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The Effects of Strenght Exercises on Body Composition and Irisin

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ABSTRACT

This is the first study to determine the effects of strenght exercises on irisin and correlation of bady composition and irisin. The purpose of this study was to determine the effects on body composition and irisin of static strength exercises with Tera-Bant® in elite boxers. 9 volunteered elite male boxers participate in the study who are non-smokers and did not use any nutritional supplements. Boxers were instructed to perform strength exercises with Thera-Band for 3 days a week for 8 weeks. Blood samples were taken before exercises (resting), after the first exercise (acute) and after 8 weeks following the last exercise (chronic), and measurement of body fats were made at the same time. Irisin levels of blood were examined. Statistical analyses were carried out using the SPSS 22 for Windows. The data were found to not be distributed normally. Thus, Friedman, Wilcoxon, Mann-Whitney U and Speraman's correlations tests were used. The results were evaluated using an alpha level of .05. Body Fat Percentage (BFP) and Fat Mass (FM) levels of athletes increased, Lean Mass (LM) decreased relatively both after a single session and after 8 weeks. While irisin concentration increased after a single session, (correlation in pre exercise and after a single exercise. Static strength exercise is effective on body fat both acutely and chronically, and effective on irisin only acute. Farther, the body fat and irisin are related to the negative.

1. Introduction

Boxing is one of the branches of sports which involves the most intensive body contact and struggle due to its nature and practice. Boxing training causes significant changes in many physical and physiological characteristics of sportspeople such as aerobic strength, endurance, flexibility, eye-hand coordination, swiftness, reflex and strength (1).

Strength is the leading motoric skill that takes part in formation of all sports skills that involve physicality (2). Strength is the encounter or victory by organisms against an external resistance through muscles. All sports disciplines wield strength in order to increase performance of sportspeople (3). Building strength is affected by the strength gain-loss relationship, beginning level, size and extent of muscle contraction, training frequency, training method, order

and practice of the training content, initial muscle length, joint working angle, contralateral training and additional tension in terms of training and is externally affected by diet and seasons. (4).

Thera-band, introduced to the world by Akron Hygenic Company in 1978, has become more adaptable and diverse in line with the emerging needs for resistance band and exercise band in fitness and rehabilitation programs (5). The exercise band assisting fitness and physiotherapy is in different colors specific to each resistance properties (6). Resistance bands provide an increase in the mass and strength of applied muscles. Effective and productive, single or multiple joint works can be ensured through resistance band training (7, 8).

The energy needed to maintain the metabolic events in anorganism is acquired from proteins, lipids, and carbohydrates. These molecules, which provide the energy required for the harmo-nious operation of metabolic events, are under the tight control of many enzymes and hormones. Preptin, adropin, and irisin are three new hormones that regulate energy input and expenditure, and maintain energy homeostasis and composition (9). White adipose tissues in mammals store primarily triglycerides and fatty acids and contain a very small number of mitochondria (10).

Irisin is a myokine that was discovered in the skeletal muscle. As a result of the researches, it has been observed that irisin is synthesized and released in many tissues, and that it mainly originates from skeletal muscle and adipose tissue (9, 11). The irisin is a proteohormone with the consisting of 112 amino acids isolated from the muscle tissue for the first time by Bostrom et al. (2012), and it is Proteolytic Product Fibronectin Type III Domain 5 (FNDC5) molecule (12). FNDC5 causes energy expenditure by converting white adipose tissue to brown adipose tissue. Exercise and cold induced stimulation irisin increases release heat production causing energy consumption in cell by increasing release of Uncoupling Protein-1 (UCP-1) pumps, thereby providing non-shivering hermogenesis and glucose homeostasis (12-14). There is an important relationship between exercise and irisin. Exercise-induced irisin mediates the beneficial effects on metabolism (12, 15). As irisin is induced in the muscle through exercises and increases energy expenditure, and due to its effects on weight loss and blood glucose level, it is accepted to be a preventive element against obesity and as a promising molecule in treatment of obesity and diabetes. (16-18).

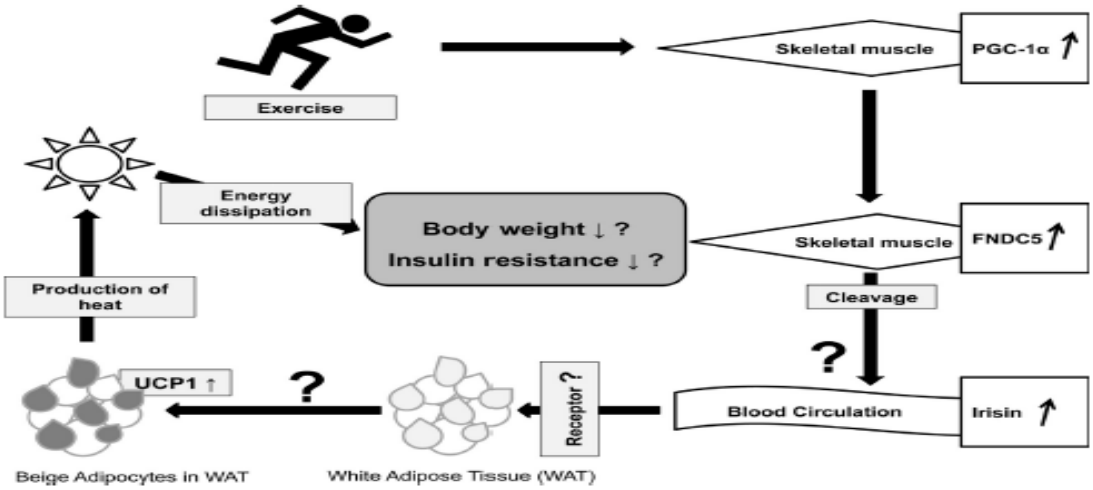

Figure 1. Proposed pathway of FNDC5/irisin to stimulate energy expenditure. (19).

Having been recently identified and involving researches initiated on its various effects, irisin hormone has

been considered as a research subject also in exercise and sports sciences, and researches in this regard have been planned particularly in strength exercise, which is the biggest method of energy expenditure. Purpose of this study is examining the effect of static strength exercises on irisin hormone metabolism.

2. Method

2.1. Research Group

9 elite boxer; 17,22±3,35 years old, 166,89±9,73 cm in length, 59,56±12,68 kg in weight and 21,19±3,36 kg/m2 in body mass index.

2.2. Exercise Protocols

Karakurt's (2017) method was applied as exercise program in this study. In this program, boxers were exercised with the Thera-Band for 8 weeks/3 days. Boxers performed this sportive movement as static; direct hit, crochet, uppercut, elbow flexion, elbow extension, sideways lifting, rowing up, flapping, chest press, front lift, cross-lift, cross back cut, leg press, fall off. Muscle contractions were stable in this group (20).

2.3. Measurement of Body Composition (Body fats)

Body mass and fat were measured with Body Impedance Analyser (TANITA SC-240MA).

2.4. Uptake and Conservation of Blood Samples

Blood samples were taken before exercises (resting), after the first exercise (acute), and after 8 weeks the last exercise (chronic). Serum specimens were separated by centrifugation (3500 x rpm for 15 min at 4˚C), and all specimens were aliquoted, frozen and stored at -80˚C until analysis.

2.5. Irisin Analysis

Serum irisin levels were determined using a commercially available human enzyme linked immunosorbent assay (ELISA) kit (Mybiosourche, San Diego, USA) with an intra-assay coefficient of variation of <10% and an inter-assay coefficient of variation of <10%. Kit sensitivity is <0,78 ng/mL and detection rage is 3.12-200 ng/mL.

2.6. Statistical Analyses

Statistical analyses were carried out using the SPSS 22 for Windows. Normalization analysis was performed to determine whether the data were normally distributed. The data were not distributed normally. Thus, K-Related Samples Friedman test was used for the analysis of repeated measurements and for the comparison of pre- and post-exercise data and chronic and acute mode data, 2-Related Samples Wilcoxon test was used in the evaluation of the groups as pairs. In addition to Mann-Whitney U test was used for inter-group comparisons. Bivariate Speraman's correlations test was used for the analysis of correlations between BFP, FM and irisin values. The results were evaluated on the basis of meaningfulness of 0.05.

2. Results

Table 1. *Comparison of BFP, FM, LM and Irisin Values After Post Exercise and Post 8 Weeks Exercise*

Parameter	Measurement	Min	Max	Med	Mean Rank	X²	Dif.	Groups
BFP	Pre-Exercise (a)	.80	39.40	1.80	7	34.000	.001*	a-b* a-c* b-c*
	Post Exercise (b)	.10	39.30	1.50	7			
	Post 8 Weeks Exercise (c)	.20	26.30	1.40	5			
FM	Pre-Exercise (a)	.20	23.70	1,30	5	34.000	.001*	a-b* a-c* b-c*
	Post Exercise (b)	.70	13.60	1,60	4			
	Post 8 Weeks Exercise (c)	.30	11.30	1,50	3			
LM	Pre-Exercise (a)	1.10	52.20	5,50	5.29	31.143	.028*	a-b* a-c* b-c*
	Post Exercise (b)	1.20	52.40	6,40	5			
	Post 8 Weeks Exercise (c)	3.80	52.10	8,10	5.71			
IRISIN	Pre-Exercise (a)	4.20	41.22	3,06	8.11	10.667	.005*	a-b*
	Post Exercise (b)	2.40	59.21	15,27	11.44			
	Post 8 Weeks Exercise (c)	8.56	59.21	25,84	11.40			

*p<.05

In Table 1, there were significant decreases in the BFP and FM values, and consequently increase in the LM values bot after a single exercise and after 8 weeks exercise. In addition to, there was significant increase in the irisin concentration only after a single exercise.

Table 2. *Correlations of BFP, FM and Irisin Values in Resting, a Single Session and After 8 Weeks.*

MEASUREMENT	PARAMETERS	IRISIN
Pre-Exercise	BFP	-,738* (.037)
	FM	-,731* (.040)
Post Exercise	BFP	-,810* (.015)
	FM	-,738* (.037)
Post 8 Weeks Exercise	BFP	,286
	FM	,281

* p<.05

In Table 2, there were significantly negative correlations between body fats and irisin pre exercise and after a single exercise. There was no significantly correlation between body fat and irisin after 8 weeks exercise.

4. Discussion and Conclusion

This is the first study to determine the effects of strenght exercises on irisin levels, and also the first study to

correlation of bady composition and irisin. İt has been found out in our research that an 8-week static strength exercises using theraband significantly decrease body fats in acute and chronic stages (Table 1). Tumminello (2014) stated that strength exercises accelerated muscle development while causing a decrease in body fat ratio (21). In line with the result of our research, Karabıyık (2018) noted that young sportspeople having applied a 6-week complex strength exercises experienced a greater decrease in fat ratios compared to players engaging in routine football training (22). Ozdil and Cakmakci (2016) indicated that fighters applying a 6-week maximal strength exercise using resistance bands and dumbbells undergone a greater loss in body weight compared to those engaging solely in match training (23). Considering that body fats constitute a major part of body weight, such decrease in the body weight can also be regarded as a decrease in body fats.

It has been determined in this study that static strength exercises significantly increase acute irisin levels. It has also been stated in previous researches that irisin levels increase after acute exercises. Sustained treadmill exercise at a moderate intensity increases irisin concentrations in the first hour of exercise (24). The effect of different acute exercise programs on serum irisin is controversial, with some studies reporting an increase in irisin (25-33).

Although in adults an acute bout of exercise has been estimated to induce a significant irisin increase by 15%, which is considered relevant from a clinical point of view (34). Irisin concentration in blood increased after 4×50 m freestyle swimming (35). In a study conducted on obese male participants in order to identify the effect of submaximal aerobics exercise on serum irisin level, it was observed that serum irisin content significantly increased in the exercising group (36). Another area of research was whether irisin secretion increased with heat or exercise. Aydin et al. (2013a) who studied obese and healthyindividuals subjected one group to a 45-min run and had the othergroup take a 45-min shower in a 50◦C hot Turkish bath. The researchers reported that irisin amounts increased after both exercise and shower, but a greater amount of irisin was secreted intocirculation and transferred to saliva after the shower in the hot Turkish bath (37).

In a study conducted on experimental animals, it was concluded that irisin existed in muscles and serum regardless of exercise but increased immediately after acute exercises (38). In a study by Castillo-Quan, it was observed that irisin level in mice increased by 65% after exercising (11). When the effect of two different exercises (High-intensity interval training and low-intensity continuous exercise) on irisin levels of diabetic mice was researched, it was determined that serum irisin levels were higher in both groups engaging in exercise compared to the control group. (39). Aydin et al.(2013b) subjected young and old mice to a swimming exercise and found that the circulating amount of irisin increased after exercise (40).

Similar to the results of our research, a significant increase was seen in irisin levels after chronic exercises. This can be considered as an adaptation process caused by exercise. . In our study results show that irisin levels at rest are not affected by training status and/or regular exercise training (41). Kurdiova et al. (2014) determined that long-term chronic exercises do not affect the skeleton muscles and blood irisin levels significantly (42). None of the regular physical activity or physical fitness are associated with resting irisin concentrations in healthy humans (43). Timmons et al. (2005) stated that FNDC5 mRNA levels in the skeleton muscle of the groups 6-week cycling exercise did not exhibit a significant difference from the non-athlete ones (44). Pekkala et al. (2013) underlined that the irisin levels subjected to chronic exercise exhibited differences although they were not significant, but such differences do not mark an absolute connection between the FNDC5 expression and irisin secretion (45). Hecksteden and colleagues reported that exercise performed 3 times per week for 26 weeks did not bring about any change in circulating irisin amounts (46).

Results in the literature mostly support this research. And an increase in irisin after chronic exercise is not mentioned only in a few researches. A chronic effect of exercise on circulating irisin seems to be minimal (47,48). Serum irisin, FNDC5 or PGC1-α increase after chronic exercise have been reported in mice and humans (12, 49).

In this research, it has been determined that 8-week static strength exercises using thera-band;

- ✓ -significantly decrease body fats at acute stage,
- ✓ -significantly decrease body fats at chronic stage,
- ✓ -significantly increase acute irisin levels,
- ✓ -caused no significant difference in irisin levels at chronic stage,
- ✓ -and that there are high-level, significant negative relationships between irisin and body fats.

In consideration of the increasing popularity of irisin, it is regarded that irisin can be subject to researches in many exercise fields. For example, it is proposed that researches are conducted on healthy or obese individuals, young or elderly individuals as well as sportspeople engaging in different branches of sports at an elite level.

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Author Contributions

MO, SK and EA planned the study and wrote the paper, SK and OA performed the exercises with the Tera-Band, HHA performed in vitro experiments, OA and IU made the statistical analysis.

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