasant situation and experiences strong strain, healthy children are looking for bodily contact (trying to hug, hug a pet, a nearest person or a toy), social support (asking for help, advice) or move away from communication not willing to speak. Children diagnosed with ICP when confronted with difficulties tend to react emotionally through experiencing grief (crying, being sad), looking for bodily contact and trying to free themselves from strain through recognition and relief from guilt (apologize, tell about it to someone).

Differences have also been found in mothers bringing up a child with ICP in the upbringing position in relation to the child depending on their acceptance or denial and the level of cooperation with them (desire to participate in their affairs and their life).

Mothers who emotionally accept a child and have a high level of cooperation when interacting with them tend to accept the child as they are. Their assessment of the child and their relationship with them is not different from the assessment of mothers with healthy children. They feel happy when they think about their child. They are not inclined to compare them with other children. They give positive qualities, aspirations to their child. Their requirements for the child are the same as for healthy children: pay more attention to their studies, hobbies, activities. The reasons for the child's difficulties are that mothers tend to look at it from the point of view of the child's inner position ("is lazy," "behaves naughty," "takes everything close to the heart," as well as having an illness). That is, mothers differentiate the difficulties of the child to those with which they can cope, and those that the disease imposes on them. Fears and concerns of mothers are connected with the child's future, that they "will not realize themselves in life", "will feel special", "will have complexes due to illness". The situation of joint interaction ("we-interaction") is characterized by a large enumeration of joint types of activity and emotional closeness ("walking", "playing", "drawing", "sculpturing", "we understand each other").

Mothers emotionally accepting a child, but not seeking to cooperate with them, participate in their affairs, plans, do not assist them (showed low values on the "cooperation" scale according to Vargi-Stolin questionnaire) see, unlike mothers of the first group, a child to be "special", "different." They tend to constantly compare the child with other children, emphasizing their lesser autonomy. They realize that they are not paying enough attention to the child. Mothers more often emphasize in children the presence of such traits of character, as the desire to be the center of attention, to be a leader, to try to make friends and to establish contacts with other children. It can be assumed that children are trying to compensate for the lack of a state of shared joint activities with other people. Mothers like when a child is engaged in some kind of activity next to them ("plays next to me") and note this child's ability and ability to control their emotional state well ("they like to play plot games themselves", "the ability to calm down immediately"). Fears of mothers are associated with the child's future in terms of the possibility of their social adaptation, education. They note that the child's affective fixation is unpleasant. Nevertheless, mothers try to "control themselves" when they do not like the child's behavior. They see reasons for difficulties in the child's bad behavior ("naughty," "she says she is bored," "does the opposite") and also in their limited financial situation. Dreams and expectations of mothers are associated with the individual characteristics of the child (I want them "to be independent", "obey", "become calmer", "to be more stress resistant"). The situation of joint interaction ("we-interaction") is characterized mainly by emotional contact: "we understand each other", "we hug", "we laugh").

Mothers who emotionally reject a child but who have a high level of cooperation (according to the Vargi-Stolin questionnaire) express mostly negative emotions when interacting with them. To the question "when I think about my child ..." they continue: "I feel sorry for them," "worrying that no one will offend them," "think about their behavior," "my heart breaks." It can be assumed that mothers are in a depressive or emotionally depressed state; they cannot fully accept the fact of the birth of a "special" child. When compared with other children, mothers indicated their "lag in development" as the main factor of difference. Mothers of this group are focused on the social behavior of the child, on their compliance with the norm of age development of healthy children. In this regard, they tend to perceive the child as a tool to achieve their inner well-being. Therefore, the child should be as close as possible to the ideal image. When characterizing their child, mothers notice that "they are not doing themselves justice," "they do not understand jokes," "they are not capable." The mothers of this group could not identify the significant characteristics of their child (the boxes were left blank). One mother noted the significant quality of a child's "feeling of mutual love," that is, she was pleased to realize that the child loved her. She also emphasized the fact that she loves when a child is "pleased and thanks her" to be positive characteristics of the child. The ideal image of a child of such mothers corresponds to a child without ICP. They want the child "to mentally conform to the age," "be more developed," "be a full-fledged person," "they will have abilities." Fears of mothers are connected mainly with the intellectual lag of the child, the presence of their illness, that the child is "not aspiring", "impatient", "amenable to bad influence". The main requirements of mothers to the child relate to their activities, study, to compensate for developmental lag, so that they "do not cry when they do their homework." The reasons for the difficulties of the child's mother are seen in the character, behavior ("aggression", "shout", "hide"). They believe that the child is hampered by "internal fears", "internal excitement", "lack of brains"., mothers

more often indicate "not to learn," "to play on the street," "to enjoy life" as interests and preferences of the child. The "we-interaction" situation is characterized mainly by interaction with each other without specifying the type of activity ("spending time together") or studying.

Mothers who emotionally reject the child and do not seek to cooperate with them (who showed low scores on the "acceptance-denial" and "cooperation" scales) demonstrate the rejection of their child. They see the child only in the "disease-health" category and they really want the child to suddenly become healthy. When compared with other children, they see that the child is "behind". When interacting with other children, they indicate that their children most often are "looking for friends". Mothers are experiencing strong internal stress due to the presence of a child's pain ("I feel bad that my child is not like everyone else"). Fears concern the behavior of children ("does not find a common language with children") and their future ("they cannot be full-fledged, respect themselves"). The main reasons for the difficulties lie in the "selfish behavior of the child in relation to me." The real requirements in relation to the child by the mothers of this group do not move or are formulated abstractive: "so that I pay more attention to my development". Ideal expectations relate to health ("so that they recover and become a full-fledged person", "so that they never gets ill". A large number of activities (modeling, drawing, singing, dancing, books, cartoons) are indicated as the interests of the child's mother, which are more desirable for them but do not reflect the aspirations of the child themselves, since the preferences of his child's mother they indicate "lying and watching cartoons" and "drawing when there is such a mood").

6. Conclusion.

Thus, the maternal attitude towards the child is largely due to the emotional state of the mother, her acceptance or denial of the child, the presence or absence of her desire to cooperate with them. A more realistic assessment of the child's capabilities and the desire of an adult to cooperate with the child will allow for the adjustment of the destructive components of education and will enable the child to achieve maximum adaptation in society and to realize their potential.

Mothers of children diagnosed with ICP are focused on overcoming the disease and the possibility of their adaptation and socialization in society. In this regard, the normative behavior of the child, their compliance with social norms acquire special significance for them. The level of abilities, achievements and interests of the child is of great importance for mothers of healthy children.

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Justification of the Required Permeability of a Cement Stone Filter

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Abstract

In the article, based on the derived dependencies of the well flow rate on various parameters of the bottom-hole design (the degree of opening of the reservoir by the well, the radius of the cement stone filter, the ratio of the permeability of the filter and the rock, etc.), the calculation and justification of the necessary permeability of the filter limiting sand production into the well during the operation of wells with poorly cemented unstable reservoirs.

Keywords: well, bottom-hole zone, productive reservoir, permeability, cement stone, filter, well flow rate.

Introduction

Well productivity with an increase in the duration of operation generally decreases as a result of natural depletion of the reservoir drive or as a result of deterioration of bottom-hole permeability caused by sand production in the well, destruction of the reservoir, watering of formations, formation of asphaltene and resinous substances and a number of other processes. During the operation of gas wells, operating Cenomanian deposits in the fields of the North of the Tyumen region, sand is produced [1, 2]. To prevent sand from entering the well, various technologies and technical means are used. They have different permeabilities from medium and low for cement stone filters to high for mechanical filters [3, 4]. It is of interest to find out what permeability a filter should have to prevent sand production in order to ensure the best possible flow rate in the well.

Theoretical part

As is known, the natural permeability of the reservoir and the permeability of the bottom-hole formation zone formed during the completion of the well determine the productivity of the well. Therefore, to obtain the maximum possible flow rate during operation, it is necessary to select the appropriate size of the filter openings and their number, i.e. give the filter a certain open area.

When using a permeable cement stone filter (CSF) in the bottom-hole design installed behind a perforated casing string with plugs, the well productivity will be determined by the total permeability of the stone and string (Figure 1) [1, 2].

Research part

Let us consider the case of a real gas inflow to an imperfect gas well. A productive gas-saturated reservoir with permeability K2 is opened by a gas well and is secured with a casing string (CS) with perforated holes 4 in the interval of the productive reservoir. Behind the casing, a cement stone filter with permeability K1 is installed (Figure 2) [1, 2].

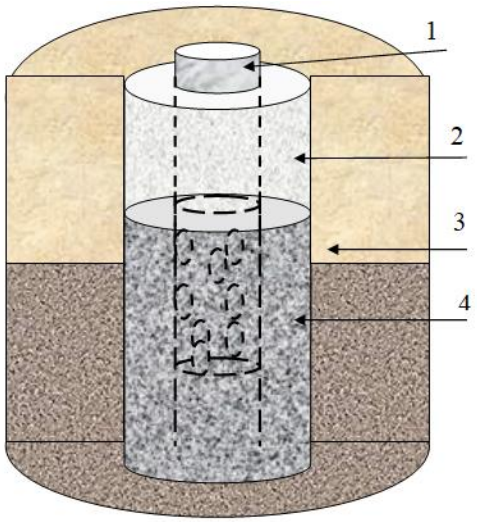


Fig. 1. Bottom-hole design: 1 - CS with plugs; 2 – "impermeable" cement stone; 3 – productive reservoir; 4 – CSF.

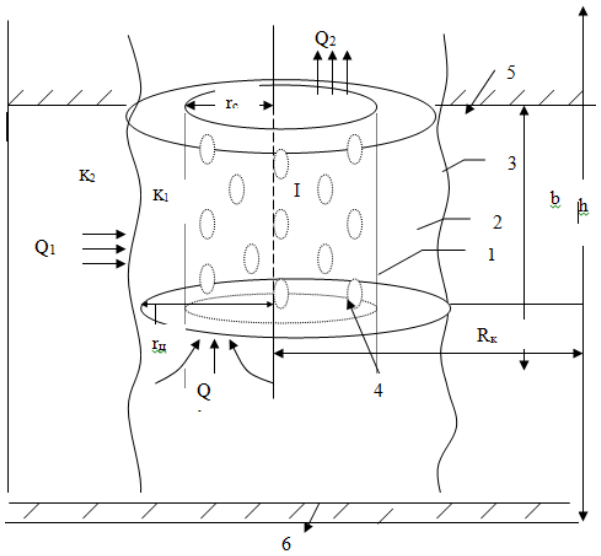


Fig. 2. Diagram of the near-wellbore zone: 1 – CS with plugs - 4 , 2 - CSF, 3 - borehole wall, 5 - roof of the productive reservoir; 6 - bottom of the productive reservoir

The imperfection of a gas well is determined by the imperfection coefficient in relation to the degree of opening of the producing reservoir by the well and by the imperfection coefficient in relation to the nature of opening the productive formation [4].

The nature of the opening of the reservoir determines the technological features of the bottom of the CS, i.e. the number and radius of the holes at the perforation interval. The degree of the opening of the reservoir determines the interval of the opening of the reservoir by the well.

In the first zone, the gas flow to the wellbore is radial and can be described by the following equation:

$$P_c^2 - P_w^2 = A_1 Q + B_1 Q^2 \quad (1)$$

where

$$A_1 = a_1^* (\ln \frac{r_c}{r_w} + C_1) \quad (2)$$

An imperfect gas well with a radius (r_w) with a CSF with a radius (r_c) opens a gas formation of thickness "h" by the value "b".

$$B_1 = b_1^* (\frac{1}{r_w} - \frac{1}{r_c} + C_2) \quad (3)$$

$$a_1^* = \frac{116\mu \cdot z \cdot P_{atm} \cdot T_{res}}{(\pi \cdot K_1 \cdot b \cdot T_{st})} \quad (4)$$

$$b_1^* = \frac{\rho_{st} z P_{at} \cdot T_{res}}{2\pi^2 l \cdot b^2 \cdot T_{st}} \quad (5)$$

where: C_1 and C_2 – well imperfection coefficients in relation to the nature of the opening;

A and B – filtration resistance coefficients, which depend on the parameters of the BHZ and the design of the bottom hole;

P_p - pressure on cement stone, Pa;

Q – gas flow rate at P_{atm} and T_{st}, m^3/day;

P_w – bottom-hole pressure, Pa;

μ - gas dynamic viscosity coefficient at P_{res} and T_{res}, cP;

Z – gas supercompressibility coefficient;

K_1 – filter permeability, D;

ρ_{st} – gas density at P_{atm} and T_{st}, kg/m^3;
b – formation borehole opening value, m;
l – macro-roughness coefficient of CSF.
Coefficients C_1 and C_2 can be assessed by the formulae [3]:

$C_1=b/(n\cdot r_0)$; $C_2=b^2/(3n^2\cdot r_0^2)$ (6)

where, r_0 – hemisphere (hole) radius, n – number of holes; b – perforation interval height.
In the second zone, there is an inflow to an imperfect well with a radius (r_c). The inflow equation can be expressed similarly, by the equation:

$$P_k^2 - P_w^2 = A_2 Q + B_2 Q^2 \quad (7)$$

where

$$A_2 = a_2^*(\ln\frac{R_к}{r_c} + C_3) \quad (8)$$

$$B_2 = b_2^*(\frac{1}{r_c} - \frac{1}{R_к} + C_4) \quad (9)$$

$$a_2^* = \frac{116\mu\cdot z\cdot P_{atm}\cdot T_{res}}{(\pi\cdot K_2\cdot h\cdot T_{st})} \quad (10)$$

$$b_2^* = \frac{\rho_{st} z P_{at}\cdot T_{res}}{2\pi^2 l\cdot h^2\cdot T_{st}} \quad (11)$$

C_3 and C_4 – well imperfection coefficients in relation to the degree of the opening of the reservoir.
Coefficients C_3 and C_4 are determined by the formulae [5]:

$$C_3 = \frac{1}{\bar{h}}\ln\cdot\bar{h} + \frac{1-\bar{h}}{\bar{h}}\cdot\ln\frac{\delta}{\bar{r}_w};\ C_4 = \frac{1}{\bar{h}} \quad (12)$$

where $\bar{h} = \frac{b}{h}$ relative opening of the formation by the well;

$\delta = 1{,}6\cdot(1-\bar{h^2})$;

$\bar{r}_w = \frac{r_c}{h}$ - relative well radius.

Summing up [5] and [7], we obtain the equation for the inflow in general to the well with a radius r_w:

$$P_k^2 - P_c^2 = (A_1 + A_2)Q + (B_1 + B_2)Q^2 \quad (13)$$

Equation [13] allows determining the dependence of the flow rate on the parameters of the perforated CS (the number and radius of the holes) and the characteristics of the permeable cement stone filter (permeability, height, and radius). The results of the calculations are presented in the form of graphs in Figures 3-7.

The influence of the degree of the reservoir opening by a well on its flow rate is shown in Figure 3. Figure 4 shows the dependence of the productivity of a well on the permeability of a cement stone filter with the degree of opening of the reservoir by a well equal to one.

The analysis of the obtained dependences showed that the flow rate depends on the perfection coefficient of the degree of opening and permeability of the reservoir itself and the filter. Thus, the well productivity is higher when the coefficient of perfection in relation to the degree of opening of the productive reservoir is greater. Moreover, the higher the permeability of the reservoir, the greater the flow rate of the well. With an increase in the permeability of cement, the flow rate of the well initially increases sharply, and then this dependence is insignificant.

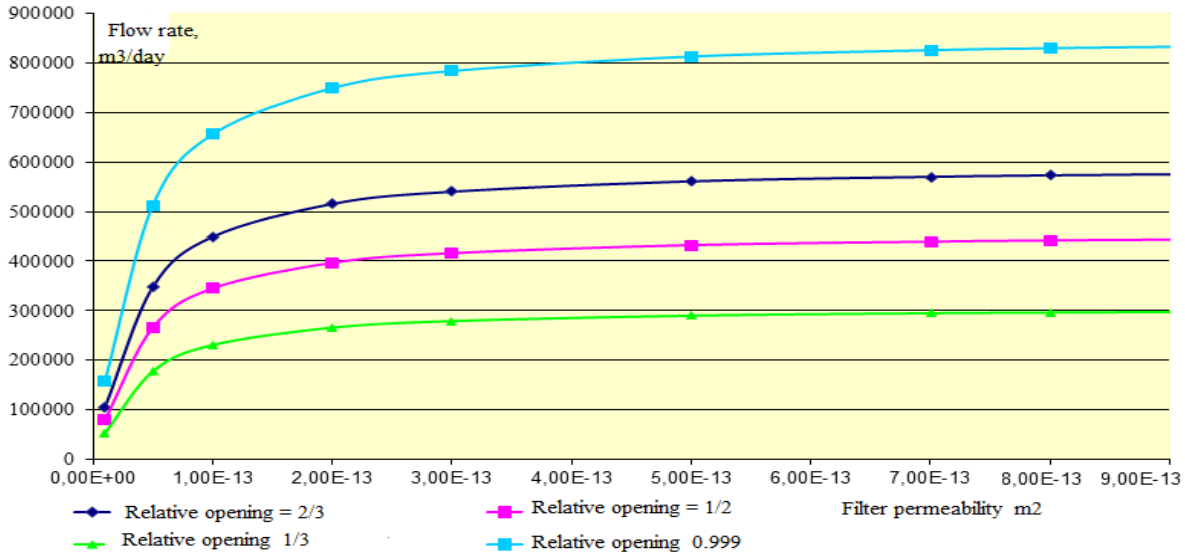


Fig. 3. Dependence of the well flow rate with a CSF behind the CS in the interval of the productive reservoir at different values of the degree of opening of the reservoir

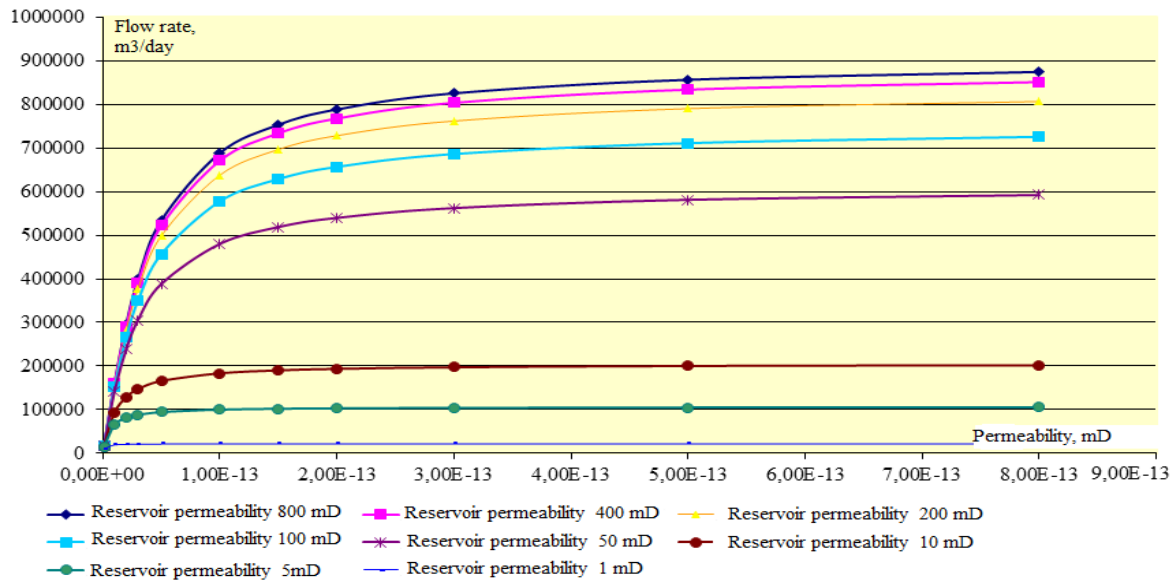


Fig. 4. Dependence of the well productivity at a different ratio of the permeability of the CSF and the reservoir

(relative opening of the reservoir by a well =1)

For a reservoir with low permeability, the limiting permeability of the stone filter at which its effect is insignificant is 1.5 times the reservoir permeability. For layers with medium permeability, the limiting permeability of the stone filter is approximately equal to the permeability of the formation.

For layers with high permeability, the limiting permeability of a stone filter is 150–200 mD. A further increase in the permeability of the cement stone filter does not lead to a significant increase in well flow rate.

It is of interest to investigate the effect of increasing the radius of the cement stone behind the casing by expanding the wellbore in the interval of the reservoir by its flow rate. Figure 5 shows the graphs of the flow rate of a well with an expanded borehole diameter in the range of a productive reservoir with a permeable backfill composition of different permeability placed in it. This well design is possible if the drawdown on the formation during opening is significantly less than the strength of the permeable material.

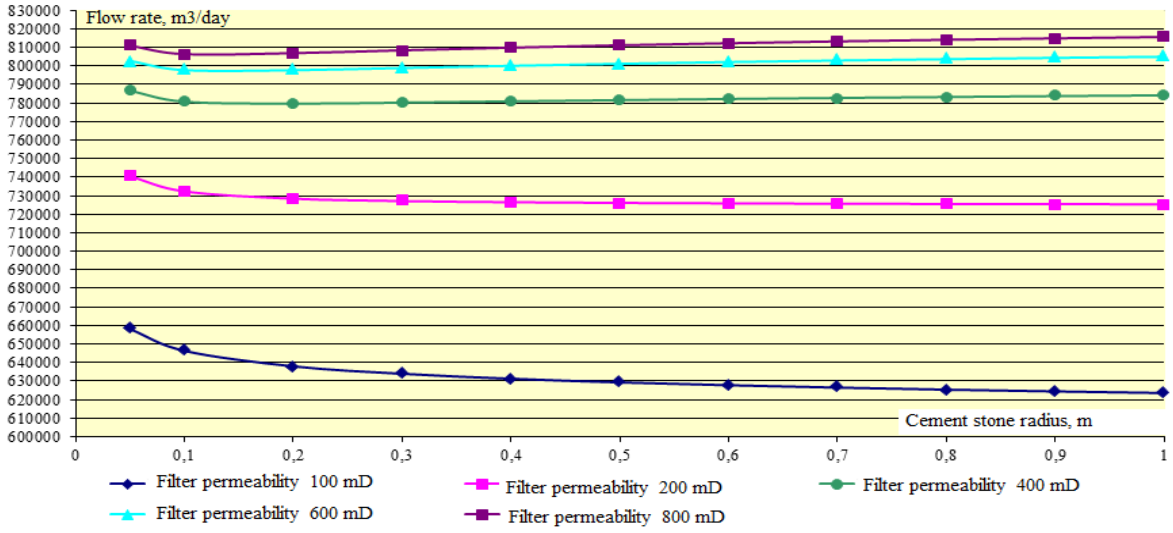


Fig. 5. – Dependence of the gas well flow rate with a CSF at the bottom-hole on the radius at the relative opening 1

An analysis of the dependences showed that an increase in the radius of the cement stone filter and its permeability relative to the permeability of the reservoir leads to an increase in the flow rate of only three percent.

It is also interesting to evaluate the influence of the CS on well productivity. With the exclusion of the casing from the bottom-hole design, the well productivity is doubled (Figure 6). Analysis of the results of the well flow rate for the bottom-hole design with a cement filter at various degrees of the opening of the reservoir is shown in Figure 7.

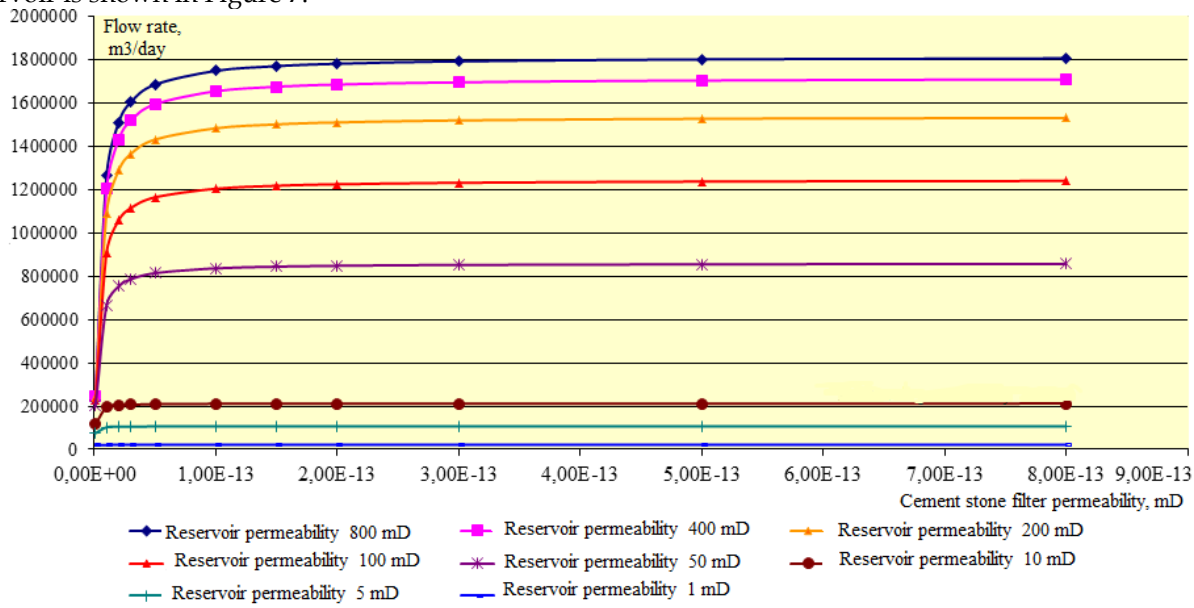


Fig. 6. – Dependence of the well flow rate with a CSF without the CS
at various ratios of permeability of the filter and rock (relative opening 1)

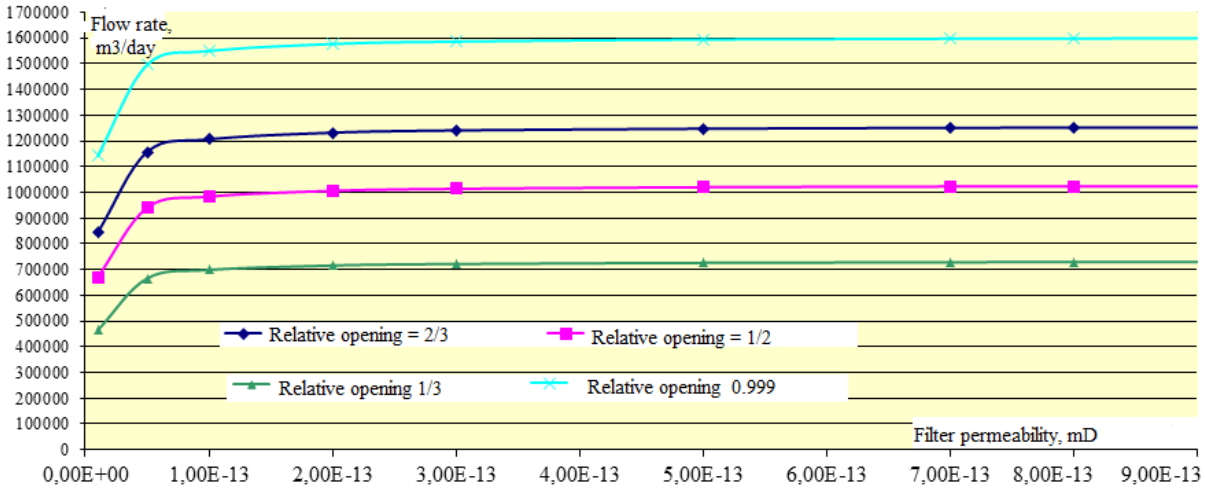


Fig. 7. – Dependence of the well flow rate with a CSF without the CS at various degrees of the opening of the reservoir by a well

An analysis of dependences showed that the efficiency of using permeable backfill material for securing the bottom-hole zone should be assessed with regard to ensuring optimal well performance during long-term operation while reducing repair work and increasing the average annual well productivity, avoiding the destruction of the productive reservoir and intensive sand removal.

Conclusions

The conducted research allows us to recommend the development or selection of technical and technological solutions for the choice of the bottom-hole design, for example:

- for unstable reservoirs with low and medium permeability, the development of technical and technological solutions aimed at increasing the permeability of the cement stone filter is required;
- for high-permeability reservoirs, technological solutions associated with the use of gravel filters are promising.

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Influence of Dangerous Meteorological Phenomena on the Emergence of Erosional forms of Relief Taking Into Account Changes in the Biodiversity of Vegetation Communities in Eastern Siberia

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Abstract

The urgency of the problem is caused by the lack of data on the formation, morphology, dynamics, features of ravine development in mountain relief, contrast of natural conditions and landscapes of areas of Eastern Siberia. The aim of the work is to study the dynamics of development of gullies under the influence of dangerous meteorological phenomena in the territories of the forest natural zone in the mountain and foothill areas of pine and larch forests in the territory of Eastern Transbaikalia. For the research, an experimental station was selected on the slope of a pine forest after wildfires, where field surveys of the ravine-gully system with the use of instrumental surveys were carried out. The analysis of data obtained from field studies and space images made it possible to identify the basic morphometric parameters of four ravines at different stages of their development and construct a model of a ravine-gully network. In addition, the floristic composition of the surveyed area was studied, represented by a small number of grasses, bushes and trees; the soil cover of gullies is represented mainly by eroded rocks: sandstones and sandy loams. The materials of the article can be useful to geographers, geomorphologists, ecologists, biologists when drawing up plans for the economic use of the territory, counter-erosion measures, when designing road transport routes for determining areas of increased danger of development of ravine erosion, when allocating recreational areas or nature protection zones.

Keywords: ravine formation, ravine, dangerous meteorological phenomena, biodiversity, Eastern Transbaikalia

Introduction

"Ravine erosion is an active relief-forming process caused by temporary channel flows of rain and melted water, as a result of which specific linear forms appear on the land surface. The direct cause of the ravine formation is a violation, under any types of economic use of lands, of the natural conditions for the formation of water runoff on the slopes of river valleys, beams, dry lands, etc." [1]. Despite the fact that ravine erosion has been studied for a long time and many articles have been published on this issue [2-8], the interest in ravine formation is growing now, which is connected with the ecological focus of modern studies of linear erosion, with the study of regions not investigated in this respect, as well as with the use of new types of measuring equipment, the use of GIS-technologies, etc. [9-20].

The main natural factors in ravine formation are periodically occurring dangerous meteorological phenomena and natural fires, which (within a different period of time) can radically transform the landscape. By the degree of influence on the relief in the space-time mode, these phenomena are subdivided into the following types:

- extremely dangerous –the changes occur within a short period of time (minutes, hours, days).
- dangerous –the changes occur within a relatively short period of time (month, season, year).
- slowly dangerous –the changes occur within a long period of time (a multi-year period).

Extremely dangerous meteorological phenomena include short-term showers, rainfall, radical warming, anthropogenic discharge of water. The dangerous phenomena include the maximum rainfall for the month or for the season of the year, which, as a rule, takes place during the warm period of the year; abundant snowfall, which, when melting, can lead to the first type of phenomena; mudflows. In addition, the second type can include wet years, when the amount of precipitation exceeds the average value. The term "slowly dangerous" can be attributed to the phenomena occurring over a long period of time, such as climate warming, the high water hydrological period. Each of the listed dangerous meteorological phenomena plays an active role in the process of ravine formation and has an impact on the development of erosion processes.

The purpose of the work is to track changes in the structure and dynamics of the development of erosion forms, by the example of ravine formation, under the influence of hazardous meteorological

phenomena, taking into account the change in the biodiversity of plant communities in the territories of the Eastern Transbaikalia forest zone.

Materials and methods

In the process of collecting and analyzing materials on the development of linear negative forms of relief (ravine formation), the following geographic research methods were used: comparative geographic, expeditionary, laboratory, stationary methods and the method of remote sensing of the Earth.

For this purpose, the following studies were carried out:

- study of meteorological data related to ravine formation;
- field surveys of ravine-gully systems in key areas impacted by forest fires with the use of instrumental surveys;
- study of the ravine development dynamics on the experimental stationary site, which allowed obtaining the basic morphometric parameters of gullies at different stages of development, and also to trace and compare the changes in space parameters of gullies;
- field observations of the formation of water and sediment runoff in gullies on the experimental stationary site, providing data on the hydrological characteristics of streams.

Results and discussion

The research areas are located in mountain-taiga larch and pine landscapes of the Zabaikalye Territory of Eastern Siberia. The area of pine forests under study is located in the valley of the Ingoda River belonging to the Amur basin; the area of larch forests under study is located in the valley of the Khilok River, which belongs to the Baikal basin. The height of the survey area above sea level varies from 700 to 1100 m. Both territories are geomorphologically different. Studies have shown that ravines in these territories are at different stages of development and their formation takes place in different conditions.

The emergence and intensity of the development of ravine forms is determined not only by the complex of natural characteristics of the territories (relief, climate, soils, soil, vegetation cover), but also by anthropogenic influence (creation of additional drainage boundaries that concentrate streams of thawed and rainwater, redistribution of runoff in the catchment area, the decrease of the filtration ability of soils, disturbance of natural vegetation, etc.).

Unconditional influence on the formation of ravines is caused by climatic conditions, in particular, showers or heavy rains, which are extremely dangerous meteorological phenomena. In the Zabaikalye Territory, the maximum liquid precipitation, which makes 70%from the total, mainly occurs in the second half of the summer period (Figure 1). The immediate effect on erosion processes is produced by the amount of precipitation, its distribution by months, daily maximums, duration, intensity, as well as the time of precipitation. According to the meteorological station of Chita, during a long observation period from 1934 to 2017, the average annual maximum precipitation is typical for July (up to 98 mm) and August (up to 83 mm). When rain falls, the soil does not have time to absorb moisture, excess water flows down the slopes, creating erosion forms (gullies, ruts, ravines). During showers or heavy rains exceeding 30 mm / h, in a few hours there emerge ravines up to 200-300 m long, with the depth reaching 3-5 m. The eroding stream of water carries in itself a huge amount of sediment that forms alluvial cones at the end of the ravine.

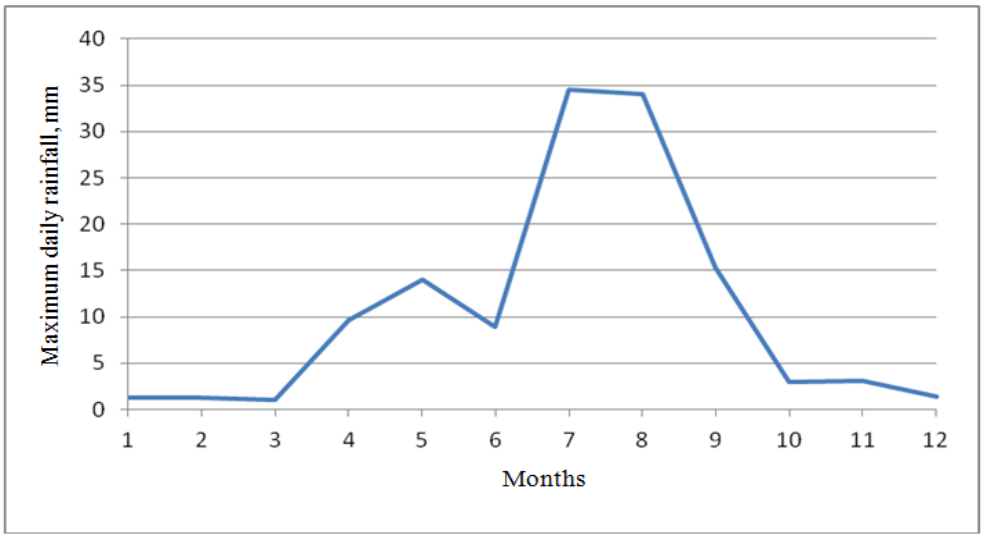


Fig.1. Maximum daily rainfall for the year
(meteorological station of Chita)

Meteorological conditions, namely high temperatures, lack of precipitation or small amounts of precipitation, low humidity, strong winds, and thunderstorms are factors of forest fire danger. Over the past 10 years, in most of the Zabaikalye Territory, there has been an increase in the number of forest fires and areas impacted by fires, due to increased aridity of the climate. In addition, the anthropogenic factor contributes to the emergence of fires (uncontrolled agricultural arsons in the spring and autumn periods: burning grass on hayfields and pastures, careless handling of fire, lighting bonfires when visiting the forest, littering the forest with bottles and glass fragments that can work like lenses when bright sunlight, etc.). Forest fires, passing large areas of the earth's surface, destroy vegetation, bare the soil cover and contribute to the development of water erosion. As a result, the landscape is geomorphologically altered; ruts and rills appear (Photo 1).



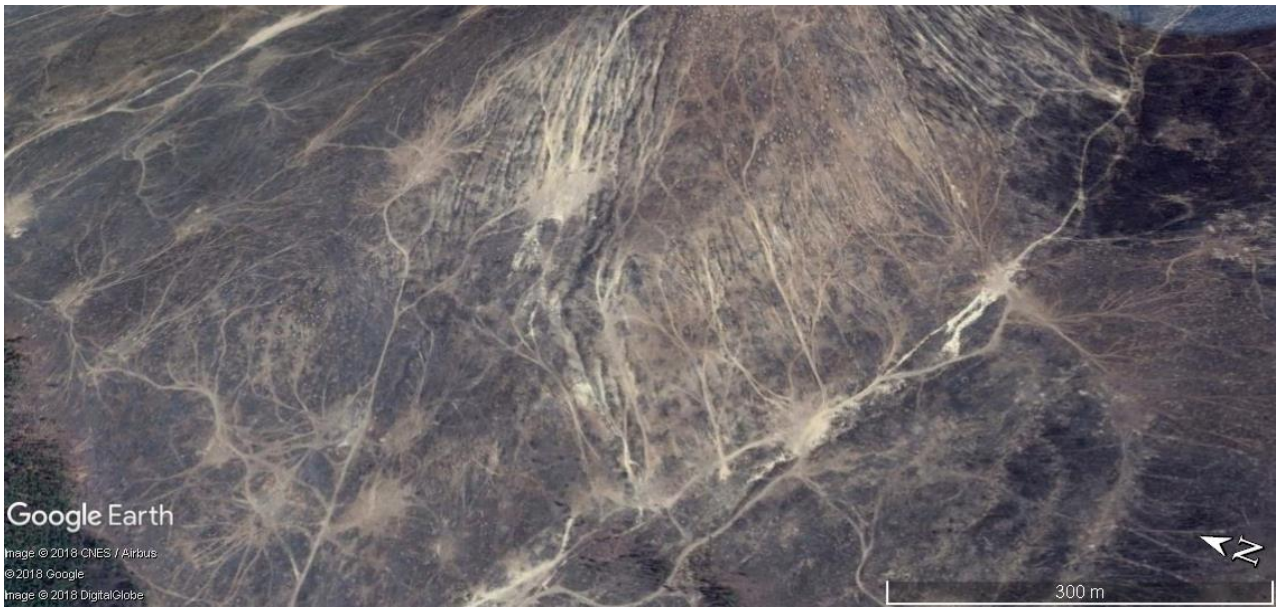
Photo 1. Areas impacted by wildfires (photo by Yu.V. Zima)

By the amount of gullies, the areas of scientific research can be divided into two types. The first includes pine forests, where the ravine-gully network is activated, which is facilitated by anthropogenic development of land and destruction of forests by forest fires. The ravine-gully network is represented by more than 50 gullies -0.05 units / km², occupying an area of 100 km². The second type includes the territories covered with larch forests, where gullies are rare and only single forms are represented, no more than 10 gullies on an area of 100 km² - 0.01 units / km².

Figure 2 shows satellite images showing the formation of the ravine-gully network on the slope of a pine forest after wildfires have passed 87 km². The soil cover is represented mainly by eroding formations: sandstones and sandy loams.



A



B

Fig. 2. Space images of the territory of the study: A - Territory before fires (2009)
B - The formation of a ravine-gully network after forest fires (2015)

Fig. 2. The formation of a ravine-gully network after forest fires (2015)

An experimental station was selected to observe the formation of the runoff and the change of the morphometric characteristics of the ravines. In this section of the ravine-gully network, 10 morphostratches were identified, which pass from a fixed landmark in a cross section along four ravines.

According to the relief, the ravines belong to the mountainous or slope type, where there is a precipitous ledge of thalweg in the upper part of the ravine. The transverse profile of ravines is V-shaped. In this case, the origin of the gullies is natural-anthropogenic, since the erosion forms emerged as a result of the construction of forest roads on the slopes, which in turn led to a change in the flow of surface waters.

In the stationary research, photographs of ravines were taken, the measurement of their length, width

and depth in different parts, and height of the summit ledge was performed (Photo 2). The length of the most developed ravine was 161 m, the length of the longest ravine in the development stage was over 200 m. There are short ravines where the stream of water merges into another ravine, which contributes to a greater erosion into the depth and width of the next ravine. The ravine, in which many water flows merge, develops strongly, the flow of soil particles increases, which creates a large alluvial cone of in the mouth.



Photo 2. Study of the ravine morphology

Space images of different years have made it possible to trace the dynamics of the ravine development. In 2004, the length of the ravine was 157 m, the width along the entire length was from 1 to 3.5 m. In 2016, the length of the ravine is 161 m, the width at the top was 7-8 m, the width in the mouth – 3-4 m. In 12 years the length of the ravine increased by 4 m, the width - by 2-4 m. The development of the riverbed and erosion of the slopes of the ravine amounted to an average of 0.33 m per year.

Important factors in the formation of ravines are the steepness of the slope, which ranges from 7 to 20 ‰, and the soil cover, which is mainly composed of sands, sandy loams. According to laboratory tests, the granulometric composition of soils is mainly represented by sands (from fine to coarse sand) with a diameter of 0.05-1.0 mm.

The active development of the ravine-gully network on the slope was caused by dangerous meteorological conditions - showers with a maximum intensity of 1 to 2 mm per minute, with a total level of more than 25 mm. The erosion forms emerged at once, and then during the year the form of the ravine changed towards the increase of length, width and depth.

The erosion of ravines is caused by temporary channel flows from different areas, with extremely variable characteristics of the slopes' mean and local values, runoff lengths, depths of erosion bases, the type of surface cover, and the filtration characteristics of soils[11].

The formation of the stream network on the slopes is one of the forces of erosion and transformation of the ravine relief [16]. Studies of flows have shown that erosion mainly occurs at a flow velocity of 0.20-0.70 m / s. The roughness coefficient is 0.0025-0.0045, the Reynolds number – 8000-35000, the Froude number – 0.50-1.50. Streams of water flow almost along the slope, they can slightly deviate from the route, avoiding obstacles in the form of stones. The erosion of soil causes the formation of rapids on the slope, which contribute to an increase in the flow speed. As a result, the longitudinal profile of the slope shows a stepped relief.

In the process of formation, ravines pass several stages. At the first stage of erosion, a ridge (rut) is formed on a steep slope. It is triangular in shape, parallel to the surface of the slope. At the second stage, the ravine becomes deeper with a decrease in the longitudinal slope of the bottom. A sharp precipice forms at the edge. The ravine expands and acquires a trapezoidal shape in the cross section. By the end of the second stage, a smooth longitudinal profile is produced at the bottom of the ravine, while at the mouth of the ravine, where water loses its speed, a cone of alluvial sediment is formed. At the third stage, a further growth of the

ravine takes place towards the watershed and its cross-section widens as a result of the washing and shedding of the banks. On the lateral thalwegs, along which water flows to the ravine from the secondary basins, branching ravines –or branches - begin to form. The ravine continues to develop until it reaches ground layers that do not yield to erosion, or until the basin that feeds it does not decrease near the watershed to such an extent that erosion stops. At the fourth stage, deep erosion and washout of the banks gradually cease; the ravine ceases to grow. The slopes take a stable outline and overgrow with grass. The ravine turns into a gully.

Figure 3 shows the model of the ravine-gully system. The diagram shows 4 ravines, each of them at a different stage of development. The first one is a developing ravine, the second one is already developed, in the third and fourth erosion is slowing down.

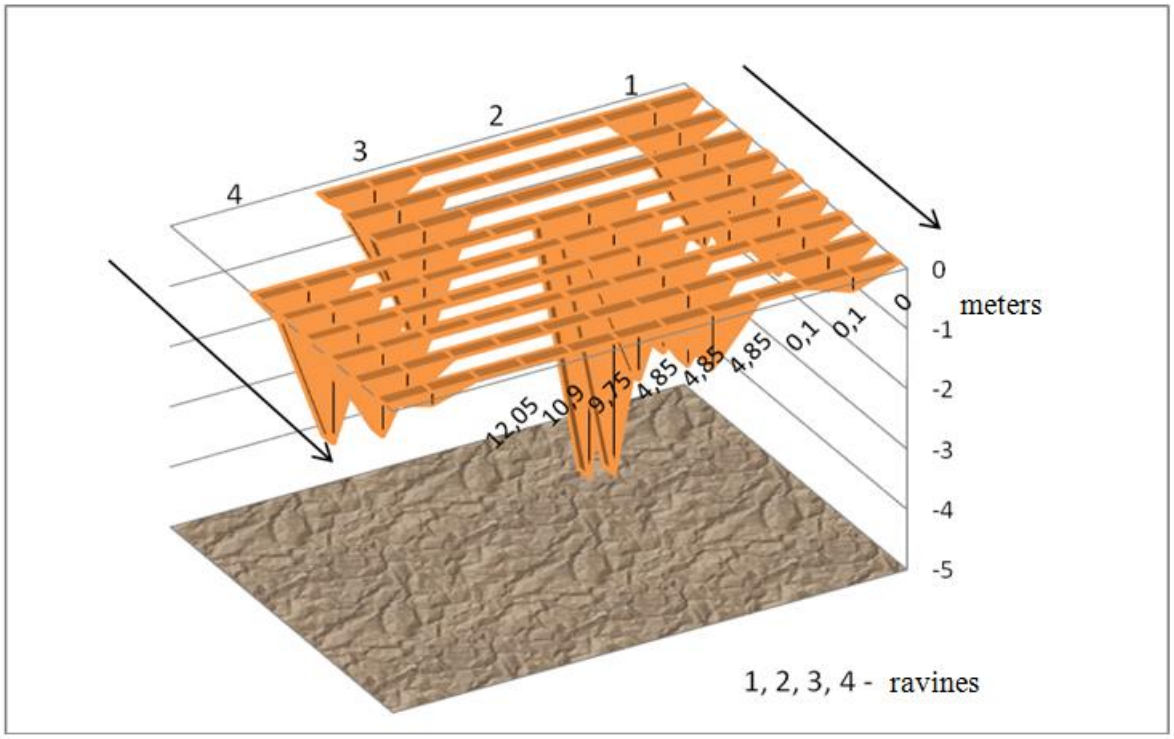


Fig. 3. Ravine-gully study model

However, after extensive forest fires, the development of ravines can resume again, as the slopes of the gullies are bared and after intensive rainfall or snowmelt, active erosion of the soil occurs and favorable conditions for the further development of erosion processes are created. It is according to this scheme that the process of ravine formation is resumed on the slopes of pine and larch forests on the territory of the Eastern Transbaikalia.

A series of forest fires that occurred after 2004 had a significant impact on the level of forest biodiversity. As a result, the forest cover of the territory has decreased from 92.2% to 52.6%. Currently, the share of burnt forest is more than 50%. The main share of the timber stock was made up by pine (78%), larch, birch (10% each), and aspen 2%. Taking into account the change in the forest cover of the study area, the timber reserves have decreased from 1.361.600 m^3 to 776.700 m^3.

When studying ravine erosion on the slopes of pine and larch forests, research was carried out on the vegetation of ravines. The total coverage of grasses was 20-30% with an average height of 80 cm. The vegetation of ravines has poor species composition. Wood forms are represented by birch, aspen, poplar, pine, larch; shrubs are represented by willow, rhododendron; grass – by willow-herb, rump, reed, etc. The covering of ravines by grass is very slow, and in some cases the vegetation cannot be fixed in the ground, the plant seeds are either washed out by the water flow, or blown out by the wind, or freeze in the cold period of the year.

Table 1. The vegetation of ravines.

Name of the plant	Number	Name of the plant	Number
Trees (saplings)		Grasses	
Betulapendula ***(0,6м)***	1	*Dendranthemumzawadskii*	2-3
Larixgmelinii ***(0,6м)***	1	*Viciaunijuga*	2-3
Populustremula ***(1,5м)***	2-3	*Chamaenerionangustifolium*	5-10
Pinussylvestris ***(0,2-0,4м)***	2-3	*Chamaenerionangustifolium*	5-10
Populussuaveolens ***(2м)***	1	*Lupinasterpentaphyllus*	2-3
Malusbaccata ***(1,5м)***	1	*Bromopsissibirica*	10-20
Bushes		*Sanguisorbaofficinalis*	2-3
Salixbebbiana	1	*Polygonatumhumile*	2-3
Salixschwerinii	1	*Potentillasemiglabra*	1
Rhododendrondauricum	1	*Festucalenensis*	2-3
Grasses		*Carexpediformis*	2-3
Astragalusmembranaceus	1	*Oxytropismyriophylla*	2-3
Calamagrostisepigeios	2-3	*Sedumaizoon*	2-3
Heteropappusbiennis	2-3		

Conclusion

When studying the development of ravine formation under the influence of dangerous meteorological phenomena, taking into account studies of the overgrowing of ravines by vegetation, the structure and dynamics of ravines development on the territories of pine and larch forest zone in Eastern Transbaikalia have been identified. On the territories of pine forests the ravine-gully network develops more actively than on the territories covered with larch forests. Steep slopes, easy erosion of soil, heavy showers, and absence of leaf cover of the tree tops after fires promote the activation of ravine formation. In order to trace the dynamics of ravine development under the influence of dangerous meteorological phenomena taking into account the change in the biodiversity of plant communities, an experimental stationary site was selected to monitor the development of four ravines. Each of them is at a different stage of development. The first one is a developing ravine, the second one is already developed, in the third and fourth erosion is slowing down.

Space images and field measurements have made it possible to obtain the main morphometric parameters of ravine development. On the basis of the morphometric parameters, the model of ravine-gully system was developed. The development of the riverbed and erosion of the slopes of the ravine amount to an average of 0.33 m per year with the granulometric composition of soils with a diameter of 0.05-1.0 mm.

The study of the vegetation composition of the ravines showed that their overgrowth is very slow and the vegetation is represented by an insignificant number of species. After forest fires, the surfaces of gullies are bared and the development of ravine is renewed.

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Management of the Development of Modern Organizations by Improving of Top Management Skills in the Master of Business Administration Programmes

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Abstract

Some topical issues connected with the development of the organizations in the sphere of heat supply in the changed conditions of their activity in connection with the adoption of new legal acts in the country are considered in the article. The authors suggest that it is necessary to organize advanced training of top managers in the Master of Business Administration programme, for the forthcoming transformations in the activity of the uniform heat-supplying organizations (new for the domestic practice), thus having provided at the same time their branch orientation. The analysis of the trends inherent in educational programmes of MBA is carried out for refining substantially fillings of such programmes, the overview of publications in two directions including the perspective of training of top management and topical issues of development of the organizations, headed by them, is performed. As a result of the research the authors defined four key factors, influencing the acquisition of competences on management of development of the modern organizations of the industry of heat supply. Taking into account the branch specifics solutions, which are new for the MBA programmes, which are found in the range from certain master-classes to the complete training programme in the Executive MBA format are proposed. Some discussion issues of the expansion of such branch education applicable and to other categories of management of the organizations and expansions of volume of training in training process in the successful organizations are designated on the basis of the received results.

Keywords: management instruments, top management, educational programmes, heat supply, organizations development

1. Introduction

The world practice proves that if being going to carry out any changes in business, top management of the organization resorts not only to the help of external consultants, creation of project teams, but also goes on the way of updating of the knowledge and receiving modern vision about that, how to do business in the modern conditions. The MBA programme is distinguished from all the education programmes of top management, which is focused on full training of students for the solution of serious problems on management of development of the modern organizations on the system basis ("MBA" - Master of Business Administration). The fact that training of managers on the MBA programmes has already passed the 115-year boundary is known in the professional environment, but at the same time some discussions about the prospects of its development remain relevant constantly owing to the fact that this program as the mirror of dynamically functioning modern business. The analysis of the offers from the leading higher educational institutions of the world as well as from the famous business schools proves that there is a wide choice of the MBA programmes, but their subject is focused on the general management problems, the most characteristic of which are strategic management, financial and investment management, personnel management, etc. Without denying the need of advanced training of top management of the modern organizations for the separate directions of management, the authors consider that they modern business have been already acquired in practice and there are well-known main technologies of management of the organizations which have universal character. At the same time the main competitive advantages of modern business of 21 century are in other plane already, which is the plane of narrowly professional management tools organization development which are closely connected with the technology of the made products (services). In this regard there is a problem connected with forming of the MBA programme of branch character which would combine topical issues of general management and management branch in the required proportions, providing the modern business requests. An important condition of achievement of such brunch MBA programmes relevance is the use of the latest research which have the innovation character and allow to provide so-called "advancing" nature of training, demanded by the top management for effective modern

organization development.

The authors have been carried out the research on the basis of the leading Russian acting university, National Research University Moscow State University of Civil Engineering (MSUCE) for more than 10 years. That allowed to create their reasonable position concerning the specified perspective and to define the prospects of the further development.

The central question is how can the content part of the MBA programme include relevant scientific developments which are aimed at business development of the organizations carried to one of the most important spheres of economy of any country, i.e. energy which follows the way of activization of scientific technology development in the Russian Federation now. The legislation of business in one of technology complex and industrially dangerous branches of energy, i.e. in heat supply due to acceptance in 2018 was essentially changed by the new edition of the act of the Russian Federation "On Heat Supply" (2010). The result of new realities of business in the sphere of heat supply in the markets of this industry is the existence of absolutely new organizations, the uniform heat supplying organizations (UHSO). The problems of their development and management functionality changed in comparison with the organization, which existed earlier: this organization has to coordinate the activity of all suppliers of heat energy in the territory and to be responsible for quality, reliability, energy efficiency of heat supply of consumers of heat energy with obligatory control of tariffs for it. The aforesaid situation stimulated the USHO top management to obtaining new knowledge which would allow them to perform reorganization of these organizations activity in the conditions of preserving and enhancement of the competitive advantages (cited as Directive 97/23/EU of the European Parliament and Council from of May 29, 1997 (1997) on approximation of laws of State members concerning the equipment working under pressure, 1997). Such situation served as a peculiar challenge for the MBA programmes developers and predetermined the need of updating of their content according to the scientific reasonable positions.

2. Literature review

Two blocks of sources were considered for forming of objective representation concerning the studied problem:

- the first block was connected with the questions of ensuring the relevance of the implemented MBA programmes, the ways of their improvement including improvement on the basis of carrying out the research and development demanded by modern business and forms of the use of their results in various components of the MBA programmes, having rather complex structure and configuration;

- the second block belonged to the chosen subject i.e. to the development of the organizations of heat supply in modern Russian conditions which were in the condition of transition from the traditional, developed decades management tools business to new substantial filling of all the components of management systems of unified heat supplying organization (UHSO) which concrete characteristics, important for managerial actions of top management, did not develop fully yet.

In modern conditions of the MBA programmes are implemented by various educational institutions, from the classical universities to business–schools. It determines the variety of approaches to the choice of forms of programmes implementation, their subject, content, realization terms (Tkachenko, 2008). Numerous offers on the websites of educational institutions and the reviews of analysts on the offered programmes studied by the authors proved that the demand for these programmes forces their creators to make their configuration most flexible, but at the same time the main dominant of the offered programmes is their focus on the latest knowledge which is demanded by listeners and did not reach for the present programes of higher education (bachelor degree, magistracy). IAnalysing the information sources, the authors defined several trends essential to modern education according to the MBA programmes which were considered in a further research concerning the chosen subject domain, i.e. training of top managers of the heat supply organizations.

As the first trend it is noted that it is universal, the MVA programs became much shorter and are more practical. Orientation to more applied business education is everywhere. Authors of publications note that "to real business the general talk about "models concepts" is uninviting for a long time" (Welch, Syuzi, 2016). Students of the MBA programmes, especially top management, are often ready to study, but do not wish to perform numerous tasks, they are not even always ready to write the final qualifying work. Students often refuse this part of training at the MBA programme, reasoning it with the fact that "they came just for knowledge".

The second trend acts as the continuation of the first one. But it illustrates how raising the aspiration

to obtaining relevant knowledge with the minimum costs to the absolute one can gain the negative effect. The authors mean remote online and offline training. The results of the market research, published in open access by RusBusinessConsulting company prove that online training is interesting for no more than 20% of the Russian top managers. The most frequent causes of failure are mistrust to the quality of online education, lack of net-working, less "popular" degree, weak control of the training process, smaller involvement into training. 5700 people in million-plus cities (50%), cities of 500 thousand-1 million (15%), cities up with the population to 500 thousand - 25%; small cities and villages - 10% were interviewed.

The third trend demonstrates the reorientation of the MBA programmes to so-called "competence-based approach". Competence-based approach assumes that the educational institution forms a set of competences which were created according to the market requirements. Its benefit is that they will be able to adapt any changes of the business environment, relying on the competence, received from experience and practice of business. Almost all the MBA programmes which are analyzed by the authors contain relevant business cases as an obligatory part of training as it is accepted by the founder of MBA - Harvard business school. However, companies are not always able and want to provide the material on the matters relating to ensuring their competitive advantages. As the result the competence are formed through business cases, taken not from the business practice, but through the "methodical recommendations" illustrated with abstract situations.

All the considered trends were concretized by studying of the modern business practice in the industry of heat supply for the purpose of identification of the needs for training of the top managers, which are significant to forming of the MBA programmes. The review of information in this subject domain was carried out for the determination of new conditions in which top management of UHSO has to perform the restructuring of the organisations management and, respectively the determination of the knowledge to be gained by them in training process on the MBA programme. The backbone essence of the UHSO development in the Russian economy, defining the main directions of these organizations development on the qualitatively new scientific and technology basis is the state energy strategy, providing the development of the cogeneration due to the creation of processing equipment on the modular basis for new construction and reconstruction of already existing sources of heat energy. Along with that the need to solve the problem of creation of processing equipment and automated systems of control and management of heat consumption for the forthcoming period till 2030 (regarding transportation of heat energy to consumers) (Silbiger, 2014). There are also some conditions of accomplishment of these tasks for top management which are also fixed at the level of the state priorities; all the projects on the UHSO development have to be created on the basis of production-and-technology chains (value-added chains). That is connected with the fact that any technology is as a rule tied to one link (generation of heat energy, its transportation and distribution), but possibilities of the technology break in some one link of heat supply can be blocked by the lack of conditions for this purpose in adjacent links. Thus, technically perspective technology for one subject of heat supply (combined heat and power plant, the boiler house heat supplying organizations and heating systems) is economically inefficient and, eventually, does not gain any application and distribution. Also changes in pricing for the heat energy delivered by UHSO are provided by legislation; that significantly changes the situation in the sphere of these organizations financing. Thus, the review of some sources of backbone character in the sphere of heat supply proves that there is an objective need for updating of the MBA programme content for top management of UHSO for several complexes to questions. The matters of restructuring and financing of the organization which are directly connected with the need of carrying out changes in the sphere of production management and the technologies acting as the main engine of all forthcoming changes, are priority.

In this regard the authors undertook additionally the profound analysis of the information sources which was directed to studying and assessment of the current technical condition of generation and transportation of heat energy which proved the availability of the problems which are saved up within the long years which are not solved by the organizations of heat supply management. Now in the Russian Federation the basis of the industry of heat supply is made by the system of the centralized heat supply (SCHS) which share in the total production of heat energy makes up about 82% (1300 million Gcal annually). Combined heat-and-power plants (45.4%) and boiler houses (48.2%) are the main sources of heat. The observed decrease in the cost efficiency of combined heat-and-power plant is caused by low loading of the capacities because of significant reduction of the attached heating loads and demand for heat energy. The heat energy release, made by combined heat-and-power plant decreased by 1.8 times from 1990 to 2018 (Silbiger, 2014, Barry, Neil, 2015).

Accidents in the heating systems do not takes place often, heat losses when transporting are minimum, the wear of the generating equipment and heating systems strictly meets the standards. The unity of opinions of all the authors investigating this phenomenon is noticed: the cardinal distinction of situations is in the low level of production quality management during construction and operation of the heat supply facilities. That took place during the Soviet period of our history. That allows to detail the substantial part of training of top management at the MBA programme, including technologies of quality management which without fail have to accompany the processes of restructuring in UHSO in the modern conditions. It is predicted that the application of the advanced technical solutions will allow to increase the service life of heating systems up to 30-40 years and more, to reduce heat losses when transporting to 2-5%, to lower capital costs of 15-20%, operational costs by 5-9 times, repair costs by 3 times, to reduce time of laying of heating mains by 3-4 times. These indicators act as quite certain strategic reference points of the development which top management of UHSO has to provide in the estimated prospect, having all the necessary volume of knowledge for carrying out necessary transformations.

3. Research method

3.1. Participants

When choosing the base of the research, the authors proceeded from the data on the terms of programmes of additional education (including MBA programmes) choice, made by top management, published in open sources. The periodically published state-of-the-art reviews noted that "The main selection terms for business school include an interesting programme (59%), prestigiousness of educational institution (57%) and convenient form of education (50%). One more interesting fact is that the respondents, who have received their degree (54%) and whose, who are receiving it (51%) do it at business schools of the country. At the same time a quarter of employers do not care, where exactly a degree is was received (Tkachenko, 2008, Barry, Neil, 2015, Kaufma, 2015). In this regard the choice of programmes, which are the participants of the research was carried out according to the following provisions:

- the considered MBA programme has to be implemented by prestigious educational institution for a long time (not less than 10 years);
- the availability of a certain branch orientation of the MBA programme which is focused on the specifics of business in the country of dislocation;
- the availability in the MBA programme of opportunities of the choice of convenient form of education depending on of the student's preferences.

MBA programme

The research object is the industry programme "MBA in Construction" in National Research University Moscow State University of civil Engineering, which has successfully functioned for 13 years, was chosen: more than 800 specialists whose statistics of professional progress convincingly confirms the growth of opportunities of career promotion, became her graduates. The results of the annually carried out monitoring of the changes in the professional activity of graduates proved that 25% of the interviewed listeners were promoted, 20% changed job for more perspective (at the same time some of them found work thanks to the developed communications among the listeners during training), 40% noteed the increase in their income, and almost one and all the graduates emphasized the acquisition of important professional and business connections with consultants, teachers and listeners of the MBA programme, which are performed after graduation. These indicators are estimated by us as positive and allowed to pass to studying of various factors having an impact on the final results from acquisition positions (Welch, Syuzi, 2016, Silbiger, 2014).

3.2. Materials

The training programme and its substantial filling acted as materials for the analysis structure. The programme consists from several distsiplinsand lasts 2 years. The first of the considered factors determining the possibility of acquisition of competences by top management for development of the modern organizations is the adaptation of the programme to the realities of domestic business. This conclusion is corresponded to the opinion of many experts in the field of the MBA programmes (Badalova, Verstina, Evseev, 2019). However, in more detailed analysis of this factor it becomes obvious that the orientation to the Russian practice of management is important, it is a necessary condition of its quality, but it is not sufficient for ensuring its full compliance to the requests of representatives of a certain sphere of business.

In this regard the second factor, influencing the acquisition of competences on management of

development of the modern organizations by top management was pointed out and studied. The practice of the implementation of this programme proved that among the main questions both at the stage of making decision on training, and during training listeners emphasize the importance of acquaintance to the industry solutions on business administration, which give them the possibility of implementation of a transfer of the gained knowledge directly in the practical activities. Ensuring these requests of listeners within the MBA in Construction programme was performed by forming of the block of disciplines of the corresponding profile, as well as by holding master classes which organically added the "classical" part of training and allowed listeners to study the latest knowledge in the field of construction science and practice (Verstina, Evseev, 2018).

During the research the materials which defined the opportunity to allocate and the third factor influencing acquisition by top management of competences on management of development of the modern organizations were received. The distinctive characteristic of the MBA in Construction programme at NRU MSUCE determining the uniqueness of its contents is the availability of the video lectures, provided on the educational portal. Let's note that such investments of intellectual and financial character at the stage of creation of the MBA programme content pay off, and during its development they become the basis for its improvement, a "reference point" for the determination of the directions of updating of the substantial part of training. Considering the contingent of listeners which is characterized by prevalence of representatives of engineering specialties (up to 75% annually), the opportunity to refer to addition basic material of a discipline in the mode, convenient for them, became an essential factor of ensuring quality of training.

The fourth factor, influencing the acquisition of competences on management of development of the modern organizations was based on the analysis of the materials connected with the programme implementation term. In comparison with many other programmes of additional education the MBA programme has a long standing of realization (13 years) and it is long (2 years), therefore the introduction of such form as "master classes" allow to provide its relevance throughout all the training course. Their subject changes year by year, as that is the objective characteristic of the MBA in Construction programme development (Kiersz, 2018). The arsenal of master classes of the programme includes more than 50 various subjects which are annually filled up.

3.3. Procedure

The authors considered the procedures of providing the competences on management of the UHSO development. We mean that the set of the interconnected actions directed to the decision are the procedures of ensuring competences within the research method, used in this work. The revealed factors influencing ensuring competences, were accepted as the initial positions. These competences considered allowed to define the crucial elements of the MBA programme having significant effect on the desirable result. Let us present their characteristic as the complication of forms of their realization in the MBA programme and the actions for their providing corresponding to them.

Master classes which allow to convey the latest information from practical area or information based on the results of scientific research as fast as possible, became the first of three chosen elements (Evseev, 2018, Verstina, Evseev, 2018).

The second element of the MBA programme which allows to provide the acquisition of competences on management of the modern organizations development, which has complex character, is the preparation of a final qualifying work on a relevant subject.

The third element of the MBA programme, directed to the acquisition of the competences which provides the required balance of terms of training and the maximum concentration of the relevant information customized to the management of the modern organizations development are the Executive MBA programmes which are significantly shorter, than classical biennial option of the MBA programme.

4.Result

During the initial consideration there is an impression that the considered elements are rather simple at their realization in the MBA programme at the level of procedures of creation. However the practical experience and the research proved in a certain subject domain, (in our research that is in the organizations of the heat supply industry) there can be the essential features, generating the need of further discussions and research on the considered perspective.

The practical application of the provisions of methodical character, received as a result of the materials studying on the basis of the chosen method of the analysis of crucial elements of the MBA programme,

having significant effect on the desirable result (i.e. on the acquisitions of competences for management of the modern organizations development in the conditions of significant changes in the industry of central heating in our country), allowed authors to perform some practical developments. The results are presented:

- some master classes on the matters of management in UHSO in modern conditions. The research proved that the weakest link in the modern UHSO, interfering their development in their operational activity is the lack of reliable information about the production processes, connected with the delivery of heat to the consumer with the use of the equipment with high degree of wear. Transformations in the current activity of UHSO determined the need for the pricing policy development for the delivered resources and determination of management instruments for its realization. The problems of forming of perspective plans of territories development, which heat supply is performed according to the current legislation in combination with the UHSO orientation to growth of cost of its business, became the subject for master classes relating to the strategy (cited as MBA programmes 2017: prices, formats, terms, 2017);

- subject and structure of the final qualification works devoted to the perspective of UHSO functioning and development within training in the MBA classical programme. Their distinctive feature is the trinity of the choice of the work subject, representing an unresolved problem in practical activities of the top managers, the author's innovation approach to its decision and offers on the choice of effective managerial tools of the implementation of developments in the organization with the obligatory assessment of expected effects of the planned transformations. The key moment of this matter research was providing logic of its accomplishment which would allow to achieve consistent results concerning the choice of the management instruments, accompanying the UHSO development;

- the development of the Executive MBA programme concept, focused on the top management training in a certain complex of matters connected with the choice of the directions of development and forming of its strategic objectives, determination of the most effective instruments of its implementation in the key spheres of USHO management, assessment of resource providing of the formed complex of actions for the development and the organization of monitoring of the carried-out transformations. This programme is positioned by authors as an independent form of the training programme of top management, and as a component of the MBA classical programme with branch orientation Efremova, 2012).

Each of the aforesaid developments can be considered both independently and as separate elements of training of top managers, they can to be combined together, in one programme, for example in the classical MBA programme. Let us give their more detailed characteristic, having allocated the novelty aspects developed.

The authors' offers on master classes are presented in the systematized form Table 1. Their distinctive feature is the use of the managerial diagnostics results for some large heat supplying organizations possessing various structure of heating systems economy and performing delivery of heat energy [6, 7, 8], for forming of subjects. According to the authors the complex of master classes provided in Table 1, if introduced in common practice of top management training, will allow to liquidate initial deficiency of competences of these managers which is required for start of these organizations developments in modern conditions.

Table 1

Master classes for top management on UHSO development (according to the research results)

Subject	**Development problem being solved**	**Research conducted for forming of classes content**	**Competences received by top managers**
Creation of a monitoring system for the equipment	Reduction of USHO losses in connection with of the equipment malfunction and the increase in its energy efficiency	Qualitative and quantitative analysis of violations in the equipment maintenance during heat energy delivery and methods of their localization	- Ability to make the forecast of the UHSO equipment condition on the basis of its diagnostics; - Ability to create plans of repair work for the UHSO equipment on the condition of resources minimization
Pricing for services by the method	Ensuring the systematic transition of UHSO to the new method of	Development of economical-and-mathematical models of	- Ability to plan and optimize the current and investment costs in the UHSO

of the "alternative boiler house"	pricing for the delivered energy established according to the legislation	planning costs on UHSO functioning and development	development
Technologies of the creation of perspective plans of the territories heat supply development	The organization of transition from a variety of suppliers of heat energy with the underutilized power to the optimization of sources and networks in the territory of UHSO (cited as Forecast of scientific technology development of branches of the energy industry of Russia until 2035 (2016))	Development of indicators and technique of forming of balance models on territories energy resources (Kisel, 2018)	- Ability to form balances of requirements and suppliers of heat energy in the territory
Organization of the cost of business management system in UHSO	Ensuring transition to cost priorities in the USHO development	Determination of factors of business cost growth for UHSO in the external and internal environment of the organization and approaches to their assessment (cited as Energy strategy of Russia until 2030, 2009)	- Ability to reveal the key factors of the UHSO development on the basis of cost forming factors; - Ability to develop and introduce the UHSO cost management system

Let us consider the results of the final qualification works, devoted to the perspective of UHSO functioning and development. It is offered as a preparatory step to its accomplishment to define basic initial positions unambiguously:

- the subject to consideration (UHSO acts as the subject owing to the chosen field of the development);
- the consideration subject which is also chosen according to the considered context of development and which is the development process management in a certain field of the UHSO activity;
- the problem and hypothesis for its solution. Certain contradictions between the purposes of the UHSO development and the UHSO top management opportunities for ensuring effective management of these processes act as a problem. The hypothesis has to show the direction of resolution of this contradiction unambiguously (Kiersz, 2018).

Final qualification works are offered to be formed of three structural parts representing three consecutive stages of its accomplishment. The first part has survey and analytical character and is directed to detailed studying of the problem field and opportunities of the previously formulated hypothesis implementation on the basis of consideration of modern UHSO activity. The second part, based on actual data of the concrete organization, contains conceptual author's developments on UHSO management reorganization in the direction of the purposes of its development taking into account the managerial situation which developed at the moment. The third part is the completion of work, which is the recommended of development of managerial decisions, instruments of management and internal regulations of UHSO activity which are necessary for the development plans implementation.

Thus, unambiguous requirements to structure and content of final qualification works, offered by the authors as the research result, can seem to be excessively strict. However, many studied works proved that desirable competences of top management and the decisions justified for practice can be reached only in case of providing aforesaid logic.

The concept of the Executive MBA programme became the third result of the authors research. In comparison with the MBA classical programme which duration is about 2 years and which includes about 30 studied disciplines, the format of the executive programme for top managers of UHSO is offered to be

shorter (2 months) and to include no more than 7 studied disciplines. They include: "Strategic management", "Quality management", "Management of production and rendering services of heat energy delivery", "Economy and finance of the heat supply enterprise", "Restructuring of organizations", "Personnel management", "Information technologies in the heat supplying organizations activity ". Time for the development of disciplines is distributed between lectures and practical training equally; that allows the top managers to master practice-oriented competences on the UHSO development in the greatest possible degree. The final work, differing from similar works of the MBA classical programs according to their volume, has to be the result of training, but at the same time the necessary quality of training has to be guaranteed by the availability of a certain result, i.e. the development of the instrument of UHSO management, demanded during implementation of that organization development.

5. Discussion and conclusion

The authors made an the first attempt in Russin practice to perform some developments of the MBA programme elements for a very problem industry of the industrial sphere of our economy, management of which traditionally was not among the active participants of educational programmes including MBA. However, the real situation in the industry of heat supply proves that control of UHSO development in modern conditions which is performed by the top managers who do not have relevant competences of management or trained according to the programmes of general management is not sufficient for ensuring technology breaks and reorganization of a business case of their activity, as that is required in modern conditions according to the new legislation in this sphere.

In this regard the most problem areas in the UHSO activity, requiring paramount attention of top management, were defined and the scientific research on management according to the main activities of the organizations including drivers of their development, which define success and efficiency of the forthcoming transformations to the industries of heat supply is performed. The received results allowed the authors to create their offers of rather new elements of the MBA programs implemented by leading universities of our country in the original version. The offers can be expanded within the research on the corresponding perspective. In the estimated prospect it will be expedient to create the specialized MBA programme of traditional volume and format, with 2-year duration, supposed both for top, and medium UHSO management. That will allow to solve new problems of these organizations development on the basis of team building of the managers, working in the uniform "semantic field" and according to uniform standards of management, based on modern management instruments.

In general, it is important to note that modern conditions of business, both in the sphere of heat supply and in any other industries, produce new challenges to additional professional education, which main characteristic is the readiness to create the training programmes demanded by the market. As for the MBA programmes it is possible to predict expansion of the practical part of the programmes, focused on a certain functional area of management, through additional training in the organizations implementing the innovation character projects, and also we can predict the growth of interest of the studied top managers in the increase of their professional level by acquisition of the scientific qualification allowing them to assess the development situation in business more deeply.

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Role of the State and Municipal Programmes for the Strategic Development of the Heat Supply Industry in Modern Conditions

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Abstract

The perspective of the energy system development at the level of the state and municipal programmes, which is relevant for many countries of the world is considered in the article. The Russian Federation, which possesses great primary sources of energy resources and has the developed system of the centralized and decentralized heat supply is among these countries. The authors carried out the analysis of the current condition of the heat generating equipment and heating systems; the considerable saved-up wear, increasing annually, was revealed as the result of the analyses. The assumption was made, that the scales of the saved-up problem can be successfully overcome only by the means of tools of the state and municipal programmes, aimed at the strategic development of the heat supply industry. The chosen method of the research allowed to identify the role and features of the state and municipal programmes, to define the need of improvement of their tools for a certain industry, taking into account the relevant development priorities. The authors formulate some scientifically based offers for the development of programmes, which will allow to increase the efficiency of the management tools for the heat supply industry strategic development from the point of view of the state.

Keywords: public administration, strategic development, state and municipal programmes, heat supply industry, management tools, heat supply organizations

1. Introduction

In modern conditions the quantity of countries possessing great primary sources of energy resources is rather small and the stocks, available for them, have an objective tendency to reduction. The Russian Federation is among these countries and it has a huge fuel-and-energy complex (FEC) which is the most important factor of the development of the industrial and social-and-economic sphere (due to the permanent attention of the state). The Russian Federation also takes the leading place in the world energy resources trade and exports nearly a half of the made primary energy. Only 3.7% of total number of the population employed in the economy, is to the share of the energy industry in the Russian Federation, however its share reaches 30 percent in the revenue breakdown of the government budget, its contribution to GDP is 25–26%, and the volume of energy industry in the Russian export is about 70% according to the cost indicators.

Energy system which main subjects are the heat supplying organizations (HSO), plays a noticeable role in the structure of branches of the energy industry in modern conditions. HSO sale the produced or purchased heat energy, the heat carrier to consumers and own heat energy sources and (or) heating systems in the territory of their dislocation on the property right or on another legal basis. Statistical data prove, that, nowadays the basis of heat supply in the Russian Federation is made by the systems of the centralized heat supply which share in the total production of heat energy makes up about 82% (1300 million Gcal annually). The main sources of heat are combined heat-and-power plants (45.4%) and boiler houses (48.2%) from which the heating systems with the extent of more than 170 thousand km are laid. The systems of small diameters from 200 mm and below make up the greatest share among them (74%). The share of pipelines with the diameter more than 600 mm makes up only 3.6%. About 40% of heating systems of this category are in the municipal property.

Nowadays the expert community notes the accumulation of problems in the heat supply industry, positioning it as the weakest link of the country's energy industry. First of all there is a decrease in the cost efficiency of combined heat-and-power plants, caused by low loading of capacities because of significant reduction of the attached heating loads and demand for heat energy: during 15 years, since 1990 the heat supply, made by combined heat-and-power plants decreased by 1.7 times (first of all due to reduction of year-round industrial loading). As a result, combined heat-and-power plants are forced to work according to the electric schedule in the condensation mode, which is non-optimal for them. High degree of the boiler houses capital equipment wear takes place. The technical condition of the heating systems, owing to natural

wear near-critical, resulted in the need of replacement of nearly 30% of the heating systems economy of the country. The volumes of reconstruction, provided, are insufficient for the achievement of significant decrease in the heat losses, connected with leakages of the heat carrier and worn-out thermal isolation, exceptions of violations of the hydraulic modes of the heating systems. In general, the disajustment is peculiar to many systems of the heat supply of territories of Russia because of the impossibility to provide the optimum distribution of the delivered energy among various consumers owing to the technical condition of engineering systems.

The research results prove that in modern Russian the practice development of the country's territories and the infrastructure facilities, deployed in them, including heat supply, their strategic reference points and measures for their achievement are based on the whole complex of state and municipal programmes directed to the state energy policy implementation. The role of these documents increases in modern conditions, as the programmes, being objective oriented, formatted according to the strategic indicators of the development, measures and terms of realization in the conditions of the state support, allow to achieve the most effectively results, including the results in the problem industries. As the analysis prove the state and municipal programmes, aimed at the strategic development, are not developed yet. There are programmes of complex character, which include the sections concerning strategic problems of HSO. However, modern practice proves, that the state and municipal programs tools, created in terms of the use of the general approaches to management, demand further development taking into account that role which they play in a certain industry, taking into account the development priorities, relevant for it. This is the very task, which is pointed out by the authors. An attempt to create some scientifically based provisions, aimed at to improvement and increase in the role of the state and municipal programmes for the development of heat supply is made.

2. Literature review

The specifics of the research task determined the need for different types of references which were focused on the theoretical developments and practical experience and also on the detailed studying of the legislation in the sphere of state and municipal programme control in combination with the heat supply industry specifics, as in modern conditions management in the heat supplying organizations is focused on the development according to new state priorities in the industry.

Firstly, the most interesting works of theoretical character, which contain various aspects of strengthening of the role of state and municipal programmes for the heat supply strategic development in modern conditions, were considered. In general, it is possible to claim that there is a theoretical conceptual framework and the general approaches to the choice of management tools for the state within the state and municipal programmes. However, at the same time there are practically no works of branch orientation.

Throughout studying the retrospective aspect, which allows to define evolution of tools of the state and municipal management in the country, was considered.

In the completion of sources studying the modern legal framework, regulating forming and accomplishment of the state and municipal programmes in the Russian Federation was analyzed. The use of the provisions of the modern legislation is provided by numerous legal acts of the Russian Federation, the Federal law "On strategic Planning" acts as the fundamental one.

The studied sources allow to claim that the information on all the state programmes implemented in Russia is public and available the portal of state programs of the Russian Federation, on the websites of state bodies of the power, Ministry of Economic Development of the Russian Federation, on the websites of the industry ministries and departments, including the Ministry of Energy of the Russian Federation. In modern Russian practice 43 State programmes in five main directions of the country development are implemented: new quality of life, the innovative development and modernization of the economy, effective state, balanced regional development, ensuring national security. Important characteristic of the developed state and municipal programmes is the orientation of their contents to the achievement of a strategic objective, separable to local objectives according to a certain hierarchy, the objectives are which broken into stages of the effective objective accomplishment by accomplishment of a complex of measures connected among themselves in a certain logic with the corresponding resource providing and fixing of responsibility to their accomplishment to certain contractors.

Besides we should one more important aspect of the research. The state programmes in our country were used as the instrument of state regulation of economy providing achievement of strategic objectives most widely and tasks began to be applied on the basis of the accumulated positive experience of

management of the country development in the new state which replaced the Soviet Union in the 1990th years. It demonstrates a new formation which is s capable to solve problems of higher level on a new qualitatively other basis including heat supply development in the territories of the Russian Federation.

Thus, the carried-out sources review prove, that the role of the state and municipal development programmes increases both in the Russian Federation, and in the world economy as whole. The objective need for the expansion of programme approach instruments, which correspond to modern conditions in the industries and territories is formed and allow to consider their strategic development specifics. The heat supply industry in the Russian Federation is a characteristic example of such requests: its pre-crisis state is not compensated by the configuration of programmes, which are being implemented now and demands new developments, concerning the tools of their development and implementation.

3. Research method

According to the aforesaid conditions, revealed as the result of the sources overview, the authors chose the research method which is based on three positions:

1) determination of the requirements to the subjects for carrying out the analysis and revealing the factors, significant to new developments of tools within the programme control at the state and municipal level;

2) definition of the strategic planning features, conditions of the plans implementation at the state and municipal levels, which cause the need of the programme management tools expansion.

3) consideration of the procedures of forming and accomplishment of the state documents of programme character, which substantial filling affects the strategic development of the heat supply industry in the Russian Federation and defines the prerequisites of updating of tools for their development and realization;

In general, the used method of the research has to demonstrate what requirements to management tools are being used in the Russian Federation within the state and municipal development programmes; where there is the possibility of the increase in the role of such programmes for the strategic development of the heat supply industry.

3.1. Participants

It is necessary to identify the study participants in details and to establish the factors important for the increase in the role of programme control in the strategic development of the national economy branches. For ensuring any conceptual unity during the identification of the research subject we will give some key definitions. Earlier they were offered by the authors in the following edition:

In modern conditions the state programme of the country is the document of strategic planning, containing a complex of the planned measures, interconnected according their tasks, implementation terms, contractors and resources, as well as the instruments of state policy, providing the achievement of priorities and purposes of the state policy in the sphere of social-and-economic development and ensuring national security of the Russian Federation within the realization of key state functions. The subprogramme of the state programme (subprogramme) is a part of the state programme, allocated according to the scale and complexity of the tasks, solved within the state programme, and containing a complex of the main measures and/or departmental target programmes and/or projects (programmes) interconnected according to their terms, resources and contractors (Verstina 2016, Verstina 2017, Verstina, Evseev, 2018).

The achievement of more than 2000 indicators of the development is provided in various sectors of Russian economy, and more than 80 public authorities of various levels are used for their accomplishment within the state programmes. The total amount of the means, realized within the state programmes is up to 70% of the federal budget, at the same time it is planned to distribute up to 90% of the expenses through the state programmes, which include the federal target programmes and subprogrammes, including departmental target programmes and separate measures by public authorities, which are aimed at the achievement of the objectives within the state programme. The analysis proves that the wide application of the state programmes, determines the need to concentrate resources of federal budgets on the priorities of the industries development, including branches of the energy industry, and demands additional studying from the positions of the management tools expansion, owing to three major factors (cited as Instruction of the Government of the Russian Federation "On the Energy strategy of the Russian Federation until 2030", 2009):

- emergence of a trend of the increase in the budget expenses which dynamics and structure were

insufficiently correlated to the purposes of the state policy and the means of its providing;

- reductions of the saved-up reserves of means in combination with the growth of expenses in the conditions of the increase in the competition for resources, the problem of budgetary funds distribution between the program and non-programme expenses;

- imperfections of the public authorities work on ensuring the increase in the efficiency of the budgetary funds use, the lack of complex assessment of operation of instruments of the state policy implementation.

The distinctive feature of the municipal programmes concretizing and continuing by the state programmes in the Russian Federation, is their direct impact on the processes of strategic development of the infrastructure facilities of territories among which the essential role is played by heat supply facilities. The analysis proves that in scales of such a large country as the Russian Federation municipalities differ both in the structure of administration of the municipal unit, and in the powers conferred to it. Therefore, certain differences in the directions and contents of the municipal programmes, determination of priorities of the heat supply development in the territory are quite natural. However, according to the authors it is admissible to use the standard list of structure of municipal programmes for municipalities of the Russian Federation.

Consideration of the study participants and defining of the general and specific factors of their improvement, which distinguish the heat supply industry allowed to pass to the next level of the research based on studying of definite materials, i.e. the documents, nowadays used in the Russian practice when forming the state and municipal programmes.

3.2. Materials

For the determination of a role of state and municipal programmes for the strategic development of the heat supply industry in modern conditions it is necessary to carry out the analysis of the materials, which create the requirements to their substantial filling. Such materials include the provisions of the Russian legislation, regulating the strategy processes in the branches of national economy including branches of the energy industry and also the strategic industry forecasts reflecting trends of the energy industry development.

The choice of the priority documents and their group is performed within the research (Figure 1).

First group	Second group
• Forecast of the scientifical-and-technological development of the Russian Federation till 2030. • Federal Law "On Strategic Planning in the Russian Federation" • Forecast of social-and-economic development of the Russian Federation till 2030.	• State programme "Energy Efficiency and Energy Development" • Energy strategy of the Russian Federation till 2030 • Forecast of the scientific technology development in the energy industry branches till 2035. • Law of the Russian Federation "About Heat Supply"

Figure 1. Complex of the state strategic documents for the analysis of the created state and municipal programmes

The analyses proves, that the important stage of improvement of public administration in the Russian Federation became the adoption of law "On strategic planning" which "gives the legal basis of strategic planning in the Russian Federation, coordination of the public and municipal strategic management and the budgetary policy, power of federal authorities, public authorities of territorial subjects of the Russian Federation, local government authorities and the order of their interaction with public, scientific and other organizations in the sphere of strategic planning". Thanks to this law the system of the concepts connected with the development strategy appeared (cited as Subprogramme 1 “Energy saving and increase in energetic efficiency of” the new state program of the Russian Federation “Energy efficiency and development of power engineering”, 2013).

It is fixed legislatively that three key components are obligatory at all the levels of public administration for implementation of strategic planning:

- the forecast of the social-and-economic development made for the medium-term and long-term period within which the directions of the development of a subject to planning and its expected results are evidence-based and defined;

- the strategy of social-and-economic development, based on the forecast and containing the purposes and tasks of public administration at the appropriate level (federal, regional, municipal) for the long-term period;

- the state (municipal) programme which contains a complex of the planned measures, interconnected according to their tasks, implementation terms, contractors and resources and providing the most effective achievement of the strategic objectives and the solution of these objectives (Meshcheryakova, 2017, Vasilyeva, 2017).

The authors point out the key document, is the backbone for programmes of all the levels concerning the heat supply industry and defining the requirements of ensuring cardinal changes in the technology basis of the energy industry branches, based on the system forecast of prospects of their development. That is "Forecast of scientific-and-technological development of the energy industry branches in Russia until 2035"). The document presents the analysis and the scenario forecast of external conditions of the Russian energy industry, the reached technological level of the industries and the research of macroeconomic, structural and institutional factors of the scientific technology development of energy in the country.

The Forecast presents the conditions, important for understanding of the context, and role of the state and municipal development programmes of the industry which are conditionally subdivided by the authors into external for the heat supply industry, determined by the needs of heat energy consumers, and internal, inherent in the industry taking into account the saved-up potential [Verstina, Evseev, 2018, Kisel, 2018). They are characterized by the following:

- external: trends of urbanization and growth of "middle class" which change the nature of heat consumption in volumes, quality and reliability. Over 70% of the world population will have appeared in the cities and agglomerations by 2050. That will promote the economic growth (80% of growth), but that will create some problems with life support resources including energy.

- internal: such the trend of the increase of the role of new approaches in the energy industry development. It is expressed both in changes in traditional the areas of the energy industry ("shale gas revolution", liquefied natural gas, etc.), and in forming of the "new energy" based on renewable energy resources, distributed generation, intellectualization, etc. and also in the development of energy-saving and energy efficient technologies in transport, industry, social sphere

Having considered the studied materials, it is important to define some features of their forming and implementation.

3.3. Procedure

The analysis of materials proves that when developing the state and municipal programmes in our country the complex of principles allowing to raise their role for the strategic development of the branches of economy and to provide compliance of the developed project to the requirements of efficiency of these processes is created and put into practice successfully. The authors note the following principles:

- accounting of the purposes and priorities of the social-and-economic development of the Russian Federation, regions of the Russian Federation, municipal units;

- the most complete scope of all the spheres of social-and-economic development, accounting of expenses from all the financing sources, including budgetary and extrabudgetary funds;

- ensuring the measurability of direct and resulting effects of the state and municipal programmes implementation;

- integration of state regulatory (law-creation, law-enforcement and control) and financial (tax, property, tariff, credit, debt) measures for the achievement of the objectives;

- establishment of an executive body, responsible for the achievement of resulting effects (executive in charge) and collaborators with fixing the required resources to them;

- carrying out monitoring and regular assessment of the effectiveness and efficiency of the state and municipal programme including external examination with the involvement of independent experts (Badaguyev, 2012).

Nowadays all the considered materials, i.e. the state and municipal programmes are formed on the basis of the uniform algorithm of actions, which is already fulfilled in practice and periodically updated. Let us consider the studied materials from the positions of current situation and the prospects of their

improvement. The development, implementation and efficiency evaluation of the state programmes of the Russian Federation, is regulated by the Order of the Government of the Russian Federation and it is subdivided into 6 stages presents in Figure 2 (cited as Order of the Government of the Russian Federation "On the statement of the Order of development, implementation and efficiency evaluation of the state programmes of the Russian Federation", 2010).

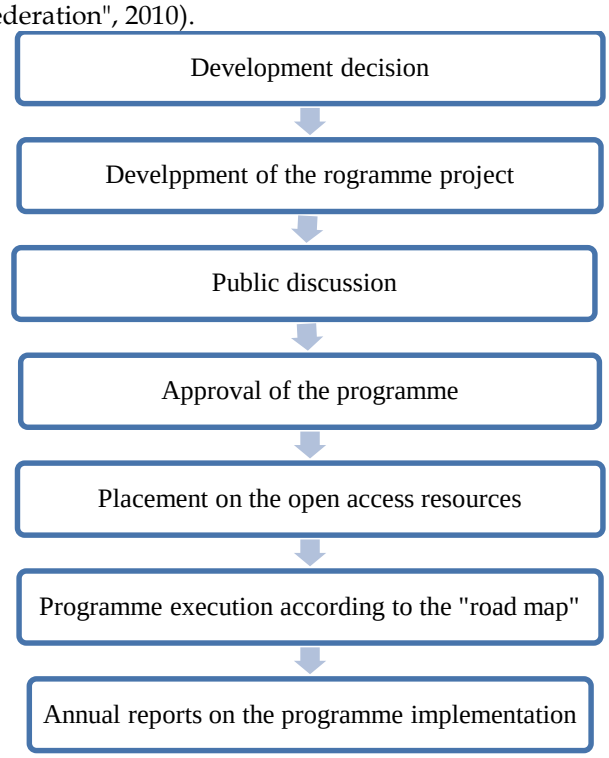


Figure 2. Stages and procedures of the state and municipal programmes development and implementation

The starting stage is the decision making on the development of the state or municipal programmes of certain orientation, which is performed on the basis of regulatory legal acts of the Government of the Russian Federation. On making decision on the development of the state programme of federal level the executive body of the government is responsible for implementation of the state policy in a certain sphere of national economy. In the sphere of energy industry the Ministry of Energy of the Russian Federation is such a responsible body now; on its website 9 state and federal target programmes of the Russian Federation is provided.

The analysis of the practice of preparation of the draft of the state programme prove that it is always carried out in the mode of ensuring availability of information on the corresponding project (placements of data on the programme on the executive in charge website). The notice of preparation of the draft of the state programme, the text of the project, terms of carrying out public discussion and its results and also results of consideration of the project by the body authorized, as it belongs to obligatory components of information. The disclosure of information on the preparation of drafts of state programmes, developed by the Government of the Russian Federation is the productive management tool, allowing to receive comprehensive assessment of the document already at the stage of its preparation. The form, order and terms of the procedure of public discussion of the draft document of strategic planning are defined according to the state and municipal programmes (cited as Order of the Government of the Russian Federation "On the order of disclosure of information on preparation of projects of regulatory legal acts and results of their public discussion by the federal executive bodies", 2012). Also the structure of information submitted for discussion is important (cited as Official portal of State programmes of the Russian Federation).

Procedures of preparation of the annual report are automated and they are carried out with the use of the portal of state programmes within the proper terms.

After consideration of the achieved results of the state program of the Russian Federation some instruments of state regulation can be used: in case of unsatisfactory indicators the decision on the reduction of budgetary appropriations on its implementation for the next year can be made or the decision on early

termination of the implementation of the main measures or programmes in general and also on imposing of disciplinary punishments can be made.

4.Result

The research conducted by authors allowed to pass at this stage to the formulation of the resulting provisions which are aimed at the improvement of the programme control (Meshcheryakova, 2017, Black , 2011, Vasilyeva, 2017).

The first provision assumes the need of planning of the state and municipal programmes on the strategic development of the heat supply industry in the context of trends of the world economy, proceeding from three predicted alternative scenarios of the development of the situation in the energy industry branches. Their fundamental difference is the availability (or absence) of financial resources for the development which directly influence the private investments into the heat supply industry and necessary volume of the state support, provided in the state and municipal programmes on the terms of public-and-private partnership (Shmakova, 2016). Let us provide substantial characteristic of their influence on the strategic development of the heat supply industry briefly:

- "New era of hydrocarbons" which forecast is the optimum one. The strategic prospect is represented as the availability of conditions of simultaneous growth and the oil demand, and the prices for which grow (up to 80 dollars per barrel by 2020, over 100 dollars per barrel. by 2030) at the expense of the accelerated growth of the world economy (it is not lower than 3.5% in a year) and possible reduction of the potential of oil extraction. At the same time the favorable climate in power in general, will also positively affect the development of heat supply, will provide some opportunities for financing of those directions of scientific-and-technical development in the industries which were limited to chronically decreasing investment opportunities of the Russian HSO.

- "Era of low prices of hydrocarbons" at which the unfavorable prices concerning these products remain. With low growth rates of the world economy (it is lower than 3% in annual calculation) and preserving of the available oil extraction potential, continuation of strategy of preserving of the market share to the detriment of the prices from the countries of OPEC and other oil producers, the low level of the oil prices (and gas and coal prices) it can be long-term. At the same time the economic situation will not allow to increase the prices of heat energy significantly, and investment resources in the required volume for improvement of technologies will not be able to be created only due to subjects of business (HSO), the state support will be necessary;

- "Power revolution" which consists in withdrawal from hydrocarbon sources and introduction of the renewable energy resources (RER). Within this scenario it is considered that traditional fields of hydrocarbons are gradually exhausted against the background of steady value addition of their production. The factor of fast reduction of prices of the power stations using RER in combination with the long investment period of their creation is also essential. Reduction in cost of heat energy due to reducing costs of the resources demanded for generation which are made in the conditions of renewable power can become positive change (cited as Plan of activities of the Ministry of Energy of the Russian Federation in 2016-2021, 2016).

The second of these provisions is the following. When forming the state and municipal programmes on heat supply it is necessary to consider the need of transition of HSO to the technologies of automation and intellectualizations, ensuring technology breaks, established in the expected documents on the development, and the actual level of technology development of heating systems in the regions in modern conditions. The essential difference among the regions causes the need of allocation of several reference purposes which consecutive accomplishment on the basis of actions will make the transition process evolutionary (Kibert, 1994, Carrillo, Franza, 2006). At the same time, it is important to consider that the changes in the world energy, which happened recently, proved that the technologies come out on top among the long-term defining factors of the development, removing the volume and quality of resource base. We concretize this provision, having given the short characteristic of three reference purposes which have to be used when forming the state and municipal programmes to provide the continuity of measures (Figure 3).

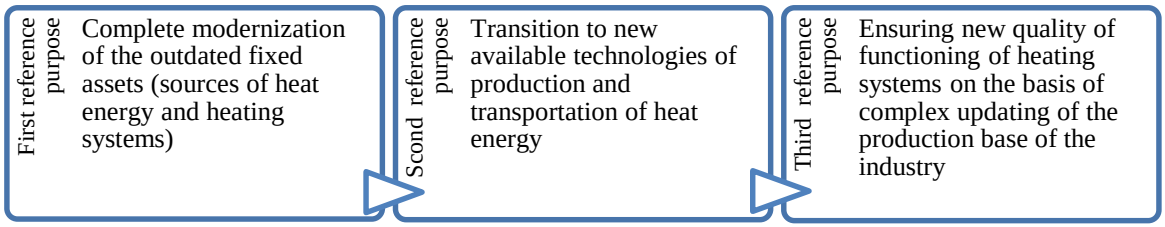


Figure 3. Reference purposes of the strategic heat supply development which are to be used during the state and municipal programmes formation

The third provision is the ensuring continuity of the programmes according to the levels of the public and municipal administration taking into account problems of the heat supply industry development, which can and have to be solved at the appropriate level: federal, branch (regional), local (cited as Technique of involvement of power service companies in modernization of regional housing stock, 2014). It is obvious that the programmes at each of the levels has the scale of scope within which its objective orientation is performed, actions are created and results, providing the "effect of investments" at all the levels of programmes, are planned. The results of the previous, the lower level have to provide possibilities of accomplishment of the listed parameters of the programmes of the higher level.

5. Discussion and conclusion

The aforesaid provisions connected with the development and implementation of state programmes are defined legislatively, according to the in process of accumulation of practical experience and they have to be improved constantly. According to authors, further scientifically based developments, concerning the programmes of meso-level, i.e. the programmes of regionals of the Russian Federation are most demanded. This level is an important intermediate link between the level of public administration in scales of the whole country and the level of municipal administration, at which the strategic priorities of the heat supply development are implemented in certain territories directly. However, unlike the state programmes of the Russian Federation, the appropriate programmes of two following levels, provided by the law “On strategic planning” legislatively and methodically, are not adequately worked out, they demand us to consider specifics of public administration of regional of the Russian Federation and to use all the necessary management tools at this level. Particularly, it is important to adhere to their typified structure which elements are substantially approved among themselves and accented on the development of mechanisms of interaction of all the stakeholders, taking into account risks of non-performance of the established indicators of the state programme of the region of the Russian Federation during the development stage of state programmes of regions of the Russian Federation.

Thus, the state and municipal programmes of the Russian Federation play an essential role in the public administration, acting as the instrument of implementation of state policy, tested and perspective in terms of their further use, in the heat supply industry, which improvement is directly connected with the strategic development of the country's economy in general.

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