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Research Paper

Effect of Eight-Weeks Aerobic Training on Serum Levels of Nitric Oxide and Endothelin-1 in Overweight Elderly Men

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High-intensity interval aerobic training, Overweight elderly men, Endothelin-1

ABSTRACT

Objectives Different physical activities can play an important role in improving health and cardiovascular fitness. The aim of this study was to compare the effect of high-intensity interval aerobic training on certain cardiovascular risk factors in overweight elderly men.

Methods & Materials In this semi-experimental study, 24 overweight elderly men were selected by convenience sampling. They were then randomly assigned into two groups based on their body mass index (BMI). The age range in the experimental group was 73.50±3.34 years (n=12) and that in control group was 71.33±3.44 years (n=12). The experimental group underwent high-intensity interval aerobic training that included 3 sessions (each of 45-60 minutes) a week for eight weeks. The control group was given no intervention. Blood samples of all the subjects were measured at baseline and at the end of the study. All tests were two-tailed, and P<0.05 was considered significant. Data analysis was performed using SPSS software (version 16.0, SPSS). For comparison of means within and between the groups, paired and independent t-tests were used, respectively.

Results The weight, BMI, and body fat percentage were found to have significantly decreased in overweight men after high-intensity interval aerobic training (P<0.05). Moreover, the levels of serum endothelin-1 reduced significantly after eight weeks of aerobic training. However, the levels of nitric oxide increased significantly at the end of the training period.

Conclusion This result suggests that eight weeks of high-intensity interval aerobic training led to decreased endothelin-1 serum and increased nitric oxide levels. This is effective in improving cardiovascular health and reducing the risk of atherosclerosis. Therefore, it is suggested that high-intensity interval aerobic training be used to prevent the adverse effects of an increased incidence of atherosclerosis.

Extended Abstract

1. Objective

Cardiovascular diseases are an important factor in mortality and impose a significant financial burden on the health system [1]. These diseases mainly originate from inflammation; therefore, vascular stimulation and their injuries, as a result of consuming some substances, can directly increase the sensitivity of vascular endothelial cells such as endothelin-1 and nitric oxide [2]. In this field, secondary prevention measures including changes in lifestyle and performing various physical activities can improve health and cardiovascular fitness of the people. The purpose of

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this study was to investigate the effect of eight weeks of aerobic training on the levels of certain cardiovascular risk factors in overweight elderly men.

2. Methods and Materials

In this quasi-experimental study, 24 overweight elderly men were selected by available and targeted methods and randomly divided into two groups of experimental (12 subjects) and control (12 subjects). The age range of patients was 73.5±3.34 years in the aerobic training group and 71.33±3.44 years in the control group. The body mass index (BMI) of the selected participants was 25 to 30 kg/m^2. In this study, the experimental group performed aerobic exercises while the control group continued their inactive way of life. The aerobic exercise program included three sessions of 45-60 minutes per week for eight weeks. The intensity of sessions was gradually increased to 90 to 95 percent of the stored maximum heart rate. The blood samples were collected 48 hours before starting the exercises and 48 hours after the last training session in order to measure endothelin-1 and serum nitric oxide. To determine endothelin-1 levels, the ELISA method and Kazabuyu Kit, made in Japan, were used. Also, the levels of serum nitric oxide were measured using the Zebra Kit, made in Germany. Impedance bioelectric device was used to estimate body composition. Using SPSS software16,the intra-group and inter-group means were compared by the statistical methods of dependent t-student and covariance analysis (MANOVA). The results were tested at the significance level of P<0.05. The present paper is based on the master thesis of Mr. Reza Mohammadi registered under code 44485214 at the meeting of the Department of Sports Sciences of Azad University of Bojnord.

3. Result

The results of this study showed that eight weeks of periodic aerobic exercise resulted in a significant reduction in body weight variables from 78.16±4.80 to 77.67±4.50 (P=0.03), BMI from 28.43±2.05 kg/m^2 to 28.26±2.13 kg/m^2 (P=0.02), the percentage of body fat from 44.71±2.38% to 43.16±2.63% (P=0.006), and Endothelin-1 serum from 4.17±0.68 to 3.86±0.71 (P=0.001) in the group of aerobic periodic exercises. The serum nitric oxide increased from 3.34±0.29 to 3.76±0.41 (P=0.001). There was a significant difference between intra-group and inter-group means in both the groups with respect to variables such as body weight (P=0.02), BMI (P=0.01), body fat percentage (P=0.01), Endothelin-1 (P=0.003), and nitric oxide (P=0.001) (Table 1).

4. Conclusion

These results indicate that eight weeks of periodic aerobic exercises are effective in improving cardiovascular health and reducing the risk of atherosclerosis by increasing nitric oxide and endothelin-1 reduction. Performing physical activity is one of the most effec-

Table 1. Comparison of intra-group and intergroup variance changes of Endothelin-1, nitric oxide, and the body composition of overweight elderly men

Variables	Groups	Pre-Test (Mean±SD)	Post-Test (Mean±SD)	P	
				**Within Group	*** Between Group
Body weight (Kg)	Experimental	78.16±4.80	77.67±4.50	† 0.03	† 0.027
	Control	78.72±4.42	78.88±4.73	0.40	
BMI (Kg/m^2)	Experimental	28.43±2.05	28.26±2.13	† 0.02	0.008
	Control	28.14±1.77	28.20±1.92	0.36	
Body fat (%)	Experimental	44.71±2.38	43.16±2.63	† 0.006	† 0.002
	Control	44.83±4.84	44.80±5.39	0.95	
Endothelin-1 (Picogram/mm)	Experimental	4.17±0.68	3.86±0.71	† 0.001	† 0.001
	Control	4.71±0.65	4.80±0.54	0.19	
Nitric oxide (mmol/l)	Experimental	3.34±0.29	3.76±0.41	† 0.001	† 0.002
	Control	3.53±0.35	3.40±0.33	0.21	

† Significant, * Significance at P <0.05 level, ** t-correlated test, *** Covariance analysis test

tive factors in changing the process of functioning of the cardiovascular system. It is dependent on the severity, duration, type of exercise and physical fitness, type of nutrition, mental and psychological states, and hormonal factors. Based on the results obtained, it can be said that aerobic periodic exercises can improve the performance of the elderly's cardiovascular system. Therefore, it can be suggested that the elderly should enjoy the benefits of physical activity and exercises to strengthen the cardiovascular system by performing varied periodic aerobic exercises with less fatigue.

Acknowledgments

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Conflict of Interest

The authors declared no conflicts of interest.