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**EFFECT OF EIGHT WEEKS ENDURANCE TRAINING ON BLOOD LIPID OF
NON-ATHLETIC BOYS**

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ABSTRACT

Impaired blood fat is a risk factor for cardiovascular disease, metabolic disorders and body mainly by other factors caused. The present study investigated the effects of endurance running on lipid components (Triglyceride, cholesterol, low density lipoprotein, very low density lipoprotein, high-density lipoprotein, low-density lipoproteins to HDL-C, total cholesterol to HDL-C) in adolescent athletes deals. Population and sample of 15 adolescents aged 12-15 years with non-athlete students in city schools Evaz is purposefully chosen. Training for endurance running and workout intensity was controlled by heart and was run three times a week for eight weeks. Blood samples from the subjects before and after the training period of fasting was received. For the t-test was used to analyze the data and the level of significance was set at 0/05. The results concerning the effect of the reduced variables endurance running triglycerides, very low-density lipoprotein and increases HDL-C variable is significant ($P < 0/05$) as well as endurance run impact on reducing the variables cholesterol, low-density lipoprotein, reducing of low-density lipoprotein and total cholesterol to HDL-C and HDL-C ratio is not significant ($P < 0/05$). The effect of exercise on blood triglyceride level is very evident from the effects of exercise on cholesterol, Perhaps this view is based on the principle of triglycerides as a source of energy to do some of the exercises, Generally endurance exercise reduces the fat and prevention of cardiovascular disease.

Keywords: Endurance Exercise, Triglycerides, Cholesterol, Lipoproteins

INTRODUCTION

Although advancement of the science and technology facilitates the matters, it also creates many problems for humans. Often the scientific developments and discoveries reverse human activities and their dynamism. Today one of the main problems in developing countries is the limitation of movement and activity which this immobility, leads to getting a variety of diseases [1, 2].

Inactive lifestyle has been diagnosed as one of top 10 health problems by the World Health Organization. This kind of lifestyle is a major risk factor for people that cause disorders such as increase in dyslipidemia and hypertension. Overweight is multifactorial phenomenon that has genetic and environmental origins. In fact, in developed countries, the lack of appropriate physical activity and poor diet, cause weight gain and cardiovascular diseases [3].

Generally, body composition is assessed to check the fitness of the individual. This assessment also helps to design training programs. It's well known that a large percentage of body fat is associated with a higher risk of heart disease, diabetes, high blood pressure, cancer, high blood fat and other health problems. On the other hand, a large percentage of pure body mass and less fat mass combines success in sports and complete fitness [4]. The purpose of some

people in participating in sport activities, is achieve general endurance and a desirable body composition therefore, they choose endurance activities. Most researchers have noted that performing aerobic activities is the best way to use the fat stored in the body. That is why to take advantage of sports and to strengthen the various body systems and prevention of complications and diseases and also using it as a method of treatment, aerobic sports and activities are recommended. Cardiovascular disease is caused by turmoil in body fat, is a major cause of mortality. Decreased lipoprotein in high-density, is a known risk factor for cardiovascular disease are independent predictors. It has been observed that high-density increase of lipoprotein is influenced by lifestyle changes and more activities positively reduce the risk of coronary heart disease [5].

To Increase the loss of fat mass, light to moderate intensity exercise may be more appropriate than high-intensity exercise, since the fat oxidation in 50% of maximal oxygen consumption, has been reported 68% higher than the intensity maximum oxygen consumption in obese children. Meg Grove et al. have reported that running slow with 50% of maximum oxygen consumption will have the greatest impact on the rate of fat oxidation [6].

Exercising stimulates production of lipoprotein enzyme which is the Fat-releasing an enzyme, which causes the release of triglyceride and increases high-density lipoprotein production. The positive effects of lowering low-density lipoprotein and increasing high-density lipoprotein are independent and cumulative. In treatment methods that reducing low-density lipoprotein and increasing high-density lipoprotein are targeted at the same time, the risk of coronary events is reduced to the extent of 80-60 percent [7].

Since increased physical activity leads to increasing energy expenditure, many studies have examined the relationship between physical activities and reduction in blood fat. Ample evidences indicate that aerobic exercise is a very important part of exercise recommendations to reduce blood fat. Given that aerobic exercise is an important part of the training program is to control blood fats, it can also play a major role in general health and increasing joy. So it seems the relationship between changes in blood fat and aerobic exercise can be a good solution for controlling cholesterol and increasing good health through exercise [8].

Studies have shown that the Iranian population according to the specification of their behavioral nutrition and physical activity are at a higher risk of cardiovascular

disease and especially the risk factor of blood lipid [9].

According to the material presented and the various investigations, it is necessary that the researcher examines effect of eight weeks endurance training on blood fat, and can endurance exercise be mentioned as a way of preventing cardiovascular disease?

METHODOLOGY

This study is quasi-experimental with an experimental group (pre-test, post-test) that was conducted to find the effect of endurance running on blood lipid of non-athletic boys.

Subjects

The population of this study consists of non-athletes males comprise of schools of Oz city. In this study of 15 male adolescents with no exercise and physical activity during the day and night who are non-athletes and qualified and are from city of Oz will be elected. These people have no history of heart disease, cardiovascular, respiratory, blood pressure, diabetes, metabolic and hormonal disorders, history of surgery, respiratory disease, kidney disease and no history of smoking. These people do not participate in a particular sport and do not follow any specific diet. For sampling method, 15 non-athlete adolescents of 12-15 years from guidance schools of Oz city were selected by purposive sampling. All participants were

asked to register personal details and were contacted to obtain health information and to insert it in the participation in physical activity preparation questionnaire and to participate in the briefing and they were invited to consent to participate in the tests.

Data collection

Subjects signed the voluntary written consent letter (Appendix A) and medical health questionnaire (Appendix B) to participate in the study. A few days before the study, at a briefing, participants will be informed about how to do blood tests before and after the test and the starting time of the test. Also their attendance on blood test day will assured. After coordination with the laboratory, subjects attended the laboratory at 10am for the first stage of the 12-hour fasting blood test and taking blood was performed to specify the amount of blood variables (Triglycerides, total cholesterol, low density lipoprotein, very low density lipoprotein, high-density lipoprotein). 24 hours after the first blood taking, the heart rate of the subjects, after training to measure heart rate and using the Karonen method and the amount of RPE in running track were measured.

Age - 220 = maximum heart rate

Resting heart rate = maximum heart rate - reserve heart rate

Resting heart rate + (intensity desired × reserve heart rate) = target heart rate

After measuring heart rate in one minute and calculating it to achieve the desired intensity, the methods to do the activity was explained to them. 24 hours later the workout program that was running endurance, was implemented.

Before the endurance running, the group did stretching and exercise for 10 minutes to warm their bodies. Then the subjects ran in the track for several rounds with a regular and steady intensity so that their heart rate reach the steady rate and required intensity, then the main course was started. Each person ran according to their age and for achieving their heart rate, and controlled the desired intensity considering the RPE. Training program for research subjects was endurance running, which according to the fitness level of the subjects they started running in the first and second sessions and at the third session to create overload, distance of 50 meters was added to each previous session. For cooling down slow running was done at the end of each session. Exercise trainings were performed for 8 weeks and 3 times a week on odd days at 6 pm. 24 hours after the last exercise session, once again the participants' fasting blood samples were taken to determine the effect of exercise on the variables. This sampling procedure was performed this way, Six milliliters of blood were taken from the brachial vein and to avoid hemolysis, the

samples were poured into tubes containing EDTA and gently mixed and transported to the laboratory.

Measuring Tools

1. SECA height gauge with accurately of measuring 0/1 inches, made in Germany, to measure the height of the subjects
2. Beurer scale with accuracy of 0.01 kilogram made in Germany for weighing the subjects.
3. The standard pars kit test for measuring blood factors.

Data in this research are obtained in field forms. First the height, weight and age of all subjects were measured and blood samples (pre-test and post-test) of all subjects were taken under identical conditions.

Statistical

Firstly, measured variables are described and then Kolmogorov-Smirnov's adaptation of distribution tests (for normally distributed variables) was mentioned and finally the correlated T test was used to test the research hypotheses. To analyze the data the SPSS software version 18 was used and diagrams were drawn using EXCEL 2007 Software.

Findings

Demographic characteristics of the participants in this study consisted mean and standard deviation, age, height and weight which is shown **Tables (1)**.

The mean and standard deviations of variables, triglycerides, total cholesterol, low density lipoprotein, very low density lipoprotein, HDL-C, before and after eight weeks of endurance running in the study group are show in (**Table 2**).

According to **Table 3** P value for serum amount is ($p=0/001$), which in this case our hypothesis is confirmed and the null hypothesis is rejected and indicates that eight weeks of endurance running decreases blood triglycerides.

According to **Table 4** serum P value is ($p=0/001$), which in this case our hypothesis is rejected and null hypothesis is confirmed and indicates that eight-week endurance running will help reduce cholesterol, but this decrease is not significant.

According to **Table 5** P value for serum amount is ($p=0/001$), which in this case our hypothesis is confirmed and the null hypothesis is rejected and indicates that eight weeks of endurance running decreases very low density lipoprotein.

According to **Table 6** P value for serum amount is ($p=0/001$), which in this case our hypothesis is confirmed and the null hypothesis is rejected and indicates that eight weeks of endurance running decreases High-density lipoprotein significantly.

According to **Table 7** serum P value is ($p=0/001$), which in this case our hypothesis is rejected and null hypothesis is confirmed

and indicates that eight-week endurance running will help reduce Low-density lipoprotein, compared to high-density lipoprotein but it's not significant.

According to **Table 8** serum P value is (p=0/001), which in this case our hypothesis

is rejected and null hypothesis is confirmed and indicates that eight-week endurance running will help reduce The ratio of total cholesterol to HDL-C blood but it is not significant.

Table 1: demographic characteristics of the participants

Variable - statistics Group	Age (years)	Height (cm)	Weight (kg)
	The mean and standard deviation	The mean and standard deviation	The mean and standard deviation
non-athletes boys	13/6±1/3	161/26±16/65	55/5±9/6

Table 2: variables descriptive statistics

Variable	Pretest	Posttest
	Mean ± SD	Mean ± SD
Blood triglycerides (milligrams per deciliter)	79/318±14/928	70/24±12/774
Blood cholesterol (milligrams per deciliter)	135/240±28/694	131/215±20/158
Blood low-density lipoprotein (milligrams per deciliter)	77/780±19/887	73/120±15/988
Very low density lipoproteins in the blood (milligrams per deciliter)	15/860±19/187	11/040±10/114
Blood HDL-C (milligrams per deciliter)	44/545±10/878	52/687±11/424
HDL-C ratio of low-density lipoprotein in the blood (milligrams per deciliter)	1/625±0/915	1/318±0/887
HDL-C ratio of low-density lipoprotein in the blood (milligrams per deciliter)	3/183±1/145	2/781±0/928

Table 3: T-dependent test triglyceride results

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant
	Pretest	Posttest				
Triglycerides	79/318	70/234	9/084	2/385	11	0/003

Table 4: T-dependent cholesterol test results

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant Pretest
	Pretest	Posttest				
Cholesterol	135/240	131/215	4/025	2/131	11	0/841

Table 5: T-dependent test of low-density lipoprotein in blood results

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant Pretest
	Pretest	Posttest				
Very low density lipoprotein	15/860	11/040	4/82	1/355	11	0/002

Table 6: T-dependent high-density lipoprotein blood test results

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant Pretest
	Pretest	Posttest				
High-density lipoprotein	44/545	52/678	-8/142	3/661	11	0/003

Table 7: T-test results of low-density lipoprotein compared to high-density lipoprotein

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant Pretest
	Pretest	Posttest				
Low-density lipoprotein, compared to high-density lipoprotein	1/625	1/318	0/307	2/221	11	0/129

Table 8: T-test results of high-density lipoprotein.

Statistical Indicators Variable	Mean		Mean difference	T-statistics	Degrees of freedom	Significant Pretest
	Pretest	Posttest				
The ratio of total cholesterol to HDL-C blood	3/183	2/781	0/402	3/158	11	0/07

DISCUSSION

The results showed that exercise, significantly reduces blood triglyceride levels, results of this study are consistent with the researchers of **Soory et al (2011)** and **Saritas (2012)**, and it is inconsistent with the research results of **Blessing (1995)** called "The effect of endurance training on blood lipids and lipoproteins" which was done on 25 subjects aged 13 to 15 and lasted over 16 weeks and triglyceride levels had not changed in both groups.

Since the amount of the enzyme lipoprotein lipase activity increases due to increased physical activity, this enzyme causes the release of fatty acids from triglycerides in adipose tissue and muscles and in general increases catabolism of triglyceride and triglyceride-rich lipoproteins, and facilitates the removal of triglycerides from the blood stream. Probably the subjects' physical activity was at some degree that activates the enzyme lipoprotein lipase which this

significantly reduces the levels of blood triglycerides.

Results of this study showed that Endurance Training, lowers blood cholesterol, but this reduction was not significant. The results of this research are consistent with researches of **Soory et al (2011)**, **Altena et al (2006)** and it is non-consonant with researches of **Giulass (2006)**, **Saritas (2012)**.

Cholesterol is in the body in the free form and in combination with fatty acid and mainly is transmitted with the LP packages such as low-density lipoprotein and high-density lipoprotein the body, and it is usually synthesized by the liver. Also performing aerobic activity is a major factor in reducing cholesterol but factors such as age, sex, and drug use and race, are impacting on the level of total cholesterol [15-17].

It can be said that these subjects' lipoprotein probably have not transferred cholesterol from the blood to the liver, sufficiently, also

the intensity and duration of exercise in these subjects was not good enough to significantly reduce blood cholesterol. It seems that performing of higher-intensity aerobic activity to 70% of maximum heart rate can significantly reduce blood cholesterol.

The effect of exercise on blood triglyceride level is very evident compared to the effects of exercise on cholesterol, perhaps this is based on the principle of triglycerides as a source of energy to perform exercise, while cholesterol does not have this feature [18].

The results showed that Endurance Training, lowers blood low-density lipoprotein, but this decrease is not significant, the results of this research are consistent with research of **Wilund *et al* (2008) and Soory *et al* (2011)** and is not consistent with researches of **Saritas (2012)**.

Aerobic exercise reduces the levels of low-density lipoprotein; this process is due to its effect on consumption of body fat and using fat as the main source of energy. So endurance activities are a factor to reduce levels of blood is low-density lipoprotein which leads to prevention of atherosclerosis and cholesterol accumulation in the coronary arteries of the heart. On the other hand during exercise, the body's endocrine system can increase fat oxidation by increasing epinephrine hormones,

norepinephrine, growth hormone and cortisol and use fatty acids as fuel (**Yektayar *et al.*, 2012; Soory *et al.*, 2011; Khalesi *et al.*, 2012**). Probably nutrition intensity and duration of physical activity of the subjects in this study were not enough to cause a significant reduction in the levels of low-density lipoprotein.

The results showed that endurance Training, reduces very low-density lipoprotein levels in blood, the results of this research are consistent with researches of **Noori Habshi (2004) and Mogharnesi *et al* (2008)**. Also the results of this research are non-consonant with results **Xi XR *et al* (1996)** which was a study comparing the effects of regular exercise on lipid values of 30 male students of 21 to 30-year-old. Training program lasted for 10 weeks. Very low-density lipoprotein levels were not significantly different.

At effect of endurance training, fat oxidizing enzyme activity, such as enzymes that are involved in beta-oxidation of fatty acids, increases. At the effect of exercise, lipoprotein lipase activity also increases. And therefore withdrawing very low density lipoprotein to oxidation in muscle blood flow increases for oxidation in muscle is increased. Lipoprotein lipase is an enzyme that has major role in the conversion of low density lipoprotein to high-density lipoprotein, the activity of lipoprotein lipase

increased with physical activity [21, 10, 25, 16]. Probably duration and intensity of physical activity in research subjects in a manner that stimulates the enzyme lipoprotein lipase, so that this enzyme can convert the very low density lipoprotein, to high-density lipoprotein, and this leads to a significant reduction In the amount of low-density lipoprotein.

The results showed that endurance training increases high-density lipoprotein significantly, results are consistent with researches of **Boyden et al (1993)**, **Giulass et al (2006)** and **Altena et al (2006)**. And it is not consistent with researches of **Gomez et al (2013)** and **Akbari et al (2007)**.

Lipoprotein lipase is an enzyme that has major role in the conversion of low density lipoprotein to high-density lipoprotein, the activity of lipoprotein lipase increased with physical activity. Increased concentrations of lipoprotein lipase increases lipolysis and increase high-density lipoprotein levels which reduces the risk of cardiovascular disease [20, 21, 10, 2012, 11]. Probable duration and intensity of physical activity In Subjects were in a manner that stimulates the enzyme lipoprotein lipase so that this enzyme can convert the very low density lipoprotein to high-density lipoprotein and this leads to a significant increase In the levels of high-density lipoprotein.

The results showed that endurance training reduced low-density lipoprotein compared to high-density lipoprotein, but it is not significant. Results of this research are not consistent with research of **Hamedinia (2005)** and **Sharifi (1998)**.

During short-term or long-term exercise, Lecithin cholesterol acyltransferase enzyme activity increases, it is the enzyme responsible for transporting cholesterol to high-density lipoprotein, thus high-density lipoprotein increases and Protein transfers plasma cholesterol activity is reduced, which is responsible for transfer of high density lipoprotein cholesterol to other lipoproteins. Probably nutrition and physical activity intensity and duration of subjects in this study were not enough to cause a significant reduction in levels of low-density lipoprotein compared to high-density lipoprotein.

The results showed that Endurance Training lowers blood cholesterol to HDL-C, but this decrease is not significant, research results are not consistent with research of **Sharifi (1998)** and **Askari et al (2013)**, which observed the effect of eight weeks of aerobic training on serum lipids and lipoproteins in women. They were divided into control and experimental groups, the experimental groups did aerobic exercise (with intensity of 60 to 70 percent of maximum heart rate) for eight weeks, three

sessions per week and each session was an hour. Results were that the level of total cholesterol, cardiovascular risk factors (RF = TC / HDL) and percentage of subcutaneous fat in the experimental group was significant decrease in posttest compared pretest.

Training sessions, their duration and intensity, has a significant role in the changes in the components of total cholesterol to HDL-C, in statistical terms. Endurance training increases the epinephrine, norepinephrine hormones and eventually leads to an increased release of free fatty acids into the blood and thus reduces fat mass. It can be concluded that endurance training with this intensity and duration for non-athletic boys cannot cause a significant reduction in the ratio of total cholesterol to HDL-C.

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