THE EFFECT OF EIGHT WEEKS OF AEROBIC RUNNING ON THE LIPOPROTEINS AND LIPID CONCENTRATION FACTORS IN MALE ATHLETES

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The purpose of this research is to study the effects of aerobic exercise on blood serum lipids after eight weeks. For this purpose, 13 male students participated in this semi-experimental research. Five cc of elbow veins` blood of subjects was taken in resting time. The concentration of cholesterol, triglyceride, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) of blood's serum was measured in pre and post-test. Subjects participated in continuous incremental running exercise for eight weeks, (two sessions per week). In the first four sessions the running distance was set on 140 – 150 heart beats. In the last four sessions the running distance increased to 3200 meters and intensity of heart rate reached 180 beats. The intensity of heart beat and exercise were controlled by pollar watch. The results were analyzed by "SPSS" statistic software. It showed the decrease of the cholesterol's concentration but it was not significant (P = 0.75). HDL concentration increased, but it was not significant either (P = 0.938). On the contrary, LDL`s concentration (P = 0.013) and the triglyceride's concentration (P = 0.028) were significant. Also the subjects` maximal volume of oxygen consumed (VO_{2max}) was significant (P = 0.0001). Final result of this research showed that continuous incremental aerobic running for eight weeks can be effective on decreasing the lipids of blood's serum and on increasing Vo_{2max} and metabolism of lipids.

1. Introduction

Cholesterol is a waxy substance made by animal liver and also supplied in diet through animal products such as meats, poultry, fish and dairy products. Cholesterol plays a major role in human heart health. Cholesterol can be both good and bad. High-density lipoprotein (HDL) is good cholesterol and low-density lipoprotein (LDL) is bad cholesterol. High cholesterol in serum is a leading risk factor for human cardiovascular disease such as coronary heart disease (CHD) [1, 2].

Triglyceride is another fat in the blood stream. High level of triglyceride is also linked to heart disease. Many people who have heart disease or diabetes have high triglyceride level [2]. Exercise is very important for health and fitness. It has multiple beneficial effects on our body [1]. Many previous studies have shown that regular exercise is beneficial and increase the HDL level and decreases total cholesterol and LDL levels [3].

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Hsieh et al. (1998) emphasized that well-defined and regular performed aerobic exercise also reduces LDL cholesterol and apolipoprotein B, the risk factors of CHD [4]. On the other hand, Durstin et al. (2001) found that duration of aerobic exercise (e.g., number of miles run), rather than the intensity, appears to have the biggest influence on HDL-C levels [3]. Endurance-trained athletes have much higher HDL-C values compared to sedentary populations [5]. The primary reason for the elevation in HDL-C is an increase in lipoprotein lipase activity in response to exercise. Lipoprotein lipase accelerates the breakdowns of triglycerides, resulting in a transfer of cholesterol and other substances to the HDL-C [6]. Stein et al. (1990) reported significant increases in HDL-C levels in men that exercised at or above 75% heart rate maximum (HR max), three times a week for 12 weeks. No changes in HDL-C were reported in the subjects that exercised at 65% HR max [7]. In addition, Kokkinos and colleagues (1995) studied 2906 men and reported that increases in HDL-C levels occurred in men jogging at an exercise intensity of 10 to 11 minutes per mile [6]. Pourvaghar (2007), showed that 20 minutes aerobic continuous running did not change triglyceride and cholesterol concentration levels of 15 subjects [8].

2. Material and Methods

This research is semi-experimental. Thirteen male athlete students participated purposefully in this research. The concentration of cholesterol, triglyceride, LDL, and HDL were measured after two months of continuous incremental running exercise. Mean and standard deviation of age (20.25 ± 1.39), weight (67.69 ± 10), height (175.31 ± 6.10), and body mass index (BMI) (21.96 ± 2.52) of subjects were measured (table 1).

Table 1. Descriptive Index of Subjects (n=13)

Variables	Mean	Standard Deviation
Age (Year)	20.25	1.39
Weight (Kilogram)	67.69	10.09
Height (Centimeter)	175.31	6.10
Body Mass Index (Kg/m^2)	21.96	2.52
Systolic Blood Pressure (mm Hg)	102.69	14.23
Diastolic Blood Pressure (mm Hg)	62.30	8.32

Five cc of elbow vein's blood sample of subjects was taken in resting and fasting mood. The concentration of cholesterol, triglyceride, LDL, and HDL serum was measured in pre and post-test. The Subjects participated in continuous incremental aerobic running exercises for two months, two sessions per week. Subjects ran 2000 meters with 140-150 intensity of heart beat in the first four sessions. After that with regard to every four sessions, the distance of running was increased 400 meters and heart beat was increased 10 beat until the last four sessions when the running distance reached to 3200 meters and the subjects heart beat to 170 – 180 beat per minute. The intensity of heart rate was controlled by pollar watch, which was made in Japan. For measuring maximum of the heart rate the formula of "220 — age" was used. Also maximum of subjects` heart rate in the last four sessions reached 90% of maximal heart rate. After the 16th session, the subjects rested for 24 hours to delete the probable changes of the concentrations of cholesterol, triglyceride, LDL and HDL, coming out of the last sessions of training. At this stage 5 cc of subjects' blood was taken again. Blood samples were analyzed in the laboratory by using enzymatic way. When the materials are added in the serum, colorful

material is produced. The severity of colour is according to the concentration of the factor that is measured by spectrophotometery.

Mean and standard deviation of concentration of cholesterol, triglyceride, LDL, HDL and P and t values are shown in table 2.

3. Results

According to table 2, cholesterol concentration of subjects' serum decreased 8 mg/dl after two months training. But this decrease was not significant (P = 0.175). The concentration of subjects` triglyceride decreased 24.38 mg/dl after two months of training. That was significant (P = 0.028). The concentration of HDL (good cholesterol) of subjects increased 0.015 mg/dl after two months of aerobic training. This was not significant (P = 0.938). The subjects' concentration of LDL (bad cholesterol) decreased 8.46 mg/dl (Figure 1). This was significant (P = 0.013). Twelve minutes running exercise test was used for measuring VO_{2max} [9]. Subjects' VO_{2max} after two months aerobic training was obtained significant (P = 0.0001), and it increased 5.08 ml.kg^{-1}.min^{-1}. Also the average of subjects` running distance increased 189 meters in 12 minutes (table 3).

Table 2. Mean and Standard Deviation of Serum Lipids and P and t Values

Variables	Mean	Standard Deviation	t Value	P Value
Cholesterol Before Training (mg/dl)	176.77	32.60	1.511	0.157
Cholesterol After Training (mg/dl)	169.77	37.26		
Triglyceride Before Training (mg/dl)	127.15	37.28	2.499	0.028
Triglyceride After Training (mg/dl)	102.77	28.00		
HDL Before Training (mg/dl)	45.23	6.65	0.08	0.938
HDL After Training (mg/dl)	45.38	8.58		
LDL Before Training (mg/dl)	106.15	28.94	2.91	0.013
LDL After Training (mg/dl)	97.69	28.59		

Table 3. Maximal Oxygen Consumption (VO_{2max}), Weight and Running Distance of Subjects

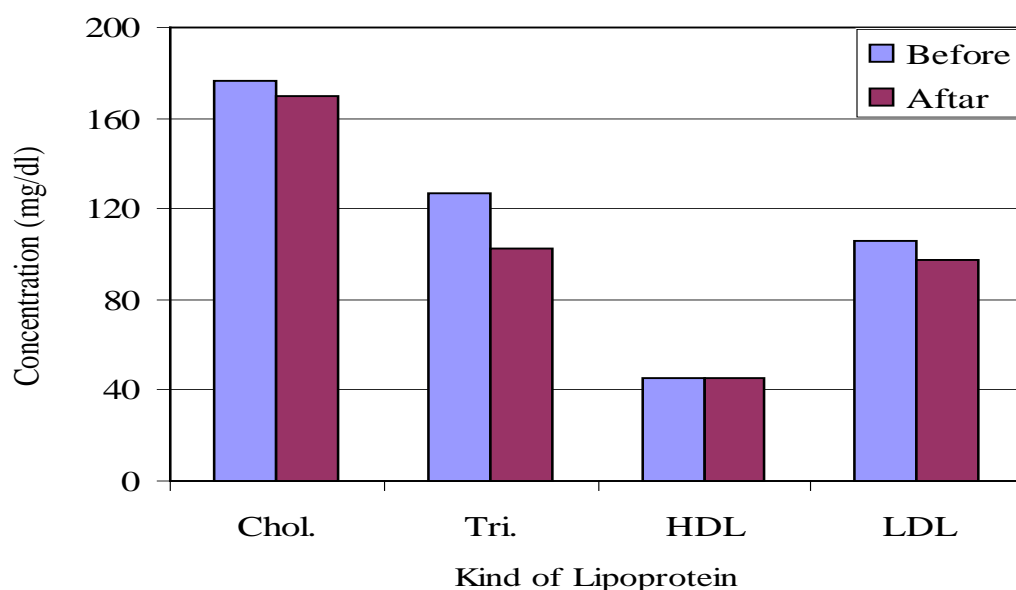| Variables	Mean	Standard Deviation	t Value	P Value
Weight Before Training (Kg)	67.69	10.09	0.322	0.753
Weight After Training (Kg)	67.76	9.93		
VO_{2max} Before Training (ml.kg^{-1}.min^{-1})	48.99	4.11	5.004	0.0001
VO_{2max} After Training (ml.kg^{-1}.min^{-1})	54.07	3.33		
12 Minutes Running Before Training (Meter)	2250	153.47	5.004	0.0001
12 Minutes Running After Training (Meter)	2439.23	124.55		

Figure 1. The Changes of Concentration of Lipoproteins before and after training protocol

4. Discussion and Conclusions

In this research, changes of 13 male athletes` concentration of cholesterol, triglyceride, LDL, and HDL after two months continuous incremental running exercise have been studied. Extracted result of table 2 shows that regular aerobic exercise can make significant changes in concentration of blood serum lipids. This research is consistent with most of the researches [1, 2, 6]. In this research the regular aerobic exercise decreased the mean of cholesterol concentration of blood serum to 8 mg/dl, although this decrease is not significant regarding statistics. But we can say that probably two months training is a short time for this change and increasing training time probably can decrease the cholesterol of blood serum. This research is in consistent with Grandapur (2006) and his collogue`s findings. He also knows that regular aerobic exercise is the cause of decreasing concentration of cholesterol, triglyceride and LDL [2]. The concentration of triglyceride decreased 24.38 mg/dl after two months training and that it is significant ($p = 0.028$), and it showed the effect of two months of exercise with particular intensity of heart rate on triglyceride's decrease. That is one of the dangerous factors of cardiovascular disease. This research is consistent with Grandeur (2006) and his colleagues research [2]. These researchers believe that slow aerobic running is the cause of triglyceride decreasing. This research also agrees with Durastin (2003) research [3]. This researcher reported that the time of exercise is more effective than the intensity of it. Concentration of subjects' serum HDL increased 0.15 mg/dl, and it showed that this cardiovascular efficient factor is not significant ($P = 0.938$). It seems that the length of time and the number of sessions of exercises in a week can have more effect on increasing HDL. This research is consistent with Oyelola (1993) and his colleagues` research. This researcher reported HDL without changing after physical aerobic activity [10]. Also Krause (2002) and his colleagues believe that at least 1200 calories a week or running 12 miles in a week are the cause of increasing HDL, which is inconsistent with this research [11].

Concentration of students' serum LDL decreased 8.46 mg/dl. This decrease is significant statistically ($P = 0.013$), and it showed the effect of eight weeks of aerobic

training on decreasing the bad cholesterol (LDL). This research is consistent with the most of the researches [12, 13, 14]. For example, Hsieh (1998) reported that regular aerobic exercises result in LDL and Apolipoprotein B decrease that is the main factor of cardiac heart disease (CHD) too [4]. In addition, regular aerobic exercises and the regular resistance exercises can also decrease LDL in both male and females [15]. Krauss (2005) reported that body exercises generally result in LDL decrease [16].

Subjects had 21.96 kg/m^2 body mass index (BMI). Their desirable weight did not have any change after two months training. The mean of subjects` weight was 67.69 kg and it changed to 67.76 after two months. And in the result the change of subjects` weight was not significant (P = 0.753). Mean of the subjects' body mass index was 21.96 kg/m^2. Therefore, desirable body mass index can probably be the cause of fixed maintenance of subjects' weight.

Maximal volume of oxygen consumed (VO_{2max}) increased 5.08 ml per kilogram of body weight (P = 0.0001), and it showed that regular aerobic training of two sessions per week in two months can cause significant increase in subjects` VO_{2max}.

On the whole, different bodily exercise with different intensity and duration can create different responses in blood serum lipid. From previous researches we can find that increasing the duration of exercises can be effective in decreasing blood lipid. The final result of research showed that two months of body training with particular intensity of heart rate can increase the lipids metabolisms and also decrease blood serum lipid significantly.

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