

Research Paper**Effects of 8 Weeks Aerobic Training on Plasma Ghrelin Level and Ghrelin Lymphocyte Gene Expression in Elderly Men**Seyyed Mahdi Ahmadi¹, *Mehrdad Fathi¹, Amir RashidLamir¹, Farnaz Aminian²

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ABSTRACT

Objectives Ghrelin is a peptide hormone secreted from the endocrine cells of stomach, affecting feeding behavior, appetite, energy consumption, and body weight. The present study compared the effect of 8 weeks of aerobic training on plasma ghrelin and lymphocyte ghrelin gene expression in elderly men.

Methods & Materials In this quasi-experimental study, 30 subjects were selected by convenience sampling method. They were randomly divided into 2 equal groups of aerobic training (n=15) and control (n=15). Aerobic training program included aerobic trainings up to 50-60 minutes at 60-85% of the maximum heart rate, 4 sessions per week which lasted for 8 weeks. After initial assessments (body composition and ghrelin gene expression), followed by 8 weeks of exercise training, post-intervention assessments were completed 48 hours after the last training session. To make intra- and between-group comparisons, repeated measures Analysis of Variance (ANOVA) was used. For all statistical comparisons, the level of significance was set at P<0.05.

Results The Mean±SD age ranges of the study participants were 69.13±3.68 years in the training group and 69.20±4.31 in the control group. Eight weeks of aerobic training significantly reduced BMI from 27.57 to 26.90 kg/m² (P=0.001), and body fat percentage from 24.31% to 21.43% (P=0.001) in the training group. In addition, lymphocyte ghrelin gene expression significantly increased from 16.87% to 24.92% in the aerobic training group. There was no significant changes in plasma ghrelin levels.

Conclusion Aerobic training through increasing the lymphocyte ghrelin gene expression level and decreasing the values of BMI in middle-aged men, can prevent the incidence of obesity and overweight. It is reasonable to support the role of physical activity as a non-prescriptive therapy in regulating balance and effective peptide hormones in the prevalence of obesity. Therefore, aerobic exercises can be used as a preventive method for the reduction of obesity and the incidence of related diseases.

Keywords:

Aerobic training, Ghrelin, Elderly men

Extended Abstract**1. Objectives****A**

ppetite is among the most influential factors in energy homeostasis and its

regulation plays an important role in controlling energy balance [1]. The environmental factors involved in energy homeostasis and appetite regulation are often controlled by long-term signals such as ghrelin, cholecystokinin, and peptide YY [2]. Ghrelin, an acylated

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upper gastrointestinal peptide, is the only known orexi-genic hormone [2]. According to studies, of 3 types of mutations in the preproghrelin gene, only 1 is associated with obesity in humans [3]. Thus, overweight and obesity and its related diseases have become a major economic problem in many countries due to their high health and medical costs. The positive effects of exercise and physical activity on preventing obesity and overweight have been reported [4]. The current study evaluated the effect of aerobic training on plasma ghrelin level and the expression of ghrelin lymphocyte gene in elderly men.

2. Methods and Materials

In this quasi-experimental study, 30 elderly men with an average age of 60-70 years and Body Mass Index (BMI) of 25-30 kg/m² participated. The subjects were selected using convenience and purposeful sampling methods. They were then randomly divided into 2 groups of training (n=15) and control (n=15). Those in the training group received aerobic training for 8 weeks; 4 sessions per week. The duration of each session was 50-60 minutes. The intervention program included: 1. A 10-minute warmup; 2. Aerobic training for 50-60 minutes with an intensity of 60-85% of the maximum heart rate. The training time gradually increased from 20 minutes at the beginning to 45 minutes at the end; and 3. A 10-minute cool down. The intensity of training was measured by a heart rate sensor (Polar, England).

Blood samples were collected 48 hours before initiating the training and 24 hours after the last training session, to measure plasma ghrelin levels using ELISA method, and the expression of ghrelin lymphocyte gene using semi-quantitative Reverse Transcription-Polymerase Chain Reaction (RT-PCR) analysis with the sequence of forward primer (5'-ATGTGGAACGCGACCCCCAGC-GA-3') and reverse primer (5'-ACCCCCAATTGTTTC-CAGACCCAT-3'). The obtained data were analyzed by SPSS. The between-group and within-group comparisons were conducted using repeated measures Analysis of Variance (ANOVA). The obtained results were evaluated at a significance level of P<0.05. This paper was extracted from a master thesis and has been approved by the Ethics Committee of the Faculty of Sport Sciences at Ferdowsi University of Mashhad (code: 18731).

3. Results

According to the obtained results, no significant differences were found between the 2 study groups in terms of height, BMI, body fat percentage, plasma ghrelin level and the expression of ghrelin lymphocyte gene. ANOVA results presented in Table 1, indicated that an 8-week aerobic training with an intensity of 60-85% of the maximum heart rate could significantly reduce BMI from 27.57 to 26.90 kg/m² (P=0.001) and body fat percentage from 24.31% to 21.43 % (P=0.001), and could significantly increase the expression of ghrelin lymphocyte gene from 16.87% to 24.92%. Moreover,

Table 1. Between-group and within-group comparisons of changes in plasma ghrelin level and the expression of ghrelin lymphocyte gene

Variables	Groups	Mean±SD		Changes			
		Pre-Test	Post-Test	Within Group		Between Group	
				F	P	F	P
BMI, kg/m ²	Training	27.57±1.59	26.58±1.90	169.27	0.000*	0.12	0.73
	Control	27.07±1.14	27.13±1.05	0.14	0.713		
Body fat, %	Training	24.31±3.39	21.43±2.94	153.27	0.000*	1.01	0.32
	Control	23.93±3.03	24.06±2.96	0.68	0.424		
Plasma ghrelin level, ng/mL	Training	0.64±0.11	0.71±0.02	3.30	0.002*	6.77	0.01*
	Control	0.57±0.11	0.59±0.09	0.79	0.396		
Ghrelin lymphocyte gene expression, ng/mL	Training	16.87±2.34	24.92±8.62	6.11	0.046	0.29	0.60
	Control	19.38±1.64	20.07±2.43	2.34	0.187		

* Significant at P<0.05

plasma ghrelin level increased from 0.64 to 0.71 ng/mL; however, this increase was not significant.

The Independent t-test results regarding between-group comparison of posttest mean scores suggested no significant differences between the 2 groups in terms of BMI, body fat percentage, and the expression of ghrelin lymphocyte gene ($P>0.05$) after the intervention. However, in terms of plasma ghrelin level, a significant difference was observed between the groups. In other words, aerobic training had a significant effect on the increase of plasma ghrelin level in the elderly men.

4. Conclusion

An 8-week aerobic exercise resulted in a significant decrease in body fat percentage and BMI in the training group. However, the expression of ghrelin lymphocyte gene significantly increased. No significant difference was observed in plasma ghrelin level after the intervention. Therefore, regular aerobic exercise can be used as a non-pharmacological treatment in regulating the balance of peptide hormones, effective in the prevalence of obesity. Possibly, the aerobic exercise causes a negative energy balance in the body. In response to energy shortages, ghrelin stimulates food intake, resupplies lost energy resources, and restores energy balance to compensate for energy reserves in the body. Further studies are required for the recognition of main mechanisms responsible for the association of ghrelin with obesity and the role of physical activity on them.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles were considered in this article. The participants were informed about the purpose of the research and its implementation stages; they were also assured about the confidentiality of their information; Moreover, They were allowed to leave the study whenever they wish, and if desired, the results of the research would be available to them. This paper has been approved by the Ethics Committee of the Faculty of Sport Sciences at Ferdowsi University of Mashhad (code: 18731).

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Authors contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflict of interest.