Obesity Medicine 1 (2016) 15–20

Contents lists available at ScienceDirect

Obesity Medicine

journal homepage: http://www.journals.elsevier.com/obesity-medicine

Original research

Acute and chronic responses of metabolic myokine to different intensities of exercise in sedentary young women

Navideh Moienneia*, Seyyed Reza Attarzadeh Hosseini

Faculty of Physical Education and Sports Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

ARTICLE INFO

Article history:
Received 23 November 2015
Accepted 29 December 2015

Keywords:
Metabolic myokine
Resistance training
Sedentary young women

ABSTRACT

Introduction: Irisin is a myokine secreted from the muscle in response to exercise. The aim of this study was to investigate the acute and chronic effect of resistance training in sedentary young women.
Material and methods: In this study, 21 sedentary young women with range of 20–30 years and BMI 22–25 kg/m^2 were selected by convenience sampling. Then, the volunteers were randomly assigned into two groups. The selected training was comprised of 8 weeks, 3 times a week. Blood samples were obtained at baseline, after one session and 48 h at the end of the study. For all statistical comparisons, the level of significance was considered $P < 0.05$.
Result: The results of this study showed that the levels of Irisin, body mass index, and body fat percentage in the low-intensity training group were not significant ($P > 0.05$). Moreover, no significant changes were shown in body mass index and body fat percentage in high-intensity training ($P > 0.05$). In contrast, the levels of Irisin in high-intensity training decreased significantly ($p = 0.034$). In low-intensity RT group and high-intensity RT group, no significant changes were observed in serum Irisin after 1 session.
Discussion: These results suggest that one period and one session of resistance training with low intensity and one session of resistance training with high intensity did not change serum Irisin levels significantly; in addition, after one period of weight training with high intensity, serum level of Irisin decreased in young women with a body mass index between 22 and 25 kg per square meter.
© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

The subject of adjusting weight, homeostasis and energy balance, appetite, food intake behavior, and energy expenditure has been the basic, favorite subject for researchers (Hosoda et al., 2002). The regulation and energy balance apparently seem easy; however, they have a complex process. The change of energy balance process towards positive or negative balance can cause hazardous consequences such as obesity, diabetes, cardiovascular diseases, wasting, and anorexia (Woods et al., 2004). Conventionally, the hypothalamus was thought to be important in feeding behavior, and it has appeared as the most important area to adjust food intake and body weight homeostasis in the brain. In addition to this traditional center, the other factors except hypothalamus have an impact on the regulation of energy balance (Zhang et al., 2005; Green et al., 2007; Nogueiras et al., 2007). On the other hand, the energy condition of peripheral tissues, changed by various metabolic factors and physical activity, result in the alteration of the environmental massages, such as the hormones secreted from peripheral tissues. There are different theories regarding the molecular mechanism and adaptation of the fat tissue changes caused by exercise, one of which recognizes the muscle tissue as an endocrine organ that releases myokines into the circulation during or immediately after physical activity (Huh et al., 2012), which adjust physiological and metabolic pathways (Kobayashi et al., 2012). The discovery of myokines has emphasized the role of muscle as a source of hormones that communicate information and interact with other tissues, including fat, liver, and pancreas to alter metabolism (Huh et al., 2012; Kumahara et al., 2004; Sato et al., 1984). In a recent study, Boströmet et al (Boström et al., 2012) reported that PGC1α[1] expression in the skeletal muscle stimulates increased expression of FNDC5, a membrane protein that

* Corresponding author. P.O. Box: 1574, Paradise Daneshgah, Azadi Square, Faculty of Physical Education and Sport Sciences, Ferdowsi University of Mashhad, Mashhad 91779-48979, Iran. Tel.: +98 (511) 8833910; Fax: +98 (511) 8829580.
E-mail address: n.moienneia@gmail.com (N. Moienneia).

[1] Peroxisome proliferator-activated receptor gamma coactivator-1α (PGC-1 α).

http://dx.doi.org/10.1016/j.obmed.2015.12.002
2451-8476/© 2016 Elsevier Ltd. All rights reserved.

is cleaved and secreted as a novel myokine, Irisin (Tanisawa et al., 2014). Irisin is a newly discovered exercise-induced myokine (Polyzos et al., 2014), secreted by myocytes, which is believed to mediate the beneficial effects of exercise on metabolism (Boström et al., 2012). It is regulated by PPARγ[2] coactivator 1 alpha (PGC1α) and is identical in mice and humans. its administration results in «browning» or «beigeing» of white adipose tissue thereby increasing the thermogenesis-related energy expenditure and improving systemic metabolism (Polyzos et al., 2014); moreover, it reduces body weight and improves diet-induced insulin resistance (Boström et al., 2012). Exercise and energy expenditure induce the transcriptional regulator PGC1α in the skeletal myocyte, which in turn drives the production of the membrane protein FNDC5.[3] The circulating factor Irisin, cleaved from FNDC5, including mitochondrial biogenesis and the expression of uncoupling protein 1 (UCP1), leads to mitochondrial heat production and energy expenditure (Kelly, 2012). Irisin is transcribed from the FNDC5 gene and transferred to the cell membrane, where it is proteolytically cleaved on the extracellular surface of the muscle cells and released into plasma (Boström et al., 2012). Chronic training is shown to enhance Irisin production in mice although conflicting results have emerged in humans (Huh et al., 2012; Boström et al., 2012; Timmons et al., 2012). In contrast, Bostrom et al (Boström et al., 2012) showed a twofold increase of circulating Irisin after 10 weeks of endurance training; Huh et al. and Pekkala et al (Huh et al., 2012; Pekkala et al., 2013) found no increase in Irisin after 8 weeks of intermittent sprint running or after 21 weeks of combined endurance and strength training, respectively. Timmons et al (Timmons et al., 2012) demonstrated an induction of muscle FNDC5 in older, but not younger, highly active subjects. However, the study of Timmons et al. has been criticized for including exercise interventions without induction of PGC1α expression in muscles (Timmons et al., 2012). Thus, an exercise intervention study with chronically increased muscle PGC1α expression would potentially clarify the relation between FNDC5 mRNA in muscle and Irisin concentration in plasma. However, Raschke et al. observed no effect of recombinant FNDC5 or Irisin on the brightening of cultured, primary, human adipocytes (Raschke et al., 2013). A potential effect of Irisin to induce browning of white adipose tissue in response to chronic training has not been examined in humans (Norheim et al., 2014). Moreover, exercise training results in adaptive structural and metabolic changes in skeletal muscles, including a change in the type of muscle fiber, mitochondrial biogenesis, and angiogenesis and browning of subcutaneous (Kelly, 2012; Xu et al., 2011). Because of its effect, Irisin is emerging as an appealing therapeutic target for metabolic diseases and other disorders known to improve with exercise (Polyzos et al., 2014). Therefore, the purpose of this study was to determine the effects of acute and chronic resistance training with different intensities on serum Irisin levels in sedentary young women.

2. Material and methods

2.1. Subjects

This research was semi-experimental with two phases which were performed before and after one session and before and after 8 weeks in two experimental groups. A total of 21 sedentary young women over 20 years (mean age 24.42 ± 2.95 years, mean % body fat 34.51 ± 4.33% and mean body mass index 23.77 ± 1.54 kg/m2) were recruited in this study. All of the volunteers were participants who had completed the exercise program, including acute and chronic trainings, during 8 weeks.

Based on the demographic and medical records questionnaires, the subjects did not do regular exercise over the last six months and did not have a history of Coronary artery diseases, kidney failure, and hypothyroidism. Furthermore, calorie intake was estimated using the dietary questionnaire in order to control the energy balance in each week. Based on the collected data, daily received calories of subjects varied between 1600 and 1900 kcal.

2.2. Measurement of anthropometric characteristics

BMI and body fat percentages were measured using body composition analyzer device (Inbody-720 Body Composition Analyzer, Japan) while height was measured with a stadiometer (SECA, Germany).

2.3. 1 RM testing

In this study, prior to the 1 RM testing session, subjects were given three familiarization sessions to ensure proper lifting techniques and testing procedures. During these sessions, the load was gradually increased to allow the estimation of a proper starting point for the test session. Prior to performing the actual 1 RM tests, subjects were given a 10-min low-intensity warm-up and 3-min rest between test efforts. They were instructed to refrain from food intake 2 h prior to the test session but were allowed to drink water.

2.4. Resistance training protocol

Twenty one young, sedentary women were assigned to an 8-week high and low intensity resistance training program in a circular shape, involving 3 training sessions per week. Based on the equation of one repetition maximum (1 RM), the training program for both groups was isocaloric. In each training session, subjects were given a 10-min general and specific warm-up (low speed running, Stretching exercises, and weightlifting movements with light weight) and 10-min cool-down exercise. The training protocol consisted of four lower body exercises (Leg Extension, Leg flexion, squat, and standing calf raise) and three upper body exercises (High Pull, Elbow Flexion, and Elbow Extension) performed at both low intensity (40%–60%1 RM and 20–30 repetition in each station) and high intensity (70%–90% 1 RM and 5–15 repetition in each station). In low-intensity exercise group (n = 11), the time of activity in each training station was 45 s. There was a resting period of 30 s between training stations and 2 min between the seven-station training rounds. In high-intensity exercise group (n = 10), the time of activity in each training station was 20 s. There was a resting period of 30 s between training stations and 2 min between the seven-station training rounds. Moreover, the number of training rounds was three. To observe the principle of overload and the regulation of practice pressure, Borg questionnaires were completed by the individuals at the end of the third session of each week. The following equation was used to determine the progressive increase in overload at each station of resistance training in the first week and at the end of the fourth and sixth weeks.

$$1RM = W/[1.0278 - (0.0278.r)]$$

2.5. Collection and analysis of blood samples

Blood samples were taken before and after one session resistance training along with before and after 8 weeks of resistance

[2] Peroxisome proliferator-activated receptor(PPAR-γ).
[3] Fibronectin type III domain-containing protein 5 precursor(FNDC5).

Download English Version:

https://daneshyari.com/en/article/1097082

Download Persian Version:

https://daneshyari.com/article/1097082

Daneshyari.com