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THE EFFECT OF AEROBIC EXERCISE AND WEIGHT-LIFTING PLUS AEROBIC EXERCISE ON BLOOD PRESSURE AND BLOOD PARAMETERS IN SEDENTARY FEMALES

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Abstract:
The purpose of this study was determined the effects of 12 weeks aerobic exercise and weight-lifting plus aerobic exercise on blood pressure, blood serum lipids and lipoproteins of sedentary females. Thirty seven sedentary females (Aerobic group mean age: 44.66 years, Weight-Lifting + Aerobic group mean age: 40.80 years) participated in this study. Before initiate the exercise their blood samples, peripheral measurements and thickness of skinfolds were taken. The subjects participated in aerobics group (n = 21) and weight-lifting plus aerobics group (n = 16) 3 times in a week through one hour. The intensity of exercise was increased gradually and their heart rates were raised up to 130-140 rates per-minute and of the tension. Two way ANOVA was used in this study. There were no significant difference between two different type of exercise groups ($p>0.05$) fırst group (aerobic); HDL-C (High Density Lipoprotein-Cholesterol) 18.12%, second group (weight-lifting plus aerobic) %28.23, there were a significant increase among them ($p<0.01$). Total cholesterol decrease 13.97% in group of aerobic exercise and it decreases 7.13% in group of weight-lifting plus aerobic. Triglyceride decreases 31.74% in group of aerobic exercise; it decreases 19.53% in group of weight-lifting plus aerobic exercise. Level of LDL-C was decreased 28.11% in group of aerobic exercise, 21.46% in group of weight-lifting plus aerobic. When we consider exercise types, the only flats of type is on triglyceride and APO B, ($p<0.05$), there were effects of exercise duration is on HDL-C, LDL-C AND Total cholesterol ($p<0.01$). There were effects of type and duration of exercise on TC, TG, HDL-C, LDL-C, APO A1, and APO B ($P<0.01$). In this study,

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regular aerobic and weight-lifting plus aerobic exercises have been shown to reduce the risk of cardiovascular disease in sedentary women and a significant improvement in systolic and diastolic blood pressures as well as reduction of cholesterol, triglyceride, and of LDL-C. Level of HDL-C was increased in both of exercise groups.

Keywords: aerobic exercise, weight-lifting, blood pressure, blood parameters, sedentary females

1. Introduction

The lipid and lipoprotein abnormalities play a major role in the development and progression of coronary artery disease and participate in many physiological and biochemical events in human body. Benefits include improved serum lipid profiles, blood pressure and inflammatory markers as well as reduced risk of stroke, acute coronary syndrome and overall cardiovascular mortality (Skoumas et al., 2003; Cinar, 2010; Shiraev and Barclay, 2012; Baydil, 2013). Human is dynamic existence and should move to survive. If the movement is performed with some rules and discipline, in order to purpose, ensure our physical and physiological health (Baydil, 2013; Yılmaz, 2016). Recently, number of women who exercise for fitness, except from professional's athletes, are lower than number of women who don't perform any sport activity (Özdal and Bostancı, 2016). Sport activity can improve the total and regional fat mass of women (Özdal et al., 2016). Because of modern life physically motionless effects every aged of people. The problems such as; hypertension, obesity, muscle atrophy, postural disorder and inadequate cardiovascular system caused by lack of exercise and sedentary life style or harmful habits such as smoking. Because of differences in percentage body fat according to sex difference and inadequate possibility or could not find the leisure time for their own life health female population affected seriously from lack of exercise than male counter parts. These results encourage many researchers to make investigation to find out effects of exercise to females physical and philological health. Finding about Coronary Heart disease (CHD) in active people is really; and in older ages the rate of the mortality is less than sedentary people (Fripp et al, 1985; Hesgel et al., 1988; Saçaklı, 1992; Mayda, 2016; Pancar, 2017; Özdal et al., 2017).

The importance of regular physical activity is emphasized in order to maintain a healthy life and to have both preventive and healing effects for many diseases and injuries (Hillsdon et al., 2005; Brown et al., 2012; Yılmaz, 2017; Vural, 2017; Biçer et al., 2015).

When literature was reviewed about effects of exercise on plasma lipids, lipoproteins, blood pressure and heart rates, results were indicated that moderate and low ıntensıty exercıse, ıf ıts performed adequate tıme perıod (at least 6-8 weeks) cause decrease in body weight and body fat ratıo, additionally decrease serum TC level (Dufaux et al., 1982). In the most studies, it has been noticed that regular exercise affects levels of lipid and lipoprotein positively and it is salutary for the heart. It has been identified that regular exercise reduces total blood cholesterol, serum triglycerides and LDL-C and increases high-density lipoprotein cholesterol HDL-C (Champe at al, 1997; Imamoğlu, 2014).

It is known that cardiovascular risk factors are greatly improved through the cardiovascular changes that occur with regular and long-term exercise (Çicek et al., 2017). Cardiovascular disease (CVD) in women is the leading cause of mortality in the United States, and less than optimal lipid and lipoprotein levels are major risk factors for CVD (George at al, 2004). There is consolidated evidence that physical activity exerts beneficial effects on several chronic conditions and longevity, on the basis of its proposed biological effects, especially on lipid profiles (Lippi et al., 2006). Aerobic exercise is efficacious for increasing High density lipoprotein (HDL-C) and decreasing Total Cholesterol (TC), Low density lipoprotein (LDL-C), and Triglyceride (TG) in women (George at al, 2004). High-intensity aerobic training results in improvement in high-density lipoprotein cholesterol (Tambalis et al., 2008).

At the end of aerobic exercise, hearts rates decrease and (O_2) need of heart muscle and heart activity become economical. These events show increase of HDL-C, decrease of LDL-C and increase protective effects to arteriosclerosis (Imamoğlu et al., 1998). Cardiovascular disease (CVD) is the leading cause of death worldwide (Cutler, 2006). Low blood levels of high-density lipoprotein cholesterol (HDL-C) are an independent risk factor for CVD (Franceschini, 2001; Boden, 2000). Cross-sectional data provide strong evidence that people who are more physically active have higher HDL-C levels (Drygas et al., 2000). Thus, the value of regular aerobic exercise in increasing serum HDL-C level and in reducing the risk of CVD has received widespread acceptance (Rippe et al., 1988). In contrast, results of aerobic exercise studies vary considerably, depending on the exercise program (duration, intensity, or frequency) and characteristics of subjects at baseline (Crouse et al, 1997).

In this study we exanimated effect of 12 weeks two different types of exercise (aerobic and weight-lifting plus aerobic) on blood pressure and blood serum parameters on middle aged females.

2. Material and Methods

Thirty seven healthy sedentary females (mean age: Aerobic group, 44.66 years; and Weight-Lifting + Aerobic group 40.80 years) participated in this study as a subject. Subjects were divided in to two group; aerobic exercise (n = 21) and weight-lifting plus aerobic exercise (n = 16). Both groups participate the training during 12 weeks period with one hour training session 3 days in a week period. Intensity of training increased slightly and heart rates were 130-140 rates in a minute at the end of exercise.

At the beginning of the study, blood samples were taken from all subjects before breakfast in the morning. HDL-C, LDL-C, TC, TG and polyproteins I (APO A1 and APO B) levels were determined these blood samples. The blood pressure and heart rates were measured by Digital Blood Pressure Meters ALP K2 777. At the end of 12 weeks period, all measurements were repeated.

All statistical data obtained from the study was calculated with licensed SPSS 22.0 packet program. Means and standard deviation were calculated with the program. Test of normality for the data were made by Shapiro-Wilk test. The difference between pre-test, post-test results of group was determined by two way ANOVA. The types of exercises are aerobic and weight-lifting plus aerobic; the duration of exercise is between pre-test and post-test. Statistical significance were accepted as and $p < 0.05$, $p < 0.01$.

3. Results

Table 1 shows physical parameters of pre-test and post-test results sedentary females who participated to our study, and table 2 shows alteration rates of blood parameters, table 3 shows blood pressure and heart rates alteration, and two way ANOVA test results of blood parameters exercise duration and types are determined in Table 4.

Table 1: Physical parameters of females before and after exercise who performed aerobic exercise and weight-lifting plus aerobic exercise

	Aerobic Exercise		**Weight-Lifting + Aerobic**		**Difference**	
Variables	Before 3 months mean	After 3 month mean	Before 3 month mean	After 3 month mean	Aerobic	Weight-lifting plus aerobic
Age (year)	44.66	-	40.8	-	-	-
Height (cm)	158.45	-	157.3	-	-	-
Body Weight (kg)	72.30	66.43	69.36	63.44	-8.12	-8.54
BMI (kg/m²)	29.36	26.11	29.04	25.14	-11,07	-13,43

Table 2: Alteration Percentage of Blood Parameters of Sedentary Females

	Aerobic Exercise		**Weight-Lifting+ Aerobic**		**Difference**	
Mg/100	Before 3 months mean	After 3 months mean	Before 3 months means	After 3 months mean	Aerobic	Weight-lifting plus aerobic
Cholesterol	221.2	190.3	196.9	182.5	-13.97	-7.32
Triglyceride	126.35	86.25	91.89	73.95	-31.74	-19.53
HDL-C	35.76	42.30	34.43	44.15	18.29	28.23
LDL-C	118.15	84.94	111.92	87.91	-28.11	-21.46
APO A1	153.21	137.94	151.08	131.07	-9.97	-13.25
APO B	126.14	109.84	108.81	100.60	-7.93	-7.55

Decrease and increase percentage of blood values of females (Table 2); cholesterol decrease 13.97% in group of aerobic exercise and it decreases 7.13% in group of weight-lifting plus aerobic. Triglyceride decreases 31.74% in group of aerobic exercise; it decreases 19.53% in group of weight-lifting plus aerobic exercise. Level of HDL-C was increased in both of exercise groups. This increase is 18.29% in group of aerobic exercıse, 28.23% in group of weight-lifting plus aerobic. Level of LDL-C was decreased 28.11% in group of aerobic exercise, 21.46% in group of weight-lifting plus aerobic. APO A1 was decreased 9.97% in group of aerobic exercise, 13.25% in group of weight-lifting plus aerobic exercise. APO B was decreased 7.93% in group of aerobic exercise, 7.55% in group of weight-lifting plus aerobic exercise.

Table 3: Alteration percentage of the blood pressure and heart rates of sedentary females

	Aerobic Exercise		**Weight-Lifting + A**		**Difference**	
Variables	Before Exercise mean	After Exercise mean	Before Exercise mean	After Exercise mean	Aerobic	Weight-lifting plus aerobic
Systolic (mmHg)	119.05	108.15	113.16	100.29	-9.16	-11.38
Diastolic (mmHg)	76.34	73.42	74.57	69.64	-3.83	-6.61
Heart rate (bpm)	89.58	77.22	84.20	72.29	-13.8	-14.14

According to Table 3, in generally there is no significant percentage difference between the groups. The sistolic blood pressure was decreased 9.16% in group of aerobic exercise, 11.38% in group of weight-lifting plus aerobic. Diastolic blood pressure was decreased 3.83% in group of weight-lifting plus aerobic, 6.61% in group of aerobic exercise. Heart rate was decrease 13.8% in group of aerobic exercise, 14.14% in group of weight-lifting plus aerobic.

Table 4: Two way ANOVA results of effects of exercise types and duration to the blood parameters

Variables	Source of Variation	Sum of Square	Df	Mean of square	F	Level of signficant
Cholesterol	**Main effect**	16574.67	2	8236.08	10.52	.000**
	Type of Exercise Period of Exercise	6010.83	1	6021.83	7.770	.006*
		10353.33	1	10451.33	13.13	.001**
Triglyceride	**Main effect**	17175.23	2	8625.61	6.61	.003*
	Type of Exercise Period of Exercise	7229.53	1	7239.53	5.58	.021*
		10026.70	1	10036.70	7.69	.007*
HDL-C	**Main effect**	807.41	2	403.20	10.40	.000**
	Type of Exercise Period of Exercise	2.30	1	2.41	.62	.804
		805.00	1	805.00	20.69	.000**
LDL-C	**Main effect**	724.67	2	3643.83	9.49	.000**
	Type of Exercise Period of Exercise	1853.62	1	1853.62	7.38	.011*
		5432.05	1	5430.05	16.32	.001**
APO A1	**Main effect**	7195.79	2	3599.39	12.53	.000**
	Type of Exercise Period of Exercise	1952.74	1	1952.74	6.71	.012*
		5244.05	1	5242.05	17.86	.000**
APO B	**Main effect**	4271.03	2	214.01	4.09	.023*
	Type of Exercise Period of Exercise	2592.770	1	2592.77	4.92	.031*
		1678.26	1	1675.26	3.05	.081

**level of significant accoding to .001 *Level of significant according to .05

Effect of type and period of exercise on blood cholesterol found significant (p<0,01). It is obvious that, more effect of period of exercise than type of exercises was significant (p<0.05 and p<0.001). While type and period of exercise is effecting is effecting HDL-C and LDL-C significant (p<0.01), only Period of exercise can it effect on HDL-C them (p<0.05). Significant of APO A1 is same as significance LDL-C type and period of exercise can be significant, together type of exercise and period of exercise is signifıcant (p<0.01). The only period of exercise is not significant effect on APO B. Because of duration and type of exercise are significant (p<0.05), (Table 4) when they controlled together.

4. Discussion

The changing of plasma lipid can be affected by endogenic sex hormones, meanwhile reducing body fat mass can be affected by physıcal activities after training (Sacks and Dzau, 1986). Because of this working which is about enough density and strength

exercise, HDL-C level raises, LDL-C level falls down (Massarei and Pyke, 1982). We accept that physical activity changes lipid and lipoprotein profiles (Crigui, 1986; Stein et al., 1990).

Several studies have shown that exercise can cause improving effect on serum HDL-C, LDL-C and TG (Güllü et al., 2013; Boardley et al., 2007) while some other studies didn't found any significant differences after exercises (Stefanick et al., (1998; Thomas et al., 2000).

Çiçek et al (2017) found 16 weeks of step-aerobic and core exercise showed significant changes of inflammatory and lipid markers with cardiac dimensions and had favorable effects on both left ventricular systolic function. Massarei et al (1982), found that long period of exercise increases HDL-C with aerobic capacities increase and reduce heart illness risk. In this study for a month, females who are obese, rode bicycle made usual, special and passive gymnastic. At the end they couldn't found significance, triglyceride, total cholesterol, LDL-C was decreased, HDL-C was increased. But when we think of effect of exercise which are on plasma lipid and lipoprotein we see that exercises which have not low and low density and enough period (6-8 weeks) reduce body mass, body fat percentage and total serum cholesterol (Dufaux et al., 1982). Trainings which have low and not low levels provide real significant fall (Franklin et al., 1984).

Ready et al. (1995), found to reduce; remaining cholesterol of women after menopause with walking program. They compared control group and walking group and they determined increase HDL-C and to decrease in total cholesterol and triglyceride too much.

Yanagibari et al. (1993), investigated 12 weeks walking effect of exercise on serum lipids lıpoproteins and apoliproteins of middle aged female. They compared to part of two females groups where walking. And they determıned both groups to ıncrease ın HDL-C and to decrease in APO A1, APO B, total cholesterol and LDL-C.

Comparisons between intensities of aerobic exercise programs resulted in favorable effects only for high intensity. The most frequently observed alteration was an increase in the high-density lipoprotein cholesterol, whereas reductions in triglycerides, total cholesterol, and low-density lipoprotein cholesterol appeared less often (Tambalis et al.2008). Imamoğlu et al (1998), investigated to effect short time exercise on serum lipids of sedentary females before and after menopause and they determined to increase in HDL-C (%27.76) and to decrease in LDL-C (20.06%), Total cholesterol (12.96%), triglyceride (27.76%) and apoliproteins. Koca (2017) in one study was finding on the effects of 12 weeks aerobic exercise 13.9% in cholesterol, 25.3% in Triglyceride, and 22.07% in LDL-C have been registered. In this study, after 3 month exercise present

results show that; Amount of cholesterol decreased in first group (aerobic exercise) from 221.2 to 190.3 (13.97%) in second group (aerobic exercıse plus weight-lifting) from 199.9 to 182.5 (7.32%) triglyceride decreased in 1 st group from 126.35 to 86.25 (31.74%) in 2nd group from 91.89 to 73.95 (19.53%), LDL-C decreased in 1 st group from 118.15 to 84.94 (28.11%) in 2nd group from 111.92 to 87.95 (21.46%). Level of HDL-C was increased in both of exercise groups. This increase is 18.29% in group of aerobic exercise, 28.23% in group of weight-lifting plus aerobic.

Coroner heart disease risk decrease %1.5 cause of to decrease %1 of HDL-C so that, in our study, decrease of LDL-C and increases of HDL-C have decreased risk of CHD (Cardiovascular Heart Daises). Our study concordant Yanagibori et al., Imamoğlu et al and Koca studies. In our study, performing aerobic and weight-lifting plus aerobic exercise groups changing percentage of serum lipids and lipoproteins resemble to each other and before the exercise there is no difference, after the exercise all variables decreased significantly.

In present study, at the end of 12 weeks exercise, decrease of cholesterol is normal ($p<0.01$) type of exercise and time of exercise are meaningful to each effect from statistical direction on the cholesterol ($p<0.01$). In our study, time of exercise effect to cholesterol, triglyceride, HDL-C, LDL-C, APO A1. In our study, Type of Exercise not effect on the HDL-C. Main effective each effect of type and of exercise is manful on blood parameters.

Most of studies about blood pressure and heart rate, claim that the exercise decreased the blood pressure and heart rate (Nelson, 1986; Parker et al., 1991; Suzuki et al., 1996, Wilmore et al., 1996). Parker et al. (1996), investigated heartrate, systolic blood pressure during submaximal walking on the female subjects. During 16 weeks, 3 times 1 hour study at a week finally average of heart rate decreased from 135-120 rate/minute to 108-104 rate/minute. So that, systolic blood pressure decreased. Wilmore et al. (1996), made same study. They investigated 62 subjects at certain times of day and they found that, the aerobic exercise decreased heart rate and blood pressure. They determined that moderate strength aerobic exercise saved blood pressure in daily stresses of life (Brownley et al., 1996). Koca (2017) found at end of the activity 12 weeks aerobic exercises, decrease effects of blood pressure, heart beats and blood parameters and cardiovascular system in middle-aged sedentary females.

In these study findings, the sistolic blood pressure was decreased 9.16% in group of aerobic exercise, 11.38% in group of weight- lifting plus aerobic. Diastolic blood pressure was decreased 3.83% in group of weight-lifting plus aerobic, 6.61% in group of aerobic exercise. Heart rate was decrease 13.8% in group of aerobic exercise, 14.14% in

group of weight-lifting plus aerobic. This reduction in heart rate variability can be considered in significant.

In this study, regular aerobic and weight-lifting plus aerobic exercises have been shown to reduce the risk of cardiovascular disease in sedentary women and a significant improvement in systolic and diastolic blood pressures as well as reduction of cholesterol, triglyceride, and of LDL-C. Level of HDL-C was increased in both of exercise groups.

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