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Effects of Resistance Exercises on Body Composition and Some Biochemical Parameters

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Abstract

Exercise has many positive effects on the human organism. In this study, the effects of resistance exercise program, which is applied regularly for eight weeks, were investigated on body composition and some biochemical values. Twenty-four male volunteers participated in the study group. The participants were randomly divided into two equal groups: control and resistance exercise groups. While the participants in the control group attended only practice lessons in the faculty, the exercise group participated in the resistance exercise program 2 days a week for eight weeks in addition to the practice lessons. Body compositions of the participants were measured before and after the program and blood samples were taken. Thus, body weight, body fat percentage, mass body fat, Body mass index (BMI), AST, ALT, GGT, cholesterol, triglyceride, HDL, LDL and VLDL cholesterol levels of the participants were determined. The data obtained were analyzed using SPSS software. As a result of statistical analysis; there was difference only GGT value of the control group ($p<0.05$). In the exercise group, body weight, body fat percentage, mass body fat, BMI, AST, ALT, GGT values were found to be significant differences ($p<0.05$). In conclusion, it was determined that resistance exercise program applied for eight weeks had significant effects on body composition and liver enzymes. However, although there are some minor changes in blood lipids, these changes are not statistically significant. It can be said that resistance exercises can be beneficial on liver enzymes and body composition but eight weeks resistance training may not be enough to change the blood lipid profile.

Keywords: exercise, strength, body composition

1. Introduction

Exercise has long been a key factor in cardiac rehabilitation. The most notable benefit of exercise is cardiorespiratory fitness (Mitchel et al., 2019). Cardiorespiratory fitness is generally defined as the maximum oxygen uptake ($\dot{V}O2max$) of the individual. Vo2max refers to the integration of the uptake, transport and use of oxygen for metabolic processes in the pulmonary, cardiovascular and muscular system (Poole & Jones, 2017). It is emphasized that exercise to be performed throughout life can prolong healthy life and is important for protection from chronic diseases. It is also reported to improve the quality of life (Ruegsegger & Booth, 2018). Aerobic exercise has benefits such as increased maximal cardiac output, increased peripheral oxygen distribution, decreased sympathetic hyperactivity, increased exercise capacity, and increased daily activity performance. Resistance exercises have benefits such as increased muscle strength, increased bone mineral density, increased lean body mass and decreased blood pressure (Tav, 2018). Body composition reflects nutritional status and provides more accurate information about the body's adiposity than the commonly used body mass index (BMI). The significant differences between individuals in fat mass (FM) and fat-free mass (FFM) gain make it important to determine the body composition (Pellonpera et al., 2019). In general, exercise causes a healthy body composition. However, especially in overweight and obese individuals, short or long-term exercise helps to reduce body fat (Westerterp, 2018). Elevated serum levels of liver enzymes can be used to assess the degree of liver damage (Akyuz, Kara, Kar, Hacioglu, & Ustuner, 2018). It is stated that there were significant changes in liver enzyme levels especially aspartate amino transferase (AST) and Alanine amino transferase (ALT) due to exercise (Cinar et al., 2018a). Lipid and lipoprotein markers, which are another health-related factor, are associated with circulatory diseases, myocardial infarction and stroke (Yaghi & Elkhind, 2015). Low Density Lipoprotein (LDL) cholesterol lowering can prevent large artery atherosclerosis. Elevated High Density Lipoprotein (HDL) cholesterol may also be beneficial in preventing problems in small arteries (Hindy et al., 2018). It has been stated in some research results that exercise leads to positive results on lipoproteins that are so closely related to health (Cinar, Akbulut, Kilic, Ozdal, & Sarikaya, 2018b; Cinar, Akbulut, Pancar, & Kilic, 2019). Based on this information, it is aimed to investigate the effects of regular resistance exercise programs on body composition, liver enzymes and blood lipids.

2. Material and Method

2.1 Participants

Twenty-four men attending the sports sciences faculty who do not have the habit of doing sports regularly participated in the study. The participants were randomly divided into 2 equal groups. The participants were informed about the study before starting the research. The study was conducted in accordance with the Declaration of Helsinki. The participants signed the voluntary consent form. No additional diet program was administered to the participants.

2.2 Research Groups

Control group (n: 12)

The control group participated in the practice sports lessons they received in the faculty 2 days a week for eight weeks. They were also not involved in any exercise or physical activity program.

Resistance Exercise Group (n: 12)

The participants in the resistance exercise group participated in the resistance exercise program two days a week for eight weeks in addition to the practical lessons they had taken.

2.3 Exercise Program

The exercise group received a resistance exercise program of 60–70% intensity of 1RM (Maksimum Repetition) 2 days a week for eight weeks. 1 RM updated at every 2 weeks. Exercises determined in each training unit were performed on 12 repetitions and 3 sets. Before the exercises, 15 min jog and 5 min streching were done for warm-up. Bench press, Dumbbell pullover, Barbell curl, Arm curl, Lat pull down, Cable row seated (lat row), Triceps barbell press, Shoulder press, Leg press, Leg curl exercises were applied in determined intensity and set number. The exercise program was completed with cooling for 15 minutes.

2.4 Body Composition Analysis

To determine the body composition of the participants, AVIS 333 brand Bioelectric Impedance device was used. Participants only came to the device with shorts on. With this method, body weight, percentage of body fat (PBF), mass body fat (MBF) and body mass indeks (BMI) values of the participants were calculated.

2.5 Biochemical Analysis

Blood samples of the participants were taken at rest using biochemistry tubes with gel. Blood samples were centrifuged at 4000 rpm for 10 minutes. Subsequently, AST, ALT, GGT, Cholesterol, Triglyceride, HDL, LDL and VLDL cholesterol levels in serum samples were analyzed using auto analyzer.

2.6 Statistical Analysis

SPSS software was used in the analysis of the data obtained. Shapiro-Wilk test was used to test the distribution of data. Mean, standard deviation and percentage were used as descriptive statistics in the presentation of the data. In order to compare the pre-test and post-test values of the participants, t-test was used in the dependent groups. Significance level was accepted as $p<0.05$.

3. Results

Table 1. Body composition values of research groups

Variables	Groups	Pre test	Post test	Change (%)	t	p
		Mean±Sd	Mean±Sd			
Weight (Kg)	Control	79.13±4.76	80.76±3.91	2.05	-2.871	0.103
	Exercise	78.35±8.26	80.05±7.47	2.16	-3.176	0.016*
PBF (%)	Control	20.40±3.42	21.56±3.42	5.68	-2.339	0.144
	Exercise	22.80±3.37	21.23±3.23	-6.88	-2.823	0.026*
MBF (Kg)	Control	16.13±2.75	17.36±2.13	6.62	-2.549	0.126
	Exercise	18.32±3.70	16.75±3.71	-8.56	-3.146	0.016*
BMI (m/kg^2)	Control	23.13±0.32	23.66±0.23	2.29	-2.621	0.120
	Exercise	23.06±1.66	23.71±1.72	2.74	-2.977	0.021*

Note. * There is a significant difference between the tests, Sd: Standard Deviation.

When Table 1 was examined, there were no significant differences between the pre- and post-test values of the control group (P>0.05). In the resistance exercise group, there were significant differences in all parameters (p<0.05).

Table 2. Some Biochemical Values of Research Groups

Variables	Groups	Pre test	Post test	Change (%)	t	p
		Mean±Sd	Mean±Sd			
AST (U/L)	Control	23.50±3.69	16.50±5.19	-29.78	2.378	0.098
	Exercise	27..44±8.96	17.44±3.57	-36.44	3.328	0.010*
ALT (U/L)	Control	21.25±1.50	17.25±4.50	-18.82	2.828	0.066
	Exercise	25.33±6.50	19.67±8.06	-22.34	2.655	0.029*
GGT (U/L)	Control	18.25±2.98	11.50±4.35	-36.98	5.400	0.012*
	Exercise	21.11±4.72	16.33±6.96	-22.64	3.562	0.007*
Cholesterol (mg/dL)	Control	146.67±26.50	147.67±23.07	0.68	-.222	0,845
	Exercise	158.00±25.90	154.14±23.89	-2.44	-.638	0.547
HDL (mg/dL)	Control	36.67±3.51	38.93±10.75	6.16	-.530	0.649
	Exercise	37.00±5.09	38.71±9.43	4.62	-.774	0.468
LDL (mg/dL)	Control	79.13±13.62	93.00±23.64	17.52	-2.388	0.140
	Exercise	82.68±11.72	101.42±28.44	22.66	-1.967	0.097
VLDL (mg/dL)	Control	30.86±13.65	24.80±16.41	-19.63	3.073	0.092
	Exercise	34.45±18.69	29.42±18.53	-14.60	1.255	0.256
Triglyceride (mg/dL)	Control	124.00±82.07	154.33±68.29	24.45	3.073	0.092
	Exercise	172.29±93.47	147.14±92.68	-14.59	1.255	0.256

Note. * There is a significant difference between the tests, Sd: Standard Deviation.

When Table 2 is evaluated; While there was a difference only GGT values in the control group, there were significant differences statistically in AST, ALT and GGT values in the resistance exercise group (p<0.05).

4. Discussion

In this study, the effects of regular resistance exercise program were investigated on body composition, liver enzymes and lipoproteins. As a result of the research, it was determined that resistance exercises affect body composition. In particular, it has been shown that there is a decrease in body fat percentage and mass body fat. However, the increases in weight and BMI are thought to be caused by increase of muscle mass. In a study conducted in this field, elastic resistance exercises have positive effects on body composition in elderly women with sarcopenic obesity (Liao et al., 2017). In a study supporting our research results, a resistance exercise model with an intensity of 65–80%, which included 6 exercises for 5 days a week for 8 weeks, was found to cause significant changes in body fat percentage, fat weight and BMI values (Kim et al., 2016). In another study, it has been shown that resistance exercises which are applied 3 days a week for 12 weeks increase the body weight in active individuals for recreational purposes (Kirmse, Oertzen-Hagemann, de Marées, Bloch, & Platen, 2019). It is emphasized that 12 weeks of combined exercises (aerobic + resistance) applied to middle-aged obese women lead to positive improvements in body composition (Cho et al., 2018). Current research results show that resistance exercises generally have positive effects on body composition. Resistance exercises have positive effects on liver enzymes. Decreases in AST, ALT and GGT levels were observed with the exercises. It has been reported in a study that resistance exercise program applied in 3 sets, 10 repetitions of 60–70% intensity for 22 weeks in non-alcoholic liver patients caused a decrease in ALT level just as results of present study (Yao et al., 2018). In a study conducted in experimental animals, AST and ALT levels were lower than the control group after 5 days of strength training for 6 weeks (Wei et al., 2019). In another study, 40–70% of intensity resistance exercise program, which was applied 3 days a week for 8 weeks, was found to decrease AST and ALT levels in overweight individuals (Gholami, 2018). In a different study, it was found that exercise program applied for 12 weeks decreased AST values in obese individuals and did not change much in ALT (Omori et al., 2018). This study has shown that Resistance exercises have positive effects on blood lipids in general. However, these effects were not statistically significant. In a study conducted in this field, it was found that a resistance exercise program consisting of 12 exercises 3 days a week for 8 weeks had positive effects on blood lipids as in the current research results, but this effect was not statistically significant (Schroeder, Franke, Sharp, & Lee, 2019). As a result of a different study, it was reported that there were no statistically significant differences in blood lipids except cholesterol after 24 weeks of resistance exercises in physically active healthy male subjects (Eklund et al., 2016). The effect of resistance exercises with different supplements on blood lipids for 8 weeks was investigated in trained individuals with an average age of 21.4 years. In conclusion, although there were positive changes in blood lipids in the placebo group, these differences were not statistically significant (Lockwood et al., 2017). As a result, it can be said that resistance exercises have positive effects on body composition, liver enzymes and blood lipids, which are generally associated with health as well as other exercise types. However, it is thought that the factors, such as the duration, the intensity of the exercise and the population, which is played to the important role in the changes that may occur.

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