Changes in the functional state of young players with different strength of the nervous system

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ABSTRACT:

The purpose of the article is to get and summarize the data obtained in the new study, namely the change in the indicators of the functional state of 11-12 year-old players having different typological peculiarities of the nervous system. The leading methods to research this problem are ascertaining and formative pedagogical experiment, theoretical analysis and summarizing of methodological literature and methods of mathematical statistics. The result is a change in the indicators of the functional status of 11-12 year-old children who play football, after using the methodology of the differential development of coordination abilities of players 11-12 years with different typology of the nervous system. Conclusion - the article can be useful for improving the outdated forms of coach’s training and instructors in football and other sports, and also can be used in the training process of football players with different skills. The urgency of the theme is caused by the search of modernization of training process in football reserve, which would increase the functional status of the children and improve their results in football.

KEY WORDS: functional status, football, nervous system, differentiated development, typology.

INTRODUCTION

A significant factor in the development of football in Russia is that the World Cup in 2018 will be held in this country. It also affects the system of training of sports reserve in football. The level of the players’ skills largely depends on the extent to which the player has mastered all the diversity of technical tactics in football, how he learned to use these techniques in various situations in terms of active opponent’s resistance [1]. In recent years the game of football among young and adult players requires high level of coordination abilities, which are an integral part of sportsmen’s technical training: the role of coordination abilities considered as a leading one long time ago [19]. At the initial stage of sports training one of the directions of development of players’ coordination abilities is to implement a differentiated approach in the athlete’s training of different sports, including football. A differentiated approach increases the efficiency of the training loads, optimizes the training process, and is considered to be an effective way to use latent reserves of athletes’ body [6]. Studies devoted to the typology of athletes show that the efficiency of training effects is connected with the influence of different properties of the athlete’s nervous system such as strength, mobility and steadiness of excitation and inhibition process [4, 13]. At the same time, in scientific research, devoted to young players’ training, there is no data taking into account such characteristics as the strength of the nervous system in the excitation process, which, as it was proved earlier, greatly influences the way an athlete reacts on the characteristics of the training load, and this proves the relevancy of the research. It should be noted that under the typological features of
manifestations of properties of the nervous system is understood as the manifestation of the power of the nervous system in the initiation process. That is, the health of nerve cells, their ability to bear strong tension, without falling beyond inhibition, i.e. the strength-weakness of the nervous system in the excitation process.

Thus, the purpose of this research is to improve the football skills of young footballers and to study the functional changes that occur in 11-12 year-old children under the training impact.

The hypothesis of the research is the assumption that the methodology of the differential development of coordination abilities of 11-12 year-old players with different typology of the nervous system will have an impact on the functional status of 11-12 year-old children and their competitive results.

Objectives of the study
To achieve the aims and verify the hypothesis of the study the following tasks were solved:
1) to determine the current state of the development of coordination abilities of young athletes aged 11-12 and the using of a differentiated approach in their training activities;
2) to develop and test the experimental methodology of the development of coordination abilities of 11-12 year-old players, based on the typological features of the nervous system;
3) to study the effect of the experimental procedure on the functional status, the competitive result of 11-12 year-old players and the level of development of their coordination abilities.

MATERIALS AND METHODS
1. Theoretical and empirical methods
A set of various methods complementing each other was used to verify the hypothesis:
- theoretical methods: the study and synthesis of innovative pedagogical experience, analysis of scientific and methodical literature, normative and methodical working papers and materials on the problem, the study of the existing programs and training systems of a football reserve team;
- empirical methods: pedagogical experiment, which involves the diagnostic method of the strength of the nervous system in the initiation process [12], methods of functional diagnostics and evaluation of the level of the development of coordination abilities [7], as well as methods of mathematical statistics [20].

2. Base of the research
The main base of the study was Vyatka state university and youth sports school №5 in the city of Kirov.

3. Stages of the research
The study was carried out in five consecutive stages:
1) The preparatory stage of the study examined the experts’ opinion on football in the region, and carried out the theoretical analysis and summarizing of the literature.
2) The theoretical basis for experimental study was developed, an object, a subject, an aim and a hypothesis were defined, the selection of tests for determining the characteristics under research was carried out. A program of experimental work was made.
3) An ascertaining experiment was carried out, primary collection and analysis of empirical material was made, the tasks and the methods of research were defined, an experimental methodology based on differentiation of players into groups taking into account their typology was developed.
4) In the experiment stage of the study a formative pedagogical experiment was carried out. During the experiment the efficiency of the methodology of development of coordination abilities of 11-12 year-old players was investigated, which takes into account the typological features of the nervous system, and its influence on the functional state of the children and their competitive results was studied.
5) It carried out the analyzing of the obtained results of the experimental research, the definition of the main conclusions, and the developing of the methodological and practical recommendations.

4. Evaluation criteria
The efficiency of the experimental methodology was carried out using the following evaluation criteria:
- the change of the indicators of the functional status during the experiment;
- the change of the indicators of coordination abilities during the experiment;
- the result in the football championship of the city of Kirov among boys aged 11-12 at the end of the experiment.

5. Experimental procedures and its description
The main pedagogical experiment was carried out on the basis youth sports school № 5 in Kirov.

The essence of the pedagogical experiment is to identify the leading and coordination abilities of football players with strong and weak nervous system and their influence on competition outcome and change functional parameters under the influence of the experimental procedure. The experiment was structured in the following way:
1. Organizing the control and experimental groups and subgroups in them.
2. Carrying out an ascertaining pedagogical experiment, namely the determination of indicators of coordination abilities and functional status of the pupils and also the determination of the strength of their nervous system in the initiation process.

The selected tests are the most popular and frequently used in previous scientific studies on the definition of leading investigated indicators of athletes [7, 12].
3. Carrying out the main pedagogical experiment and measuring the characteristics afterwards.

In our study, we purposefully developed coordination abilities of young players, and special attention was paid to their functional condition taking into account the differentiation of the typological characteristics, namely the strength-weakness of the nervous system in the excitation process.

The essence of the developed methodology consisted of the following characteristics:

1) using of a differentiated approach in the choice of physical exercises to develop the coordination abilities including the strength of the nervous system, the means of achieving the result were technical exercises well-known for football players.

2) up to 30 minutes of the total duration the sessions were devoted to the targeted development of coordination abilities of young athletes separately from the players with strong and with weak nervous system in the excitation process;

3) The implementation of the goals and tasks of teaching and training activities was carried out in compliance with the principles of the development of physical abilities.

4) the means of achieving the result were well-known technical exercises for football players;

5) the methods used in the experiment – repeated, variational, role playing, competitive ones;

6) the main methodological techniques were:

- the introduction of new exercises;
- complication of previously learned exercises by new preparatory positions, an increase in the rate of movements.
- lack of space during exercise;
- uniting of mastered physical actions in various combinations and bringing them to automatism;
- Complication of exercises by additional means;
- Improving of technical actions in a state of significant fatigue;
- Introduction of several balls to the exercise;
- Juggling objects;
- of additional guidance;
- Mirror exercises.

7) a distinctive feature of the experimental procedure was a differentiated load which for players with a strong nervous system was more intense, while for players with a weak nervous system was more extensive. That is, in the training of the players with a strong nervous system it is preferable to increase the intensity of the load by increasing the number of exercises and reduce the rest intervals between exercises and (or) between the series of exercises in training. In the training of the players with a weak nervous system the volume of the training load in the process of development of coordination abilities is increased by increasing the number of repetitions, sets and rest intervals. Exemplary components of the load for players with different typology is presented in table 1.

<table>
<thead>
<tr>
<th>The components of the load</th>
<th>Footballers with strong nervous system</th>
<th>Footballers with weak nervous system</th>
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</thead>
<tbody>
<tr>
<td>1. The intensity of an exercise</td>
<td>140-160 beats/min</td>
<td></td>
</tr>
<tr>
<td>2. The duration of an exercise</td>
<td>1-2 minutes</td>
<td>2-3 minutes</td>
</tr>
<tr>
<td>3. Rest intervals</td>
<td>To full recovery (pulse 100-120 beats/min)</td>
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The experiment involved 28 players at the age of 11-12. Organizing of the control and experimental groups and subgroups was held with the method of random selection based on typology, namely the strength-weakness of the nervous system in the excitation process.

Control group (CG), which had players with strong and weak nervous system was engaged in a training program of sports training for Youth Sport School and Specialized Children and Youth Sport School of the Olympic Reserve [2]. At the same time the football players of the experimental group (EG) were engaged in the designed methodology, the aim of which was to increase sports results due to purposeful influence on coordination abilities. During the training year, there were 110 sessions of 90 minutes each.
4. Measurement of the studied parameters after the forming pedagogical experiment.

5. Statistical and mathematical elaboration of the main pedagogical experiment.

To identify the reliability and validity of the results of the pedagogical experiment obtained in the course of the study, the data were processed using mathematical statistics methods, namely using parametric tests (student's t-test) [20]. Statistical processing of results was carried out using a personal computer with a Pentium 4 and using the standard statistical package Microsoft Excel 2007 software. Correlation analysis was performed using Bio Stat program the 2009. Result when the value of P>0.05 was considered significant.

6. Formulating of the conclusions of methodological and practical recommendations.

STATISTICAL RESULTS

1. The results of the ascertaining pedagogical experiment

It is important to note that the significant differences between the indicators of the functional status of the young players with strong and weak nervous system were not found (P>0.05).

2. The results of the formative pedagogical experiment

Technical training of young players is one of the most valuable topics in sports today. Therefore, the necessity of improving the system of training of sports reserve in football requires a constant search for the new forms of organization of educational-training activities, which would contribute to the achievement of high sports results. The efficiency of formation of the rational technique of motional actions among young athletes involves the development of psychomotor abilities, most of which is the level of development of coordination abilities. In CG the players with strong and weak nervous system in the excitation process during the period of the pedagogical experiment in the shuttle-run test 3x10m don’t have significant differences (P>0.05). However, the indicators have improved slightly among the players with strong and weak nervous system in the excitation process.

In the EG during the period of the pedagogical experiment the data have changed significantly and credibly. So, the figure of the players with a strong nervous system rose from 7.4±0.1 to 7.1±0.1 (P<0.01), and of the players with a weak nervous system from 7.6±0.1 to 7.3±0.1 (P<0.01).

Intergroup comparison also shows obvious prior development of coordination abilities of football players of the experimental group than in the control group. The changes in the indices of the functional status of young players in the EG and CG after the forming pedagogical experiment are presented in Table 3. The data displayed in Table 3, show that the indicators of the functional abilities of football players of the EG and the KG with a strong nervous system and a weak one from the beginning to the end of the pedagogical experiment revealed no significant changes (P>0.05).

Heart rate of the football players in the EG with a strong NS increased by 2.5 beats /min and the KG by 2.3 beats /min (P>0.05). Heart rate of the football players with a weak NS slightly decreased in the EG from 83.9±3.3 beats /min to 83.4±2 beats /min (P>0.05) and the KG from 82.9±2.9 beats /min to 78.9±2.9 beats /min (P>0.05).

Analysis of the changes in the systolic blood pressure shows a positive trend in all subgroups, except for the football players in the KG with a weak NS from 117.9±1.0 mm Hg to 117.1±1.5 mm Hg (P>0.05).

Investigating the change of indices of diastolic blood pressure, one should note the lack of significant increase of this index in all subgroups (P>0.05).
Significant changes in indicators of VCL in all subgroups over the period of the pedagogical experiment were not detected (P>0.05). Thus, the development of the coordination abilities of 11-12 year-old players based on the typological features of the strength of the nervous system contributes to the normal development of functional systems of young athletes’ body.

### DISCUSSION

In scientific and methodological literature, a number of criteria by which athletes while performing physical exercises can be divided into homogeneous subgroups. For example, the type of a body – [1, 10]; the level of technical competence – [3, 5]; the level of functional training – [15, 18]; playing position – [8, 11].

At the same time, there are studies that focus on typological features of display properties of the nervous system [4, 13, 16, 17]. However, during the study of the literature, the research devoted to the differential development of coordinating abilities with the features of manifestations of properties of the players’ nervous system was not found.

In the new experimental studies specific results were obtained what are consistent with those obtained in other studies. The main thing is that the load for athletes with strong and weak nervous system must be different, so as to achieve the same goal athletes go separate ways. For players with a strong nervous system in the excitation process it is more efficient to have intense workload with a large amount of exercise and more frequent change. At the same time for players with a weak nervous system the load should be extensive with plenty of repetition of exercises, lots of sets, and longer rest intervals between exercises and series.

Most of the authors in their studies do not pay attention to the functional state of the involved athletes and the change in this indicator, based on the differentiation criterion, namely the strength-weakness of the nervous system in the excitation process. The authors pay attention to the technical and tactical aspects only.

Such studies were conducted previously, however, they were devoted only to the development of coordination abilities [3, 5], or the differentiation of the training process [6] or the study of typological features of manifestations of the properties of the nervous system [4, 13], but in other sports having no relation to football.

### CONCLUSION

Since the experimental methodology was not focused on high physical load, which can cause significant changes in the body systems, so the significant changes didn’t happen in the functional state of 11-12 year-old during the period of the pedagogical experiment.
At the same time the effect of methodology has had an extremely positive result on the level of development of coordination abilities of young players in the EG for players with a strong nervous system, and for players with a weak nervous system (P<0.01).

In the CG the results in the test of Shuttle run 3x10 also improved, but their value was not significant (P>0.05), it can be explained not only by the efficiency of the training process in KG, but also by the growth of muscle fibers and development of 11-12 year-old children going in for sport.

It should be noted that the achieved level of development of coordination abilities after pedagogical experiment can be regarded as high for children of 11-12 years [2], and the functionality of the body in the EG and CG correspond to age norms [9, 14].

Efficiency of using the experimental methodology can be confirmed by the results of the competition. So, the team of children of the EG, which was applied to the experimental methodology of targeted development of coordination abilities in football championship of the city Kirov among boys of 11-12 years occupied the 4th place. The boys 'team is KG, which was trained in accordance with the program of sports training in football for Youth Sport School and Specialized Children and Youth Sport School of the Olympic Reserve took the 9th place. Obtained competitive results, of course, give evidence of the efficiency of the experimental methodology.

RECOMMENDATIONS

The data, obtained after the conducting of the pedagogical experiment are of practical interest, especially for trainers of Youth Sport School and Specialized Children and Youth Sport School of the Olympic Reserve. It must be remembered that for a tactically competence of the training process it is necessary to examine the proposed methodology aimed at the development of different skills, including coordination. You should also use a differentiated approach in the process of training, based on the typological features of manifestation of the properties of the nervous system. This approach increases the efficiency of the lessons, optimizes the learning process, and it is one of the most effective ways to use latent reserves of the athlete’s body. You need comprehensive testing to evaluate the children which will help to monitor their health and fitness. These data will allow us to maintain or improve the health of the student, to adjust the training process in the right direction and to achieve high sports results.

REFERENCES


