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# THE EFFECTS OF 8-WEEK AEROBIC EXERCISES ON THE BLOOD LIPID AND BODY COMPOSITION OF THE OWERWEIGHT AND OBESE FEMALES

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## ABSTRACT

**Objective:** The purpose of study was the determine the effects of 8 weeks aerobik exercise program on body composition and blood lipids of sedantery middle aged women.

**Material and method:** 29 obese (O) subjects whose mean age was 41.55 ± 6.72 years, mean height: 159,21 ± 7.18 cm, average body weight (BW) : 85.97 ± 9.60 kg, and 29 overweight (OW) subjects whose mean age was: 35.10 ± 9.11 years, mean height: 160,59 ± 5.20 cm and average body weight (BW) was : 68.55 ± 6.72 kg, total 58 individuals taking part in the step aerobic exercise program run by KOMEK(Konya Vocational Course) were included in the study In this research, 8 weekly period- aerobic exercise in 3 days of the week have been applied to people. Before and after the exercise protocol, the body fat percentage(BFP), the rate of the waist to the hip(WHR), elasticity(E)), blood lipid parameters (cholosterol, HDL-C,LDL-C,VDLD-C,TRİGLY) , systolic blood pressure (SBP),and diastolic blood pressure (DBP) blood pressure have been measured.

**Result:** In this study, it has been determined that there is significant difference ($p<0.05$) between the tests of BW, BFP, BMI, WHR, SBP and DBP given after 8-week aerobic-step exercise protocol in favor of the last test. We too have demonstrated in this study that exercises have affected positively BW, BFP, BMI and WHR compatible with other studies. We established in this study that HDL-K increased but triglyceride increased in the overweight and obese groups before and after exercises, and LDL-K decreased in the overweight group ($p<0.05$)

**Discussion and conclusion:** As a result, exercises cause favorable changes in lipids and lipoproteins. Furthermore, diet program in addition to exercise program will provide more prolific results with obese people. It has been proved with the obtained results that the negative effects of sedentary living on individuals are decreased with exercises.
**Key Words: Step**-aerobic exercise, Antropometric Measurements, Obesity, Blood lipid Parameters.

## INTRODUCTION

It is a well-known fact that blood parameters vary in accordance with the stress, duration and type of exercise. There can be changes in the blood values during and after the intensive exercise caused by the differences such as the state of individual training, environmental factors and nutrition (G.T.Sönmez, 2002). It has been stated in some studies that the physical and physiological features of the organism are improved as a result of training performed three days a week and lasted 20-60 minutes under maximal 60-90% rate (J.Smith, 1990, EL.Fox et all,1999 ).

However, there are controversies about the effects of regular exercises compared with the studies on biochemistry of blood. Beside the studies reporting that there have been positive developments in the biochemistry of blood as a result of acute exercise (A.Berg et al, 1983, B.Foger et al. 1994), there are also studies stating that there have been improvements as a result of not acute but long term exercises (M.Sucic and I.Oreskovic 1995, R.Yanagibori et al. 1993). Moreover, it has been determined with the studies that in order to find out the effects of regular exercises on the lipoproteins, at least 5-week regular exercise is required to have positive effects on the lipid metabolism (R.M.Şekeroglu et all, 1997 ), exercises have positive effects on all body regimes and prevent the occurrence of health problems (F.Turgay et all, 2002).

Physical inactivity is the most important cause of the development of obesity. The possibility of performing tasks with little energy in modern societies and spending more time in front of television and computer lead this unused energy to be accumulated as lipid (G.A. Bray,1989, H.L.Taras et all ,1989, M.S.Buchowski and M.Sun ,1996).

In addition to decreasing weight and blood pressure, exercise also increases HDL-K, and reduces triglycerides and insulin resistance. Exercises have an effect providing euphoria resulting from the secretion of endogen opioid. Although there has not been a precise consensus on the level of required exercise, moderate and regular exercise program is suggested as a part of healthy life not only for the atherosclerotic patients with high risk but for the healthy subjects. Prospective epidemiologic studies have strongly established that sedentary life style

has increased the risk of coroner artery illness (R.S. Pfaffenbarger et all, 1993).

Exercise activities accelerate body metabolisms. 300-500 kilocalories can be spent with an hour walking. Besides diet, medicine and other complements, exercise must be advised. Plasma non-esterified lipid acids are burnt with very low stressed exercise (%25 VO2 max) (walking).as the exercise intensifies, plasma glucose and muscular glycogens are burnt. Triglycerides in the muscles are burnt with moderate exercises (%65 VO2 max).

As the level of total cholesterol and LDL-cholesterol rises, the risk of coronary artery disease increases. Every 1% decrease in the level of LDL-cholesterol lowers 2% the risk of the coronary artery disease occurrence. The accumulation of fat around abdomen, waist and hip increases blood lipids especially LDL/HDL cholesterol rate, blood pressure and triglycerides level, and thus increases the risk of cardiovascular disease (C.Maffeis, 2001, A.Sarria , 2001).

Life quality improves, energy level increases, hobbies develop, mobility boosts, relation with opposite sex improves, emotional state recovers and job performance gets better as result of long term effects of dieting in obesity.

The habit of regular exercise of normal and obese individuals protects them life long from chronic diseases and improves life quality.

## MATERIAL

**The choice of subjects:**

29 obese (O) subjects whose mean age was 41.55 ± 6.72 years, mean height: 159,21 ± 7.18 cm, average body weight (BW) : 85.97 ± 9.60 kg, and 29 overweight (OW) subjects whose mean age was: 35.10 ± 9.11 years, mean height: 160,59 ± 5.20 cm and average body weight (BW) was : 68.55 ± 6.72 kg, total 58 individuals taking part in the step aerobic exercise program run by KOMEK (Konya Vocational Course) were included in the study.

They were classified according to their body mass index (BMI). In classification, the subjects with 25.0 – 29.9 BMI were regarded as overweight (OW) and with 30.0 – 39.9 as obese (O). The subjects were informed about the parameters and their written consents were obtained and then examined physically. The completely healthy individuals who had no diabetic, cardiac and chronic systemic and metabolism diseases, and the diseases affecting immune functions in their clinical examinations and history were included in the study. The subjects were asked to follow their usual normal nutrition habits and to avoid excessive physical activities during the study.

## METOT

**Exercise program and its severity:**

We had the subjects do warm-up exercises for 10 minutes, active step aerobic exercises for 45 min. and finally stretching cooling exercises for 10 min. at the 60-70% severity of their target pulse rate three days a week for 8 weeks, and the rates before and after the exercises were recorded. The severity of the aerobic exercise was determined according to Karvonen protocol.

Pulse Rate (PR)= 60-70% PR(PR max-PR min)+PR

Maximal PR=220- age (K.Özer, 2006).

**Measuring/measurement means:**

Before the subjects started training, the initial tests and at the end of the training after 8 weeks the final tests of height(H), body weight(BW), systolic blood pressure (SBP), diastolic blood pressure (DBP), body fat percentage (BFP), waist and hip rate (WHR), elasticity (E) and body mass index(BMI) were obtained and recorded.

**Anthropometric Measurements:**

The body weights of the individuals included in the study were measured in kilogram (kg) with NAN scale in their casual home clothes with bare feet before the exercises began. Their heights were measured in meters with studio meter and recorded. Body mass index (BMI) was calculated with Weight / height² ($kg/m^2$) formula. The contour of the body was measured in cm. with a fiberglass tape measure which is 0.6cm wide, rigid but flexible. The steps taken during the measurements were mentioned below.

Waist circumference was measured horizontally from the narrowest point of the distance between ksifoid prominence and umbilicus, and hip circumference was measured from the trochanters horizontally as the widest diameter while the legs were 20-30cm apart. Moreover, the values of waist and hip circumferences were divided to each other and waist/hip rat was obtained. The thickness of skin pleat was measured from triceps, biceps, subscapular and suprailiac zones using Holtain T/W Skinfold Caliper. In order to measure the thickness of the skin pleat, the fold between thumb and index finger was separated from the muscular tissue removing the skin with its hypodermic fat tissues and slightly compressing it between the ends of caliper and the values on the dial was read and recorded.

**Total Body Fat Percentage:**

Body density was calculated using Durnin-Womersley formula with triceps, biceps, subscapular and suprailiac SF Total body fat percentage was calculated applying Siri equation to this body density.

Durnin-Womersley Formulas:

Female=1, 1581- (0,0720x (LOG (triceps, biceps, subscapular and suprailiac SF)))( J.V.Durnin and J. Womersley, 1974)

Siri equation:

**Total Body Fat Percentage**= (4.95/body density - 4.50) x 100 Siri (Siri, 1956)

Blood Pressures: the SBP and DBP of the subjects were taken in mmHg with stethoscope and sphygmomanometer (B.N.Roohi, 2008).

**Sit and Reach Test** was used to measure the elasticity of the individuals. The test was repeated twice and the highest score was recorded (K.Tamer, 2000).

**Blood parameters**: Total cholesterol, triglyceride, HDL cholesterol, LDL cholesterol were measured from the fasting blood samples. Laboratory tests were carried out using standard measurements techniques.

**Statistic Analyzes**: The arithmetic means and standard deviations of all statistical data in the study were calculated with SPSS 15.0 packet program. The comparison of test assessments of the subjects with each other before the training and after 8-week training was performed with Paired Samples t-test.

**RESULTS**

Table1: In-group comparison of the measurement values of body composition, blood pressure, elasticity of the overweight and obese individuals before and after 8-week regular exercises.

| | Overweight group (N:29) | | | | Obese group (N:29) | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | T | P | Mean | Std. Deviation | T | P |
| Age (year) | 35.10 | 9.11 | | | 41.55 | 6.72 | | |
| Height(cm) | 160.59 | 5.20 | | | 159.21 | 7.18 | | |
| BW (kg) | 68.55 | 6.727 | 7.376 | .000* | 85.97 | 9.601 | 4.687 | .000* |
| BW 2 (kg) | 66.00 | 6.164 | | | 83.31 | 10.160 | | |
| BMI 1 (kg/m2) | 26.57 | 2.257 | 7.502 | .000* | 33.99 | 3.888 | 4.506 | .000* |
| BMI 2 (kg/m2) | 25.58 | 2.027 | | | 32.92 | 3.960 | | |
| WHR 1(%) | ,7919 | ,05723 | 2,092 | ,046* | ,8411 | ,05645 | 1,047 | ,304 |
| WHR2 (%) | ,7744 | ,04781 | | | ,8316 | ,05206 | | |
| BFP1(%) | 36.12 | 2.739 | 5.448 | .000* | 39.31 | 2.644 | 3.435 | .002* |
| BFP 2 (%) | 33.41 | 3.772 | | | 37.56 | 2.492 | | |
| Elasticity (cm)1 | 28.90 | 5.492 | -2.727 | .011* | 27.62 | 6.925 | -3.225 | .003* |
| Elasticity(cm2 | 30.07 | 5.675 | | | 30.45 | 6.231 | | |

When table 1 was examined; according to the initial and final test values; there was significant difference between the parameters of BW, BMI, BFP, WHR, E, SBP and DBP respectively in favor of the final tests (Table: 1P<0.05*)

TABLE 2: The comparison of in-group biochemical parameters before and after exercises

| | Overweight group (N:29) | | | | Obese group (N:29) | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | T | P | Mean | Std. Deviation | T | P |
| CHOL1 (mg/dL) | 193.72 | 27.736 | -2.328 | .027* | 187.45 | 29.810 | 1.224 | .231 |
| CHOL2 (mg/dL) | 185.28 | 30.491 | | | 193.59 | 35.219 | | |
| TRIGLY 1(mg/dL) | 88.86 | 39.324 | -1.306 | .202 | 127.48 | 66.585 | -3.855 | .001* |
| TRIGLY 2(mg/dL) | 83.34 | 46.528 | | | 101.93 | 45.128 | | |
| VLDL -C1 (mg/dL) | 17.87 | 8.455 | -1.487 | .148 | 26.74 | 12.300 | -5.306 | .000* |
| VDLD-C 2 (mg/dL) | 16.59503 | 9.309 | | | 20.84 | 8.43 | | |
| HDL-C 1(mg/dL) | 40.328 | 11.782 | 3.728 | .001* | 36.865 | 10.090 | 5.303 | .000* |
| HDL-C 2 (mg/dL) | 45.734 | 12.460 | | | 42.586 | 10.880 | | |
| LDL-C1(mg/dL) | 134.648 | 20.487 | -1.160 | .256 | 125.783 | 22.820 | 1.761 | .089 |
| LDL-C 2 (mg/dL) | 130.441 | 26.086 | | | 133.076 | 26.566 | | |

When Table 2 was examined; the initial and final biochemical test values there was considerable difference in the final tests of cholesterol, HDL-C in group K, NTG-C, VDLD-C, HDL-C parameters in group O respectively (Table: 2 P<0.05*).

**DISCUSSION AND CONCLUSİONS**

Physical exercises performed regularly have effects on obesity, cardiovascular system, blood pressure, physical fitness, body fat rate and healthy life of the middle-aged individuals (D.E.Laaksonen et al, 2002; A.S.Ryan et al, 1996; I.S.Ockene et al. 2004; G.Charach et al.2004). There is a strong negative correlation between coronary cardiac disease and the height of plasma HDL concentration. On the contrary, it is a known fact that there is a positive correlation between the high level of LDL and cholesterol concentration and cardiac disease (R.W.Grandyean et all, 1996, W.L. Haskell et all 1992).

It is alleged that regular exercise has positive effects on the lipid profile (A.T.Hostmark et al. 1992, B. Foger, et al 1994). However, there are controversial studies related with the exercise type and duration leading to changes in the lipid metabolism. Considering physical activities and exercise physiology are primarily intended for sportsmen, more detailed researches are required into the exercises for sedentary people. We planned this study for this intention.

B.N Roohi et al. (2008) found in a study carried out on 37 females that BFP was 28.68 ± 5.33 kg and BMI was 26.59 ± 4.02 kg. M.Egana and B.Done (2004) applied (n=7) treadmill, n=(8) elliptical and n=(7) stepper exercises on 24 females for 12 weeks and the groups were given BFP and BW pre tests before starting exercises and they found that the rate of the BFP in the last tests was significantly different in favor of the last tests. Özcan et al. (2004) found no statistically significant difference in the values of BFP, SBP, DBP and E of the sedentary males after 6-week aerobic exercises. F.F.Çolakoğlu and S.Karacan (2006) applied 30 min run-walk training program 3 days a week for 12

There are plenty studies indicating that regular exercises increases HDL-C. M.R.Şekeroğlu et al. (1997) have observed decrease in the level of serum triglyceride and increase in HDL-C after 5-week exercise program. Haskel have found in his study that triglyceride level has decreased mean 18% and HDL-C has increased 16% in the individuals with hypercholesterol as a result of aerobic exercise. Still, there are studies alleging that triglyceride decreases with exercises (G.H.Hartung and S.J.Lawrence, 1993 M.Sucic and İ. Oreskovic, 1995). Besides, there are other studies maintaining that triglyceride does not change (O.O.Oyelola and, M.A. Rufai,, 1993).

A.Bedir et al.(1998) have found that young female doing sports have lower level of total cholesterol and higher HDL-C and LDL-C than sedentary young females. Yet, only HDL-C was significantly lower. Besides, there are some studies weeks and established that the results of BMI and BW in the first and last tests before and after 12 weeks were significantly different in favor of the last tests. However, there was no significant difference in SBP and DBP. Ü.Erbaş (2007) investigated the effects of regular aerobic exercise protocol on 54 middle aged sedentary females for 6 months. He gave total 3 tests; an initial test before training, a middle test 3 months later and a final test 6 months later. After the exercise protocol, it was determined in the initial, middle and final test values of SBP, DBP, BW, BFP, BMI that middle test results were considerably different those of initial test, and the results of the final test were significantly different from both fir and middle test. J.M Saavedra et al. (2007) applied water aerobics on healthy 43.1 ± 9.7 years old middle-aged females twice a week for 8 months. They established that the values of the last tests of BW and BFP after 8-month exercise were significantly different from the initial tests and positive in favor of the final tests. M.E.Kafkas et al.(2009) are of the opinion that12-week regular aerobic and stress exercises have positive effects on BW, BMI, BFP, WHR and blood pressure. Pressue et al. (1997) have found in their study carried out on 97 sedentary male-female subjects that regular aerobic exercises have positive effects on BMI and BFP.E. Zorba et al. (2000) established significant increase in the values of elasticity after the exercises performed 45 min 3 days a week for 8 weeks in the middle-aged sedentary females.

In this study, it has been determined that there is significant difference ($p<0.05$) between the tests of BW, BFP, BMI, WHR, SBP and DBP given after 8-week aerobic-step exercise protocol in favor of the last test. We too have demonstrated in this study that exercises have affected positively BW, BFP, BMI and WHR compatible with other studies.

suggesting that HDL-C does not increase only as a result of exercises (A.K Gupta et al. 1993, O.O.Oyelola and, M.A. Rufai,, 1993).

There are also some studies claiming that LDL-K decreases with exercises (G.H.Hartung, et al. 1993, M.Sucic and I.Oreskovic, 1995). Besides, some studies allege that LDL-K does not change with exercises (F.Giada,et al. 1995, Ç.İşlegen,et al. 1988). We established in this study that HDL-K increased but triglyceride increased in the overweight and obese groups before and after exercises, and LDL-K decreased in the overweight group.

BFP is higher in obese people than in overweight people. Metabolism responds to exercises differently. In severe exercises (%85 VO2 max), fat burning lowers and glycogen burning increases. More energy is spent during the exercises in obese people than in normal people. They are obliged to do more

mechanic work in order to overcome the friction between upper and lower extremities and body. As a matter of fact, it has been determined that net outputs of the exercises have decreased due to the size of the body mass (R .Marks and, JP. Allegrante, 2006, N. Özbey, 2002). It was observed in this study that cholesterol and LDL-K increased in the obese. However, cholesterol and LDL-K decreased in the overweight compatible with the literature.

Usually obesity is accompanied by hypertension, glucose tolerance, triglyceride, total cholesterol, LDL cholesterol and elevated VLDL-cholesterol, HDL-cholesterol decrease (Ç.Erol et al., 1999; WHO, 2000; A.B Bowman and M.R.Russell, 2001, A.Onat, 2003). As it is known, circulation system diseases and the development of complications are caused by the level of blood lipid levels. The main function of LDL-K is to transfer cholesterol from liver to the other tissues. However the task of HDL-K is to carry cholesterol from tissues to blood.

In other words, while HDL-K has protective effects against the development of atherosclerosis and circulation system diseases, LDL-K has the effects of making it easy (N.H.Gisberg, 1994). It is considered that lipoprotein lipase activity, which is responsible for catabolism of triglycerides and has positive correlation with HDL-K, increases with exercises (F.Giada, et al. 1988).

As a result, exercises cause favorable changes in lipids and lipoproteins. Furthermore, diet program in addition to exercise program will provide more prolific results with obese people. Because surplus weight brings about extra exercise load and this normal exercise for overweight people turns out to be strenuous exercise and thus, metabolism responds this severe exercise reverse reaction. Consequently, while benefit is expected from the exercises, severe exercises pose risk for obese people. Exercise program accompanied with diet makes the individuals feel psychologically good, healthy and safe enabling them to escape from atherosclerotic risk factors of obesity. It has been proved with the obtained results that the negative effects of sedentary living on individuals are decreased with exercises.

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