Journal of Humanities Insights *4(1): 041-044, 2020*

Research Paper

The Changes of Irisin Levels in Athletes after Eight Weeks Intensity Internal Training

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Received: 26 December 2019 Accepted: 10 February 2020 Published: 01 March 2020

Abstract

Introduction: Irisin is a myokine that its secretion elevates in response to exercise and is stimulator of white to brown adipose tissue transformation. The purpose of this study was to investigate the effects of eight weeks high intensity interval training (HIT) on irisin levels of in young obese men.

Methods: Subjects of study were divided into control and experimental groups (each group 10 men). Subjects of experimental group performed HIT trainings for eight weeks (three sessions per week, each session 45 to 60 minutes with intensity of 90% of heart rate reserve). Fasting blood sampling was done 24h before and 48h after trainings. Data were analyzed using Wilcoxon and U-Mann-Whitney tests.

Results: Data analysis showed that in experimental group levels of BMI decreased (P=0.023) and irisin increased significantly (P=0.005). Also mean differences of BMI (P=0.049) and irisin (P=0.031) were significant between control and experimental groups (P≤0.05).

Conclusion: Overall, findings showed that eight weeks HIT is effective in elevation of irisin and reduction of BMI in obese young males.

Keywords: Irisin; High Intensity Interval Training; Adipose Tissue; Obesity

How to cite the article:
A. Batumi, The Changes of Irisin Levels in Athletes after Eight Weeks Intensity Internal Training, J. Hum. Ins. 2020; 4(1): 041-044, DOI: 10.22034/jhi.2020.105799.

1. Introduction

A sedentary lifestyle is one of the leading risk factors for mortality worldwide, and inactive people are more at the disability and mortality risk than active people [1]. Inertia and lack of physical exercise are considered as key causes of obesity and metabolic diseases such as chronic inflammation, type 2 diabetes and atherosclerosis. Sport is used as a non-prescriptive therapeutic strategy for the prevention and treatment of various diseases. Studies have shown that sports activities prevent the onset of diseases such as diabetes, atherosclerosis and cancer [2-4]. Sport is an important factor in reducing the size and lipid adipocyte content and enhancing mitochondrial proteins, such as activated alpha, receptor of activated gamma with Peroxisome Proliferator-Activated Receptor Gamma Coactivator (PGC1α) in adipose tissue, which is a mitochondrial biogenic stimulant [5].

Recent studies have shown that skeletal muscle has endocrine function, in a way that secretes hormones called myokine, and this explains the role of skeletal muscle as the main source of hormone secretion from exercise [6]. The ability to produce and release chemokines is primarily due to metabolic changes associated with muscle contractions caused by exercise, which increases the release of several myokine capable of interacting with adipose tissue such as IL-6, IL-15, and irisin [7]. Irisin is a myokine that its secretion from the muscle is multiplied by exercise, and it is responsible for activating nonleukemia thermogenesis in beige and brown fat tissues by stimulating the expression of the Uncoupling Protein 1 (UCP1) [8]. Irisin is made up from

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proteolytic decomposition of a membrane protein called Fibronectin Type Iii Domain Containing 5 (FNDC5) in skeletal muscle. On the other hand, the expression of FNDC5 gene increases as a result of increased expression of PGC1α gene due to exercise [9].

After discovering the irisin as a sport hormone in mice and humans, several studies have examined questions about the production and release of irisin in response to exercise. Although in some studies, irisin is considered as a target for the treatment of obesity and metabolic disorders [10,11], further studies on the mechanism of exercise effects on the production and release of irisin and its role in regulating metabolism and body composition are needed. Although some studies have shown a significant increase in irisin concentration after exercise, these findings are not definitive and enough [12, 13]. The chronic effects of exercise on PGC1α, irisin, and browning of skinfold adipose tissue in inactive men (40 to 65 years old) were investigated.

The exercises consisted of 12 weeks (four sessions per week) combined moves (strengthresistance). After the exercises, the irisin levels did not change significantly and the browning of skinfold fat did not occur [12]. In another study, the effect of six weeks of whole-body vibration training on irisin levels was studied in healthy inactive women and no significant change was reported [13]. Regarding the lack of exercise research on irisin, the purpose of this study was to investigate the effect of eight weeks of High Intensity Interval Training (HIT) on irisin serum levels in overweight young men.

2. Materials and Methods

This was quasi-experimental and applied study. The statistical population of the study consisted of overweight young men with a Body Mass Index (BMI) of 25 to 35 kg / m 2, low mobility and in the age range of 25 to 35 years old in sport clubs of Bojnurd, among which 20 young obese male between 25 and 35 years old were selected as the statistical sample and they were randomly divided into control and experimental (10 persons) groups [10]. The number of subjects was obtained according to the studies. The entering criteria for the study included being healthy (without a background of any cardiovascular, kidney, lung, and diabetes), overweight and obesity (BMI between 25-35 kg / m 2) and taking no medicine for metabolic diseases.

Table 1. Description of the subjects' characteristics

Group	Age (year)	Height (m)	Weight (kg)
Experimental	27.3±7.4	176.2±4.2	87.9±8
Control	31.5±2.95	178.1±7.5	93.4±14.1

Prior to the beginning of the training sessions, the initial measurements, including weight, height, BMI, and maximum heart rate (MHR) of the subjects were measured. Additionally, the blood samples were taken from the subjects 24 hours before the beginning of the exercise and while they were fasting at least 12 hours before the test. The exercises were then performed for eight weeks and 48 hours after the last training session, blood sampling was performed again.

The exercise protocol included HIT exercises for eight weeks, three sessions per week, and each session for 45 to 60 minutes. The intense periodic exercise program included warming up with all kinds of stretching and flexible exercise for 10 minutes and then performing intense periodic movements with 2-minute active break between each set. The exercise program was run from simple to difficult, considering the overload principle and increasing the workout intensity. The intensity of the periodic exercise pattern was in a following way; during the first week, three sets of 4 minutes with 90% heart rate reserve (HRR) intensity with 2 minutes of active recovery, the second week, 4 sets of 4 minutes, 90% HRR with 2 minutes Active recovery; the third week; five sets of 4 minutes running at 90% HRR intensity with 2 minutes active recovery; 4th week; 6 sets of 4 minutes running at 90% HRR; 2 minutes active recovery; 5th weeks; 7 sets of 4 minutes running; 90% HRR intensity with 2 minutes of active recovery; 6th week, 8 sets of 4 minutes running with 90% HRR intensity with 2 minutes of active recovery; 7th week; 6 sets of 4 minutes with 90% HRR intensity with active 2-minute recovery. The eighth week, 5 sets, of 4 minutes with 90% HRR intensity with 2 minutes of active recovery [14]. The intensity of the exercises was controlled by the polar beater, made in Finland. The control group did not have any activity during the exercises.

Blood samples were taken 24 hours prior to the beginning of the exercise and 48 hours after the training by a laboratory expert through the left arm of the subjects in a sitting position with a volume of 5 ml of blood. ELISA method and a special kit (Eastbiopharm), were used to test the blood. Finally, all statistical data were tested according to the thesis hypotheses.

Study restrictions include the lack of control for individual differences and their impact on fitness adjustments from physical exercise, lack of complete control over the subjects' physical activity, outside the research hours, lack of precise control of subjects' nutrition during the training period and lack of control of the subjects' motivation during the tests.

Shapiro–Wilk test statistical tests were used to evaluate the data distribution. After identifying the lack of normal data distribution, the Wilcoxon test was used to compare the pre-test and post-test results of the two experimental groups, and U-Mann-Whitney tests was used to compare the variables between the groups. SPSS 23 was used for data analysis and the significance level was considered less than 0.05.

3. Results

The research findings analysis showed that in the experimental group, the BMI values were decreased significantly (P = 0.023) and the irisin value was increased significant (P = 0.005). Also, the difference between BMI (P = 0.049) and irisin (P = 0.031) was significant between experimental and control groups (P≤0.05).

Table 2. Summary of study result

variable	Groups	Steps		Wilcoxon results		UMW results	
		Pre-test	Post-test	Z	P-value	Z	P-value
Irsisn (μg/ml)	Experimental	6.3±2.7	7.2±2.5	2.8	0.005	2.16	0.031
	Control	5.9±2.6	5.02±1.66	-0.95	0.34		
MBI (kg/m²)	Experimental	28.34±2.8	27.15±1.7	2.7	0.023	-2.11	0.049
	Control	29.3±2.8	29±2.7	1.45	0.18		

4. Discussion

The results showed that there was a significant increase in the amount of irisin in the experimental group after HIT training, and the BMI decreased. This finding was consistent with Khalafi et al. (2018), Heidari Sharif Abadi and Taghian (2018), and Tofighi et al. (2017), but was not in line with Shirvani and Aslani (2017) and Mombini et al. (2018) did not match (15-19). Khalafi et al. (2018) investigated the effect of 12 weeks (five sessions per week) on HIT exercises with 85-90% intensity and the VO2max levels on the irisin levels in obese male rats and reported irsisn increase after these exercises [15]. Heidari Sharif Abadi and Taghian (2018) studies the effect of 10 weeks (three sessions per week, with the intensity of 75-85% MHR) of HIT exercises on irisin levels in obese women with type 2 diabetes and observed an increase in irisin levels [16]. Similar to the study, the increase in irisin after eight weeks (three sessions per week) of the HIT exercise in inactive obese women is shown [17]. On the other hand, Shirvani and Aslani (2017) reported that eight weeks of HIT training had no effect on the irisin levels in male rats [18].

Also, Mombini et al. (2018) observed that six weeks of HIT exercise did not change the irisin levels of in overweight men [19]. The difference between the researches of Shirvani and Aslani (2017) with this research was in the subject type and the volume of exercise and the difference between the research of Vahdat et al. (2018) with this research was in the subjects' age and the intensity and duration of the exercises [18, 19]. Therefore, it seems that variables such as intensity, duration, type of exercise and type of subjects are factors affecting the levels of irisin after exercise.

In the subjects, increased irisin was related with a decrease in BMI, which could indicate a reduction in the fat percentage due to the increase in irisin. In other studies, there was a reverse relation between irisin with BMI [17]. The irisin in the adipose tissue stimulates the expression of the UCP1 gene by increasing the non-vibrated pyrogenic of the fatty acid, which can affect the conversion of white to brown adipose tissue and reduce fat percentage and subsequently weight loss, which is consistent with the findings of this study [8]. Physical exercises increase Cyclic Adenosine Mono Phosphate (cAMP) by stimulating beta-adrenergic receptors 2 by catecholamines and subsequent stimulation of the protein bound to the cAMP response of Camp Response Element-Binding Protein (CREB), which stimulates the expression of the PGC1α gene. It also increases the amount of FNDC5 in the muscle membrane, which results in increased levels of irisin [18]. The activation of Amp-Activated Protein Kinase also results in phosphorylation of PGC1α, a stimulant of Peroxisome Proliferator-Activated Receptor Gamma (PPARγ), and stimulating FNDC5 and irisin to stimulate energy and brownness of white fat [17]. Also, irisin is related with ATP and lipolytic and glycolysis metabolites, and changes in these materials by exercise, such as ATP decrease, provide signals for irisin secretion [20].

Generally, the findings showed that eight weeks (three weekly sessions) of the HIT exercise was effective in increasing irisin and reducing BMI in overweight young men, and may be a suitable stimulant through the conversion of white to brown adipose tissue for lipolysis, and a reduction in the fat percentage and weight.

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