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Effects of Anaerobic (RAST) and Aerobic (Cooper) Running Training Programs on Plasma AgRP concentrations in Female Students

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Abstract

Introduction: Agouti-related peptide is a neuropeptide produced in the arcuate nucleus of hypothalamus and has important role in central controlling of food intake and appetite. The purpose of the present study was to compare the effect of two types of exercises, aerobic and anaerobic, on plasma intensity of female students.

Methodology and Procedures: Thirty female students of physical education were voluntary selected (Age= 22/73±1/97; Weight= 56/6±5/8 kg; Height= 162±4/57 and Body Mass Index (BMI) =17/48±1/73 kg/m². Then they were randomly divided into two experimental groups (15 aerobic and 15 anaerobic) and exercised for 4 weeks. Blood samples were taken in two periods (24 hours before exercise protocol and after the last session of exercise). Plasma AGRP values were measured according to ELISA method.

Results: There was a significant increase of Plasma AGRP concentration in two groups after 4 weeks of training. Also, there was no significant difference between the effect of cooper aerobic exercise and running based anaerobic sprint test (RAST) on Plasma AGRP concentration ratio.

Conclusion: It seems that plasma AGRP increase could be associated with the increase of this peptide in hypothalamus and in response to the negative balance of energy produced by exercising for increasing appetite to compensate energy resources of testers' body.

Key Words: Aerobic and Anaerobic Exercise, Plasma AGRP concentration, Female Students.

Introduction

Weight control, balance and energy homeostasis, and appetite and energy expenditure always are the most important and interesting topics for researchers in the fields of physiology, pharmacology, pathology and health science, especially in the past decade. It is also in the focal point of many researchers [1, 2, 3]. Regarding obesity and appetite, sole concentration on the simple phenomenon of weight change is not noteworthy and nowadays researchers are seeking to find the most important factors from these surface views [4].

It should be stated that weight change is not a simple indicator of the process of energy regulation and balance in the body since there are numerous complex processes and resolutions which are involved centrally and environmentally [4]. From these factors, one could be mention appetite peptides like Ghrelin, AGRP and neuropeptide Y the sources of which are stomach and hypothalamus [5, 6]. It has been suggested that AGRP is a potent orexigenic peptide among appetite peptides which has more power in regulating and balancing of energy and increasing body fat. It is also believed that Ghrelin applies its performance via this peptide. AGRP is an elected gen for human obesity which is effective in the behavior of food intake, food choice, weight regulation and energy balance and homeostasis. It was first discovered by Shutter in 1997. AGRP is a short gene of 1.1 kb length which is located on 16 q 22 chromosomes in man and 8D1 -D² chromosomes in rat. AGRP has 4 Axon and is a 132-amino acid protein. AGRP has been detected in animals such as pig, sheep, Japanese quail and pigeon more than human and outdoor rat [7]. The main source of AGRP release into blood circuit is known to be the arcuate nucleus of hypothalamus [8]. According to Wood et al (2003), failure to control weight has made researchers wonder what factors could be involved [9]. Nevertheless, the role of this peptide in peripheral tissues in relation to the cell or tissue itself is not clear [10, 11]. Besides, its response to different physical performances and exercises is not well clear, and "could probable concentration changes be accompanied with changes of this peptide in plasma?"

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There is only one study based on our knowledge that has concentrated on concentration and levels of plasma of this peptide in human samples with effectiveness of one stage of wheel resistance activity. In a study (2001) by Hathory et al. demonstrated the existence of Ghrelin gene (which is one of the orexigenic peptides originating from stomach fondues tissue) in all types of immune cells (B, T cells and neutrophil) in natural subjects. Indeed, no training protocol was used in this study [12, 13]. According to the knowledge of the authors, there is no study which shows the effect of two types of aerobic and anaerobic exercises on AgRP plasma concentration in women whose role in the healthiness of society is undeniable and effective. Therefore, the purpose of this study was to investigate the effect of two types of exercise training (aerobic and anaerobic) on AgRP plasma concentration in female students.

Material and Methods:

Participants

Thirty female students of physical education were voluntary selected and they were randomly divided into two groups; Aerobic (15 students with mean age= 22/86±2/19; Weight= 55/86±6/03 kg; Height= 162±2/17 and BMI =17/39±1/77 kg/m² and anaerobic (15 students with mean age= 22/6±1/91; Weight= 57/9±5/95 kg; Height= 161±4/57 and BMI =17/76±1/79kg/m². The conditions for selecting volunteers were: not taking any medication and supplementary, having individual health and not having any record of blood diseases or diseases affecting biochemical factors and not participating in any physical activity programs. The weights of the subjects were measured by Beurer digital scale made in Germany with a sensitivity of 0.1 kg, their height was measured by wall scale with a sensitivity of 1 cm and BMI was determined according to the formula of height to square 2 divided by weight (kg/m²).

Training Protocol:

After attending 2 sessions in the stadium and familiarizing with training protocol, anaerobic group was asked to run in the indicated lines a distance of 36 meters with 6 repetitions and 10 seconds of rest in the intervals, and then repeat the test after 4 minutes of rest. Anaerobic group asked to perform the test for twice per day of training protocol and every week one repetition was added to the whole activity of the subjects. Aerobic group ran a certain distance (based on their abilities) for 12 minutes in each session and with the advancement of training, the development of running distance was controlled by testers. Heart rate was measured Polar heart rate at the end of the tests. Training program was consisted ; 10 minutes of warming up, 12 minutes of especial practicing and 10 minutes of cooling down and totally lasting 30 minutes.

Blood Samples

Blood samples (10 mL) were taken 24 hours before and after the last session of training program, while the subject were overnight fast (at least 12h). Plasma was obtained for AgRP determination. Plasma AgRP was measured by using a commercial human AgRP ELISA kit. All samples were measured duplicate. ,

Statistical Analysis

Data were normalized by using the Kolmogorov-smirnov test (K-S test). A paired and unpaired sample *t*-student was employed for comparison between pre and post values and for difference between groups, respectively. A significant difference was accepted at $P < 0.05$. The data were analyzed using SPSS package (version 16).

Results

Individual characteristics of the subjects determined by are highlighted in Table 1. There was no significant difference between the two groups in terms of anthropometric values.

The plasma AGRP for the two groups before and after the exercises is shown in table 2. Results show that AGRP concentration has increased significantly for the two groups according to table 2 ($p<0.001$). Also, despite an additional increase of Plasma AGRP concentration in anaerobic group to aerobic group, this amount was not meaningful.

Table1: Individual characteristics of subjects

Characteristics	**Age (years) M ±SD**	**Height (cm) M ±SD**	**Weight (kg) M ±SD**		**BMI (kg/m²) M ±SD**	
Group			**Before Training**	**After Training**	**Before Training**	**After Training**
Anaerobic (RAST)	22/6±1/91	161±4/57	57/9±5/95	57/4±6/06	17/76±1/79	17/59±1/78
Aerobic	22.86±2.19	162±2.17	55.86±6.03	54.76±6.28	17.39±1.77	16.78±1.68

Table2: Pre and post training values of Plasma AgRP concentrations in aerobic and anaerobic groups

Group	AGRP	No	M ±SD
Anaerobic (RAST)	Before Training	15	18.40±.90
	After Training	15	*63.16±3.36
Aerobic	Before Training	15	18.19±.33
	After Training	15	*60.72±1.55

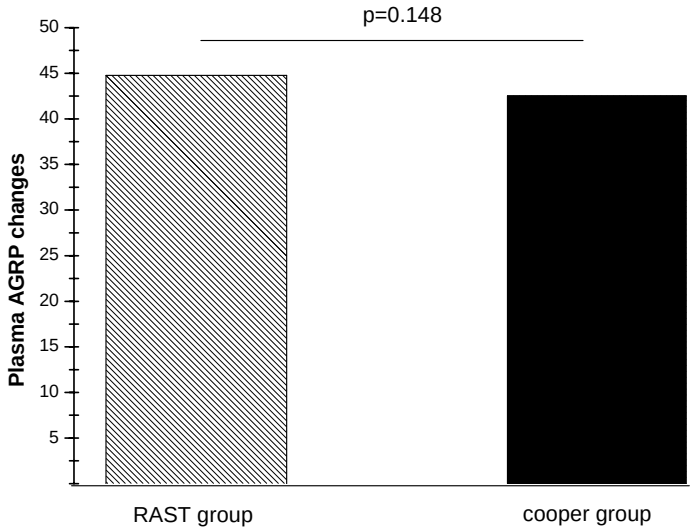

Figure 1: plasma AgRP in RAST and Cooper groups after 4 weeks of training program

Discussion

As the results show, 4 weeks of aerobic and anaerobic exercise can significantly increase AGRP concentration in Plasma.

There are few researches about the effect of exercising on plasma AgRP, especially in humans. In these few studies, the effects of fasting and fullness have been investigated on Plasma AgRP [14]. Results of these studies show that overnight fasting would bring 73 percent increase in plasma AgRP in the subjects. Ghanbari-Niaki et al have shown the increasing GH and plasma AgRP levels after resistant training [12].

Based on researches, no investigation of the effect of short term and long term on plasma AGRP concentration on human being has been done. The present study has investigated the effect of two types of different exercising based on times in university female students. The results obtained from this study are in accordance with these few researches. In study by Ghanbari-Niaki et al [12] Plasma AgRP levels increased immediately after exercising and returned to the pre-exercise level in the recovery period. It has been determined that food restricting would significantly increase plasma AgRP levels both on rats in humans [12, 15, 16, 17]. On the other hand, a reduction in liver and muscle ATP and glycogen content have been reported by several researchers [3, 18]. Therefore exercising and physical activity disorders energy balance and homeostasis between muscle cells and increases the demands of energy for cells. It seems that subjects of this study have experienced negative balance of energy as a consequence of 4 weeks of aerobic and anaerobic exercising with 85-95% maximum heart rate. This might have arisen from the decreasing of muscular ATP because of continuous losing of purines in muscles [3, 16]. This probable decrease of energy resources of cells with overnight fasting could be an important factor in increasing plasma AgRP concentration in the subjects. It could be concluded from the findings that hypothalamus increases plasma AgRP after exercising. Findings of this study are in compliance with this concept that: inner and outer signal channels of the cells are responsible for increasing appetite due to increase of energy expenditure after exercising and AgRP appetite increasing signal channel could be an important channel toward response to exercising [18]. Moreover, it has been suggested that AgRP increase could have an important impact in reconstructing glycogen recovery mechanism after intensive exercises [3]. Therefore, a higher plasma AgRP concentration could indicate an exercise training-induced energy deficiency (glycogen depletion) in tissues (liver and working muscles).

Karen et al (2005) presented a hypothesis which stated that ghrelin participate in regulating a negative feedback circuit which in return regulates body

weight. This hypothesis maintains that reduction of weight losing is a reason why blood ghrelin levels increase. In fact, this increasing has been known as a part of compatibility to energy shortage. It has been observed that plasma Ghrelin levels will change with increasing or reduction in BMI [17]. Since ghrelin and AgRP collaborate in increasing appetite, and in previous studies increasing of these two peptides have been reported to be concurrent [18], reduction in BMI in this study can be considered as another reason for increasing plasma AgRP concentration.

According to Rashidlamir et al [21] who studied the effects of two, traditional and scientific weight reduction methods on plasma AgRP levels on wrestlers a coordinating central system of controlling appetite and energy balance is in scientific method and is a sign of not reducing energy storage in wrestlers. These resources can prevent reduction of athletes' performances following weight losing [19]. These results support the findings of the present study. Nonetheless, it seems that further investigation is necessary to understand possible mechanisms in this field.

It seems that the increase in plasma AGRP can be in line with the increase of this peptide in hypothalamus and in response to the negative energy balance due to the exercising which increases the appetite in order to recover energy resources of the subjects' body.

Inferring from the results of the present study, it could be concluded that hypothalamus homeostasis factor which influences the increasing of plasma AgRP from exercising should be noted [20, 21]. In addition, athletes and active people, in particular women interested in weight control are recommended, for the proper controlling of their weight to consider an anaerobic based-exercise; particularly running (such as Cooper test as running protocol) which is inexpensive, non-equipment demand, indoor and outdoor, and manageable activity. Thus, both types of exercise program would have the similar effect on plasma AgRP levels.

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