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The effect of continues and intermittent training on level of serum Intracellular adhesion molecules in sedentary young woman

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ABSTRACT

Intracellular adhesion molecule-1 (sICAM-1) is one of the factors associating obesity and inflammatory lesions like atherosclerosis. The purpose of the present study was to investigate the effects of continues and intermittent training on serum levels of sICAM-1 in sedentary young women. For this purpose, 30 female overweight volunteer students (BMI ≥ 26) of Azad University Shahre Qods Campus were selected and randomly divided into three groups: continues and intermittent training group and control group. Training groups exercised for 12 weeks, three sessions a week with definite intensity and distance. ICAM, body weight, fat percentage, BMI And maximum oxygen consumption were measured both before and after the 12-week exercise. Results showed that continue and intermittent training caused a significant decrease in sICAM-1, weight and body composition, significant increase in Vo2max of the experimental groups in comparison to control group. Our findings showed that with significant reduction of sICAM-1 levels and decreasing inflammation, continue and intermittent exercise may perhaps play an effective role in prevention, control and mitigation of atherosclerosis.

Keywords: Continues and Intermittent Training - Intracellular Adhesion Molecule - Young Woman

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INTRODUCTION

Circulating markers of inflammation such as soluble intercellular adhesion molecule- 1 (sICAM-1), are now recognized to be major risk factors for cardiovascular events both in the general population [1] and in individuals with known coronary artery disease [2]. Any factor that reduces sICAM-1 may reduce atherosclerosis. In this respect other sciences, such as sports science have also acted to identify the relationship of disease and physical activity thereby helping to prevent it.

Due to the effective role of physical activity in preventing and reducing cardiovascular disease, researchers study the effects of exercise on inflammatory markers of adhesive molecules. Studying the acute effects of exercise, the results suggest increased sICAM-1 (3, 4, 5). On the other hand the effects of different exercises on sICAM-1 have been reported to be inconsistent by different studies so some of them report a decrease and some (6, 7) report no unchanged (8, 9, 10). Zoppini et al observed a decrease in sICAM-1 due to 6 months of progressive aerobic exercise with moderate intensity (7). Christopher et al have also reported a significant decrease in plasma concentrations of sICAM-1 after 12 weeks of aerobic training in male smokers (11). Also Saxton at al also investigated the effects of low intensity cycling with hands and feet for 24 weeks, observed a 25 percent decrease of vascular adhesive molecule (12). In contrast Sabatier et al reported no significant change in plasma following 14 weeks of 50- minute aerobic exercise sessions in 13 healthy women (9). Rankovic et al reported no significant change in plasma following 6 weeks of cardiac rehabilitation program with low intensity in person with cardiac disease (13).

The review of various researches before implementing the study, the effects of aerobic activities were better than resistance exercise on modulating the inflammatory responses associated with sICAM-1 (14). But there have been few studies on the two types of continuous and intermittent aerobic activity. Therefore, this study seeks to answer the question whether there occurs a significant change in serum sICAM-1 level and if there is a significant correlation between these two exercise methods.

MATERIALS AND METHODS

Subjects: First of all call notices were posted in Azad University Shahre Qods Campus in which the researcher invited to identify overweight and obese individuals who were willing to run exercise for weight adjustment and improvement of their physiological conditions. In the next stage the candidates were invited for the purpose of the Initial assessments and from among them, at least 30 individuals with BMI $\geq$ 26 whose being overweight or obese was not associated with thyroid under-activity and did not have a history of exercise or caloric restriction diet were selected. After obtaining consent letters from the participants, they were asked to avoid rigorous physical activity 48 hours before the test and attend the pathobiology laboratory for blood sampling after 12 hours of fasting. The anthropometric measurements and maximal oxygen consumption of the subjects were done in the gym. The subjects were then divided randomly into three groups (Continues training, intermittent training and control).

Anthropometric and Physiologic Measurements: The height was measured using a medical height meter; weight and body composition were measured using a body composition monitor (OMRON, Finland). The maximum oxygen consumption of all the subjects was measured twice using the Cooper test; once before the test and once after the test. The subjects ran for 12 minutes at their maximum speed. The mileage was then placed in this formula:

$$\mathbf{Vo2max} = \text{Mileage (M)} \; - \frac{504/9}{44/73}$$

The aerobic capacity of the subjects was calculated milliliters of oxygen for each kilogram of the body weight per minute. The amount of calories intake of the subjects was determined by data collection method using a three-day questionnaire, at the beginning, at the end and every fortnight during the exercise period [15]. The subjects were advised to keep up their usual diet during the research period.

Exercise Protocol: Over 12 weeks the subjects exercised 3 time a week with a specific intensity and distance. Karvonen heart rate reserve formula was used to determine the exercise intensity. The exercise intensity was controlled using a heartbeat monitor (Polar, made in Finland). A session of training program in intermittent group included a ten-minute warm-up with and stretching exercises. The subjects then continued with running a distance of 1600 to 3200 meters with the intensity of 80 to 95% of their maximum heart rate reserve with the work to rest ratio of one to three (Table 1). They cooled off for five minutes.

Table 1 - Intermittent training programs

Week	1	2	3	4	5	6	7	8	9	10	11	12
Target heartbeat (percentage)	70-75%	70-75%	70-75%	70-75%	75-80%	75-80%	75-80%	75-80%	80-85%	80-85%	80-85%	80-85%
Distance (meter)	8× 200	8× 200	9× 200	9× 200	12× 200	12× 200	14× 200	14× 200	15× 200	15× 200	16× 200	16× 200

A session of training program in Continues group included a ten-minute warm-up with and stretching exercises. The subjects then continued with running a distance of 1600 to 3200 meters with the intensity of 60 to 75% of their maximum heart rate reserve (Table 2). They cooled off for five minutes.

Table 2 – Continues training programs

Week	1	2	3	4	5	6	7	8	9	10	11	12
Target heartbeat (percentage)	60-65%	60-65%	60-65%	60-65%	65-70%	65-70%	65-70%	65-70%	70-75%	70-75%	70-75%	70- 75%
Distance (meter)	1600	1600	1800	1800	2400	2400	2800	2800	3000	3000	3200	3200

Blood sampling: Five milliliter of blood was taken from each subject after 12 hours of fasting from the brachial vein and was reserved degrees by test time. Blood sampling in both phases was done between 8 and 9 AM of every subject. Biovendor kits were used accordingly to measure serum ICAM using ELISA method.

Statistical analysis: All values are represented as mean ± SD. As to the inferential statistics, first the Kolmogorov–Smirnov test was used for normal distribution Leven test was used for data homogeneity. Then one way analysis of variance test was used for testing significance between groups. All the statistical operations were performed by spss software and significance level of tests was considered $p \leq 0.05$.

RESULTS AND DISCUSSION

The descriptive profile of the groups in variables of age, height, weight, body mass index, body fat percentage and adiponectin as well as the one way analysis of variance are presented in the table 3. After 12 weeks of Intermittent and continuous training adiponectin level (p= 0.000) (Diagram 1) showed a significant increase. This increase was between Continues and intermittent training whit control group and did not difference between two training groups. also the difference of measurements of variables of the three groups including Body weight, Body mass index, Body fat percentage, Maximum oxygen consumption was significant, that of this significant was between two training groups with control group and did not difference between two training groups ($p \leq 0.05$) (Table 3).

Table 3- Pre-and post-test physical, physiological and biochemical variables and one way analysis of variance test in the three groups
Data are expressed as mean and standard deviation

Group / Index	Intermittent		Continues		Control		P
	Pre test	Pos test	Pre test	Pos test	Pre test	Pos test	-
Age (year)	22.2 ± 1.64	-	22.2 ± 1.68		22.70 ± 1.63	-	-
Height (cm)	160.4 ± 3.43	-	159 ± 1.88		158.80 ± 4.21	-	-
Weight (kg)	75.01 ± 6.32	72.21 ± 2.34	75.21 ± 2.86	73.22 ± 2.74	75.08 ± 2.52	75.20 ± 2.49	0.049
Body mass index (kg/m2)	29.13 ± 1.99	28.27 ± 1.83	29.76 ± 1.27	29.00 ± 1.25	30.12 ± 1.83	30.17 ± 1.84	0.05
Fat percentage (%)	31.26 ± 1.40	27.75± 0.88	30.92 ± 1.48	28.06± 0.84	31.80 ± 1.57	31.96 ± 1.57	0.000
Vo2max (ml/kg/min)	23.48 ± 1.30	29.56 ± 1.36	23.64 ± 1.24	29.83 ± 1.28	23.13 ± 1.49	23.03 ± 1.50	0.000
ICAM (µg/ml)	374.30 ± 21.85	333.70 ± 16.37	379.60 ± 20.67	341.40 ± 18.27	377.00 ± 18.60	380.70 ± 18.64	0.000

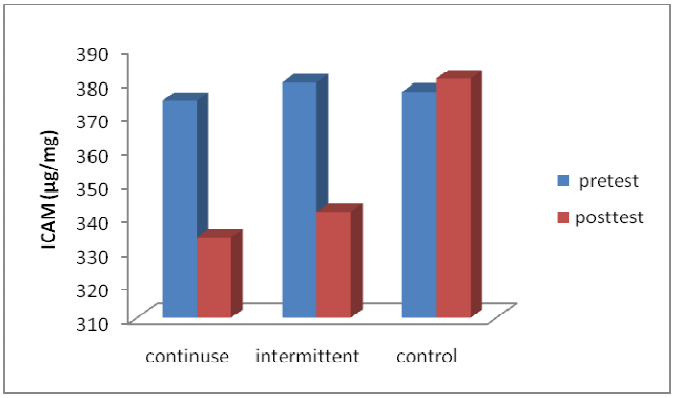

Diagram 1: The pattern of changes in ICAM levels before and after 12 weeks exercise in there groups

Cell adhesion molecules are proteins expressed on the surface of a variety of cells and mediate the leukocyte response to inflammation. Some of these molecules are released to the plasma as soluble forms, whose presence indicates the degree of vascular endothelial activation or dysfunction. Increased concentrations of soluble adhesion molecules are thought to hamper the immune response and mediate the atherosclerotic inflammatory process [7, 9, 12, 16]. The result of this study showed that ICAM-1 concentrations significantly decreased due to intermittent and continues exercise and there was no significant difference between these two types of exercise methods.

The response to exercise depends on intensity, duration and type of exercise program. After the implementation of a six-week low intensity heart rehabilitation exercise program, Rankovic et al reported no significant changes in plasma ICAM-1 [13], but Saxton et al, reported a 25- percent decrease in vascular adhesive molecules after 24 weeks of low intensity cycling exercise [16]. In the field Adamopoulos et al observed a decrease following 12 weeks of endurance exercise 5 sessions per week with 70 to 80 percent of maximum heart rate [17]. The decrease of

vascular inflammation markers subsequent to aerobic exercise has been observed in other researches [18, 19, 20]. These findings are consistent with the findings of this study and demonstrate the positive role of exercise.

The mechanisms of the decrease in sICAM-1 inflammatory markers, caused by regular exercise may by the reduced sympathetic stimulation, increased anti-inflammatory cytokines, improved anti-oxidative systems [21, 22, 23] and decreased fat mass [12, 19, 22]. So fat loss observed in this study could be a mechanism for the reduction of sICAM-1 inflammatory cytokines. Interestingly, in some studies the reduction in sICAM-1 has not been reported to be associated with reduced fat and weight loss. Accordingly physical activity probably leads to a decrease in sICAM-1 by both reducing fat mass and decreased inflammatory factors [7, 24, 25].

The results of some studies, however, are not consistent with those of this study [10, 26]. These inconsistencies could result from differences in the intensity, duration, and type of exercise and the subjects.

CONCLUSION

Continues and intermittent training during 12 weeks induces significant reduction of inflammatory markers ICAM, with significant reduction of percent body fat. All these effects of physical training are beneficial regarding the reduction of cardiovascular risk for subsequent coronary events. The results of this study suggest that regular physical activity is clinically desirable in primary and secondary prevention of coronary heart diseases.

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