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THE EFFECT OF 14 WEEK REGULAR AEROBIC-STEP EXERCISES ON FEMALE UNIVERSITY STUDENTS' CHOLESTEROL LEVELS

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Abstract

Aim. It was aimed in this study to detect the effect of 14 week regular aerobic-step exercises on female university students' plasma cholesterol levels.

Method. The participants of the study were 64 healthy voluntary female university students. Out of these students, 32 students formed the exercise group and 32 students formed the control group. Students practiced the continuous aerobic-step exercise program for 60 minutes for 3 days a week. Intensity of the exercise was calculated as 50-70% via Karvonen formula. Prior to the practice of exercises; age, length, body weight, relaxation heart rate, systolic and diastolic blood pressure and blood lipids of the participants were measured. T-test was used for the statistical analysis of the data. Each physiological variable obtained from the measurements was accepted as significant at the level of $p<0.05$.

Findings. At the end of the study, body weight, relaxation heart rate, systolic and diastolic blood pressure, total cholesterol, LDL-Cholesterol, triglyceride levels of the exercise group significantly decreased while HDL-Cholesterol values significantly increased ($P<0,05$, $p<0.01$).

In conclusion, it was detected that regular and continuous 14 week aerobic-step exercises that are performed by the participants for 3 days in a week was effective on cholesterol levels of female university students.

Key Words: aerobic-step exercise, cholesterol levels, blood pressure

Introduction

Exercise is most important for every living being; in other words, we can also say that physical inactivity results in several types of diseases in the body. It mostly causes Cardio-vascular diseases. So, if we maintain and keep balance between our diets and regular exercise, it will result the best. Morning walk is often suggested by the doctors. It is also suggested by the experts that a human body needs a five day exercise in a week, irrespective of what age he/she belongs (Narayani and Sudhan, 2010). However, primary aim of regular exercise is to prevent organic deficiencies due to sedentary life style and, to the extent possible, to maximize physiological capacity and tolerances, which are the fundamentals of a dynamic and balanced life. Therefore, regular aerobic-step exercises improve physical capacity of individuals and play a role in primary and secondary protection from cardiovascular diseases (Morris and Froelicher, 1991; Ummanand and Kaya, 2001). Exercise improves functional capacity in addition to certain cardiovascular diseases in completely healthy people. In addition to controlling lipid, carbohydrate, diabetes and obesity, regular exercises slightly decrease blood pressure in some hypertensive groups (Martin et al., 1990). Exercises such as aerobic-step, walking, climbing stairs, joggings, cycling, swimming, rowing, tennis, football and basketball have a significant impact when they are done regularly. These types of exercises generally require an effort of higher than 50% of exercise capacity of an individual. But, Physical inactivity or sedentary life style is also considered a risk factor for Coronary artery disease (CAD). Regular exercise results in an increase in exercise capacity and lowers myocardial oxygen demand leading to cardiovascular benefits, including lower mortality rates and fewer occurrence of CAD. It is advised that those individuals who are inactive should increase their physical activity gradually (Shirazi, 2006). Those who participate in light levels of exercises or who are irregularly active should attempt to exercise more regularly at least at moderate levels. The beneficial effect will depend upon how active the individual is at the base line. For example sedentary people will gain the most followed by moderately active individuals (Wood, 1998).

Having high cholesterol can cause life-threatening diseases. However, it can be controlled through diet and exercise. When there is high cholesterol, the HDL and LDL cholesterol levels are reversed making LDL level higher than HDL level. It is also important to consult a physician before starting any diet or exercise routine. He/she will monitor the progress to determine if medication will be needed to control the high cholesterol (Kitamura et al., 2004). However, People doing exercise are expected to experience certain physiological changes along with acute and chronic adaptation. It was reported that regular and long-term

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and moderate degree of aerobic-step exercises decrease lipids such as total cholesterol (Total C), low density lipoproteins (LDL-C), triglyceride (TG) and increase high density lipoprotein (HDL-C) level. Furthermore, it was emphasized that high blood pressure and obesity diseases are decreased by exercise (Lemuraand and Amdreacci, 2000).

It is widely suggested in the literature that regular exercise has positive impacts on lipid profiles and protects from coronary risk factors. However, in recent years, researchers report controversial results on the type and duration of exercise in terms of leading beneficial changes in lipid metabolism (Engeret al., 1997, Martı, 1991). While some researchers suggest that even an acute exercise changes lipid parameters, some others report that this change will occur after long-term and regular exercise (Martı, 1991). Although aerobic exercises are known to have positive impacts on blood volume, oxygen carrying hemoglobin and heart rate volume, lower number of heart rate number is required due to increased heart rate volume (Günay et al 1998).

This study aimed to analyze the effect of 14-week aerobics-step exercises (3 days a week, at 50-70% intensity) on cholesterol levels.

Material and Method

This study was carried out in accordance with Helsinki Declaration. The participants were informed about the aim and possible risks of the study. Written consents of the participants were taken. The study consisted of 64 healthy female university students (32 experiment group, 32 control group). Age, height, body weight (BW) (at a sensitivity of 0.1kg, 0.1 cm), resting heart rate (HR rest), (rate/min), systolic blood pressure (SBP), diastolic blood pressure (DBP), (mmHg) of the participants were recorded before and after the exercise program. Blood lipids (Total-C, HDL-K, LDL-C and TG) values were evaluated by analyses at Kafkas University Faculty of Medicine.

The subjects participated in an aerobic-step exercise program 3 days a week for 60 minutes. Exercise intensity: target heart rate number was determined according to reserve (Kravonen) method at the end of 10 second heart rate count from carotis artery immediately after the completion of exercise (Tamer, 2000 and Fox, 1999). The method is explained below.HR max= 220-Age HRR= HR max- HR rest, %50-70 THR = (0.50 x HRR or 0.70 x HRR) +HR rest. All measurements and tests on the subjects were performed for two times; prior to the exercise program (pre-teat) and after 14-week period (post-test). Arithmetic mean, standard deviations (standard errors) were calculated. Paired sample t-test was used to compare pre-test and post-test values of the subjects. The values ≤ 0.05 were regarded as significant.

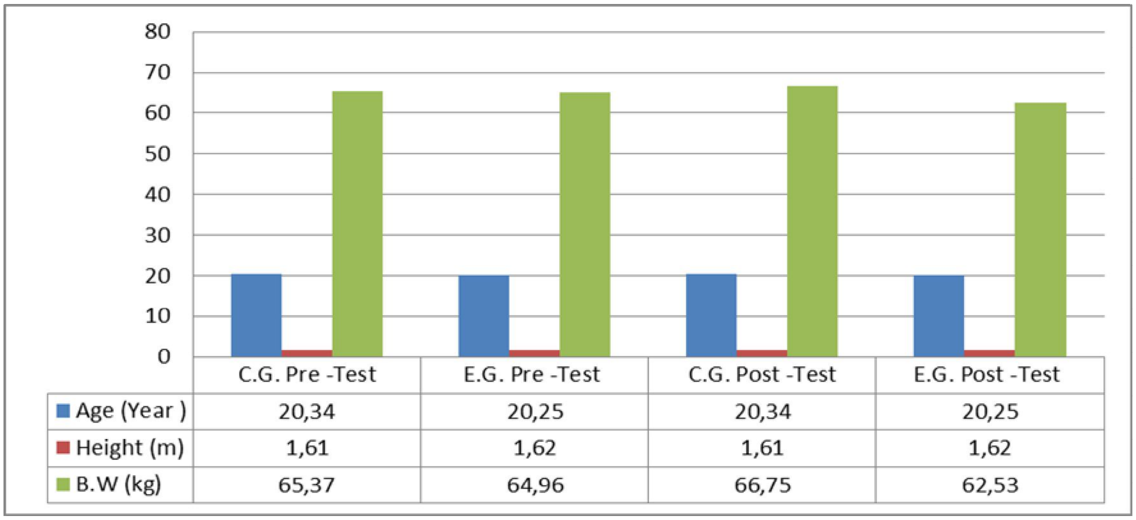
Results

Measurement results obtained from the 14-week aerobic-step exercise program (3 days a week) are presented in Tables 1-3 and Figure 1-3

Table 1: Anthropometric Measurement Values on the Subjects in Exercise and Control Groups. Data is presented as mean ± standard deviation

Groups	Variables	Pre -Test	Post -Test	*p value
Control Group (n=32)	Age (year)	20.34 ± 1.91	20.34 ± 1.91	p> 0.05
	Height (m)	1.61 ± 5.30	1.61 ± 5.30	p> 0.05
	B.W. (kg)	65.37 ± 2.05	66.75 ± 1.95	p< 0.05
Exercise Group (n=32)	Age (year)	20.25 ± 1.75	20.25 ± 1.75	p> 0.05
	Height (m)	1.62 ± 4.88	1.62 ± 4.88	p> 0.05
	B.W. (kg)	64.96 ± 1.87	62.53 ± 1.41	p< 0.05*

B.W.: Body Weight



C.G.: Control Group, E.G.: Exercise Group, B.W.: Body Weight

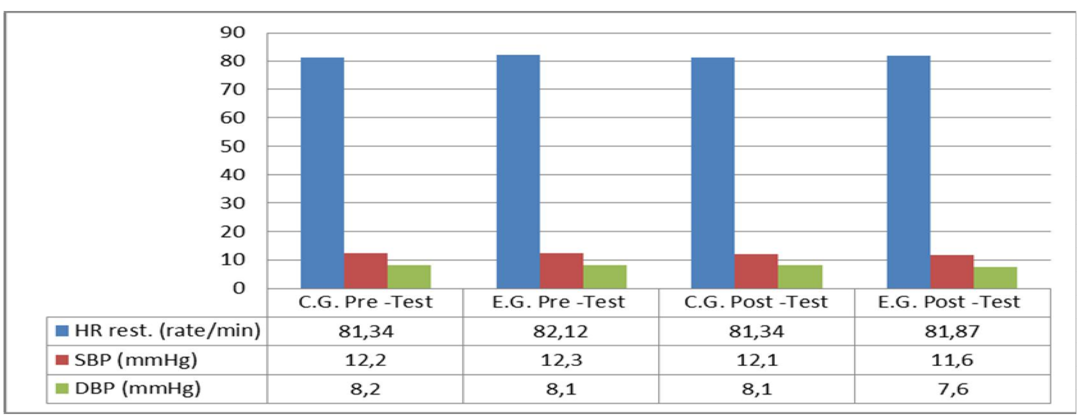
Figure 1: Anthropometric Measurement Values on the Subjects in Exercise and Control Groups. Data is presented as mean

It is understood from Table 1and figure 1 that exercise and control groups were similar in terms of age and height values and showed no significant difference (p>0.05). However, comparison of body weight values before and after starting the exercise program showed that there was a statistically significant decrease in body weights of the subjects in exercise group (p<0.05).

Table 2. Resting Heart Rate and Blood Pressure Values in Exercise and Control Group Subjects. Data is presented as mean ± standard deviation.

Groups	Variables	Pre-Test	Post- Test	*p value
Control Group (n=32)	HR rest. (rate/min)	81.34 ± 2.97	81.34 ± 2.96	p> 0.05
	SBP (mmHg)	12.2 ± 1.26	12.1 ± 1.17	p> 0.05
	DBP (mmHg)	8.2 ± 0.8	8.1 ± 0.8	p> 0.05
Exercise Group (n=32)	HR rest. (rate/min)	82.12 ± 3.17	81.87 ± 2.92	p< 0.05*
	SBP (mmHg)	12.3 ± 0.7	11.6 ± 0.5	p< 0.01*
	DBP (mmHg)	8.1 ± 0.8	7.6 ± 0.5	p< 0.05*

HR rest.: Resting Heart Rate, S.B.P.: Systolic Blood Pressure, D.B.P.: Diastolic Blood Pressure



HR rest.: Resting Heart Rate, S.B.P.: Systolic Blood Pressure, D.B.P.: Diastolic Blood Pressure, C.G.: Control Group, E.G.: Exercise Group

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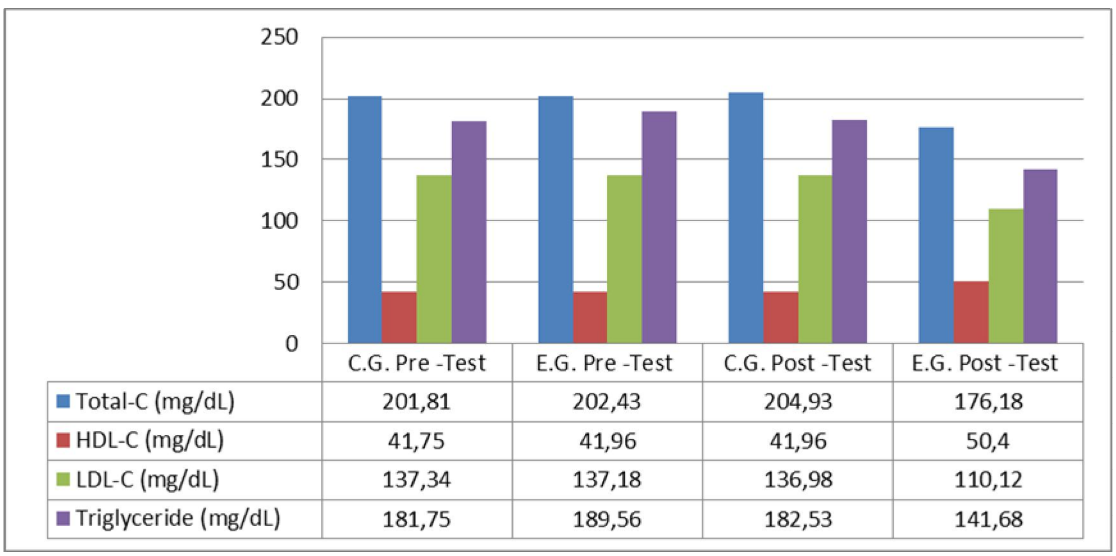
Figure 2: Resting Heart Rate and Blood Pressure Values in Exercise and Control Group Subjects. Data is presented as mean

Table 2 and figure 2 were examined, comparison of the values before and after the exercise showed that there was no significant difference in the control group. However, it was observed that HR rest, SBP and DBP values decreased in the exercise group ($p<0.05$ and $p<0.01$ respectively).

Table 3. Blood Lipid Values of the Subjects in Exercise and Control Groups. Data is presented as mean±standard deviation.

Groups	Variables	Pre-Test	Post-Test	*p value
Control Group (n=32)	Total-C (mg/dL)	201.81 ± 15.15	204.93 ± 12.56	p< 0.05*
	HDL-C (mg/dL)	41.75 ± 1.01	41.96 ± 0.93	p> 0.05
	LDL-C (mg/dL)	137.34 ± 5.95	136.98 ± 6.56	p> 0.05
	Triglyceride (mg/dL)	181.75 ± 2.57	182.53 ± 2.97	p> 0.05
Exercise Group (n=32)	Total-C (mg/dL)	202.43 ± 14.60	176.18 ± 7.35	p< 0.01*
	HDL-C (mg/dL)	41.96 ± 0.91	50.40 ± 2.38	p< 0.01*
	LDL-C (mg/dL)	137.18 ± 6.46	110.12 ± 3.92	p< 0.01*
	Triglyceride (mg/dL)	189.56 ± 3.60	141.68 ± 3.51	p< 0.01*

C: Cholesterol, HDL: High Density Lipoproteins, LDL: Low Density Lipoproteins, TG: Triglyceride Total-C: Total Cholesterol



C: Cholesterol, HDL: High Density Lipoproteins, LDL: Low Density Lipoproteins, TG: Triglyceride Total-C: Total Cholesterol, C.G.: Control Group, E.G.: Exercise Group

Figure 3: Blood Lipid Values of the Subjects in Exercise and Control Groups. Data is presented as mean

Table 3and figure 3 were examined, comparison of pre-test and post-test values of the subjects showed that Total-C, LDL-C, Triglyceride values of exercise group decreased, while HDL-C values increased ($P<0.01$). In control group, Total-C values were observed to increase ($p< 0,05$) while blood lipid values showed no statistically significant difference ($P>0.05$).

Discussion

In this study, which analyzed the effects of a regular 14-week aerobic-step exercise program on cholesterol levels of 64 healthy female university students, height, body weight, HR rest, SBP, DBP and blood lipid values of the subjects were measured prior to the exercise. Second measurements were conducted after the exercise. The values obtained before and after the exercise were compared to the values in previous studies. Various studies emphasized that an active lifestyle and regular aerobic exercises had positive effects on body fats and blood lipids (Fox et al., 1999; La Fontaine, 2003; Marso and Stern, 2005). But, Uğraş ve Savaş (2004) the purpose of this study was to determine the effects of specific endurance training program – 8 weeks long, 4 days a week, total of 32 practices - on some physiological characteristics and blood lipids of male students-players. 25 experiment (20.36 ± 1.55) and 25 control (21.56 ± 1.575) university male students volunteered to participate in this study. As a result of the specific endurance training program, statistically no significant changes were observed in the body weights, heights, RHR and anerobic power, blood lipids and diastolic blood pressure of the subjects. At the end of the specific endurance training program, aerobic power (maxVO2) values and systolic bloodpressure were statistically found significant ($p<0.01$).

Burning high amounts of calories through exercise decreases body fat percentage (Gökdemir et al., 2007).We obtained similar results in the present study. It was found that pre-test and post-test age and height values of the control and exercise groups were similar ($p>0.05$), while there was a decrease in body weight of the subjects in exercise group ($p< 0,05$). Similarly, Günay et al., carried out a study on 30 university students with a mean age of 20-21 and applied two types of interval training methods 3 days a week, for a period of 12 weeks, The values of the group, which underwent 1200mx4 series, were consistent with the results of the present study (Günay et al., 1998).

Dawson (1993) reported that a 30-minute exercise program at 75-85% intensity, which was applied 3 days a week for a period of 16 weeks, decreased systole and diastole blood pressure in males having the risk of coronary heart diseases. Van Zant et al. (1993) found that at the end of a 12-week exercise program, which lasted for 20 minutes, at maximal heart rate of60-80%, HR rest and SBP significantly decreased. Brill et al. (1989) carried out a study on leisure activities and found that systolic blood pressure was X = 121.6 mmHg ± 11.8 in athletes and it was X = 122.2 mmHg ± 12.9 in non-athletes. Diastolic blood pressure was X = 80.2 mmHg ± 8.4 in athletes and X = 80.6 mmHg ± 8.9 in the subjects who were non-athletes. Penny et al., (1982) carried out a study on athletes and found that systolic blood pressure was X = 120.67 mmHg ± 6.49 in marathon runners; X = 117.83 mmHg ± 5.44 in joggers and X = 124.91 mmHg ± 10.49 in control group. Diastolic blood pressure was found to be X = 77.33 mmHg ± 6.18 in marathon runners; X = 72.17 mmHg ± 6.85 in joggers and X = 85.64 mmHg ± 7.18 in the control group. In this study, we obtained similar results. In our study, comparison of value before and after the exercise showed that there was no significant difference in the control group, while the HR rest, SBP and DBP decreased in the exercise group ($p<0.05$ and $p<0.01$ respectively). Thus, aerobic-step exercises have a positive impact on blood volume, oxygen carrying hemoglobin and heart rate volume. Lower heart rate number is needed due to the increase in heart rate. The increase in heart rate facilitates transport of O2into the muscles, which is necessary during the exercises.

Various studies on blood lipids reported that following an aerobic training at enough intensity, triglycerides in blood decreased; total cholesterol sometimes decreased and sometimes remained unchanged; however high density cholesterol (HDL-C) increased; while low density cholesterol (LDL-C) decreased (Akgün, 1992). Thus, regular exercise positively affects lipid and carbohydrate metabolism. Exercise-related HDL "High Density Lipoprotein" increase is generally accompanied by the decreased body weight. Lakusic et al., (2004) carried out a study on 444 participants (male; n = 364, female; n=80) with a mean age of 58±9 and found that TC, triglyceride and LDL-cholesterol levels significantly decreased; HDL-cholesterol level significantly increased following a 3-week cardiac rehabilitation program. In this study, we obtained similar results with the literature. Comparison of pre-test values and post-test values of the subjects showed that Total-C, LDL-C, triglyceride values of exercise group decreased, while HDL-C values increased ($p<0.01$). On the otherhand, an increase was observed in Total-C values ($p< 0.05$) in the control group; while there was no statistically significant difference in other blood lipid values ($p>0.05$). Total-X, triglyceride, HDL-C and LDL-C levels are reported as important risk factors in coronary heart diseases. In another study, the effects of exercise and gender on these risk factors in participants who did and didn't do regular exercise were investigated and it was found that female athletes had higher HDL-C levels, however lower Total-C, triglyceride and LDL-C levels than males. Total-C and triglyceride levels of non-athlete females were found to be lower than those of non-athlete males (Kayatekin et al., 1998). Thus, we conclude that regular aerobic-step exercises at moderate intensity make positive and significant changes in blood lipids values and thus its effectiveness on prevention of coronary heart diseases can be increased. Furthermore, it can be stated that frequency and intensity of exercise programs can make positive changes in blood lipids.

Conclusion

Body weight decreased due to reduced body fat percentages through exercise. Our findings, which were consistent with the literature, indicate the importance of regular aerobic and step exercises in terms of regulating body weight, HRrest, SBP and DBP and preventing obesity. Exercise programs, diet programs and other factors can be used to protect from cardiovascular risk factors, to reduce LDL-C and to increase HDL-C. As understood from the results, it can be suggested that decrease of lipids such as Total-C, LDL-C and triglyceride and increase of HDL-C levels are an important effect of regular and long-term aerobic training. Similarly, based on our findings, it can be stated that longer exercise programs are required to achieve permanent and beneficial effects on lipid parameters.

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