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INVESTIGATION OF THE EFFECTS OF CARDIOVASCULAR AND AEROBIC EXERCISES ON BODY COMPOSITION AND BLOOD PARAMETERS IN SEDENTARY WOMEN

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Abstract:
Aim: The aim of this study is to investigate the effects of 12-week cardiovascular and aerobic exercise on body composition and some blood parameters in sedentary women.
Materials and methods: The selected 48 sedentary women attending B-fit sports hall in Giresun province participate in this study. The sedentary women are splitted into two groups and subjected to the cardiovascular (n = 24) and the aerobic exercises (n = 24) one hour three times a week. The intensity of the exercises is arranged according to the case that the heart rate is about 130-140 per minute. Measurements are made by adopting the same measurement methods before and after 12-week exercise thereafter the data are presented in tables using "student's t-test" and "paired samples statistics".
Results: Results have revealed that the values of body weight, body mass index, body fat percentage, cholesterol, triglyceride, low density lipoprotein (LDL-C) and waist-to-hip ratio of the subjects are decreased by the end of the 12-week workout. In addition, the high density lipoprotein (HDL-C) values of subjects are found to be increased in both groups ($p < 0.05$ and $p < 0.001$). **Conclusion:** The change in cardiovascular exercise group has been more significant in comparison with the aerobic exercise group. The cardiovascular and aerobic exercises performed in sedentary women have been found to trigger positive changes in body composition and blood parameters.

Keywords: exercise, blood parameters, aerobic step, Bosu Cardio Traning

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1. Introduction

Although benefits of regular physical activities are known, recent researches show that physical activity levels of individuals were found to be less than the recommended levels.

In the 20th century, as technologies and industrialization continue to progress at a rapid pace, conditions of life have changed in many countries. The sedentary lifestyle, which is potential a negative factor determining these changes causes the development of diseases such as cardiovascular disease, diabetes, obesity, some types of cancer and muscular-skeletal problems (Atan et al., 2012). There is substantial, consistent and strong evidence that physical activity is a deterrent for developing many forms of cardiovascular disease (Imamoğlu et al., 2005). Cross-sectional studies support a significant incremental effect of exercise on blood lipids and lipoproteins in women. Observational data provide stronger evidence for lower TG and higher HDL-C levels in physically active individuals (Durstine et al., (2001); Fritz, (1987).

Cardiovascular disease (CVD) is the leading cause of death worldwide. 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 (Williams, 1996; 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 (eg, duration, intensity, or frequency) and characteristics of subjects at baseline (Crouse et al., 1997). Cardiovascular disease 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. 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).

When literature about effects of exercise on plasma lipids, lipoproteins was reviewed, the results indicated that moderate and low intensity exercise, if its performed for an adequate time period (at least 6-8 weeks), cause a decrease in body weight and body fat ratio, additionally, a decrease of serum total Cholesterol level (Dufaux, 1982). These events show an increase of HDL-C, a decrease of LDL-C and an increase of the protective effects in arteriosclerosis (Imamoğlu et al., 1998, Koca, 2017). 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).

It is commonly suggested that the regular exercise positively affects plasma lipid profiles. However, any change in the plasma lipid profile differs in relation to the type and level of exercise. Physically fit and active individuals tend to have lower levels of lipids than less active individuals (Baygutalp et al., 2016). Koca in one study (2017), aerobic exercise was effective in female with initially high total cholesterol, triglyceride, and LDL-C levels. Çicek et al., (2016) in one study, it was found that 3 months regular cardio exercise decrease the risk of cardiac vascular diseases. It has seen that exercises have a positive effect on lipid and lipoprotein metabolism and CVD. Programs that incorporate multisensory balance training have a potential to induce adaptive responses in neuromuscular system that enhances postural control, balance and functional ability of women. The training using BOSU may help improve static balance and functional ability in women (Nepocatych et al., 2016). We are wondering about the effect of the Bosu cardio exercise in the same phase as the aerobic step exercise.

In this study was to examine the effects of 10 weeks Bosu cardio and aerobics step exercise on body composition and some blood parameters in sedentary female.

2. Material and Methods

This study was chosen as a sedentary women subject to continue in B-fit sports hall in 2017-2018 in Giresun. This study investigated a group of 48 sedentary women (Bosu Cardio average age 37.26 and aerobic step 35.94). The exercise groups; Bosu Cardio (n=24) and Aerobics Step (n=24) who participated in the study were scheduled for indoor and outdoor activities for an hour a day and three days a week for a period of 12-week exercise program.The intensity of the exercises was decreased gradually and their heart beats were raised up to 130-140 per minute at the end of sessions.

Bosu group exercises included Bosu Step Ups, Bosu Burpees, Bosu Jogging, Bosu Shuffles, Bosu Jumping Jacks and Bosu Mountain Climbers. Aerobic steps group were composed from general aerobic routines. We also excluded from the studies subjects having specific medical problems in which treatments such diets or drugs assumptions would influence the effect of exercise (egg, history of cancer, hemodialysis treatment, and coronary heart disease).

At the beginning of the study, blood samples were taken from all subjects before breakfast in the morning. HDL-C, LDL-C, Total cholesterol and Triglyceride levels were determined from these blood samples. Triglyceride (TG), Total Cholesterol (TC), High density lipoprotein (HDL-C) and Low density lipoprotein (LDL-C) levels were determined by using a Hitachi 717 auto analyzer. The blood pressure and heart beats were measured by Digital Blood Pressure Meters ALP K2 777. At the end of 12 weeks perıod, all measurements were repeated. Body composition was measured by Tanita

TBF 305 bioelectric impedance analyzer. The waist and hip circumferences were measured using a measuring tape. BMI and waist hip ratio were calculated by standard formulas.

Waist to hip ratio = Hip circumference / Waist circumference.

2.1 Analysis of Data

Analysis was performed using SPSS 22 version. Kolmogorov-Smirnov test was used to evaluate the normality of parameters. Comparison of Age and Height were used in this study with the independent t-test. The difference between pre-test, post-test results was paired sample t-test. A difference was considered as significant when p value was less than 0.05 in 95 % confidence of interval.

3. Results

Table 1 contains the Age and Height parameters of females before and after exercises, Table 2 shows us Anthropometric and Blood Parameters, Table 3 shows us Incidence of Cardiovascular Disease Risk.

Table 1: Age and Height Parameters of Sedentary Women (n=48)

Variables	Group	Mean	Std. Deviation	Minimum	Maximum	t-test
Age (year)	Bosu Cardio	37.26	7.02	27	47	0.58
	Aerobics Step	35.94	6.94	26	47	
Height (cm)	Bosu Cardio	165.26	5.85	155	179	-0.18
	Aerobics Step	164.31	4.59	154	169	

No significant difference of Age and Height was found between Bosu Cardio group and Aerobics Step group ($p>0.05$).

Table 2: Anthropometric and Blood Parameters of Sedentary Women (n=48)

		Bosu Cardio Group			Aerobics Step Group		
Variables	Time	Mean/ Std. Deviation	Paired T-test	Change %	Mean/ Std. Deviation	Paired T-test	Change %
Body weight (kg)	Pre	72.53±7.47	7.37**	-6.47	71.22±5.37	8.84**	-5.42
	Post	67.84±6.12			67.36±4.12		
Body mass index (kg/m2)	Pre	26.68±3.50	7.22**	-6.86	26.44±2.65	5.52**	-4.95
	Post	24.95±3.01			25.13±2.09		
Hip circumference (cm)	Pre	85.89±6.24	8.225	-5.46	86.68±5.84	10.06**	-4.01
	Post	81.22±5.80			83.20±5.81		
Waist circumference (cm)	Pre	103.79±2.99	8.61**	-1.47	104.15±2.79	7.08**	0.69
	Post	102.26±2.49			103.43±2.55		
Fat (%)	Pre	30.53±2.25	11.86**	-15.95	29.94±2.39	7.85**	-10.06
	After	25.66±2.72			26.94±2.50		
Cholesterol	Before	199.58±9.85	11.46**	-7.57	192.47±12.91	8.10**	-2.62

(mg/100 cc)	After	184.47±10.01			187.42±14.08		
Triglyceride	Before	104.95±7.98	6.376	-8.13	105.42±9.08	3.16*	-2.94
(mg/100 cc)	After	96.41±8.71			102.32±9.03		
HDL-C	Before	51.05±3.81	-3.33*	1.82	52.84±2.98	-8.49**	1.78
(mg/100 cc)	After	51.98±3.67			53.78±3.09		
LDL-C	Before	104.26±8.36	7.23**	-8.38	104.47±10.35	4.58	-3.56
(mg/100 cc)	After	95.52±10.00			100.75±11.07		

*p<0.05 and **p<0.001

Table 3: Risk of Cardiovascular Diseases before and after Exercise Round in Sedentary Women (n=48)

Variables	Group	Before mean	After mean	T-tests	Change %
TC/HDL-K	Bosu Cardio	3.91 ± 0.71	3.55 ±0.69	1.37	-9.21
	Aerobics Step	3.64±1.06	3.48±0.68	2.04	-4.40
LDL-K/HDL-K	Bosu Cardio	2.04 ± 0.61	1.84 ± 0.58	1.24	-9.80
	Aerobics Step	1.98±0.70	1.87±0.71	1.7	-5.56

4. Discussion

The effect of BMI was presented in four categories according to WHO recommendations: < 18.5 kg/m^2 (lean); 18.5-24.9 kg/m^2 (normal weight); 25–29.9kg/m2 (overweight) and ≥30 kg/m^2 (obese).

The waist to hip ratio was calculated as waist girth divided by the hip girth. It is statistically proved that men with WHR (Waist to Hip Ratio) of more than 0.90 and women with 0.85 are at greatest risk of health complications (Annamna et al., 2012). Waist Hip Ratio (WHR) above 0.85 for females is important indicators of lifestyle-related health problems throughout the world (Dubbert, 2002). Sedentary women with waist circumference of more than 85cm had almost doubled mortality risk compared to active women with waist circumference below 80 cm (Annamna et al., 2012). In this study, WHR (Waist to Hip Ratio) found before 10 weeks exercise program 0.83 cm and after 0.79 cm in Bosu cardio group and 0.83 cm and after 0.80 cm aerobic steps group. It can be said that the cardiovascular risk ratio has decreased according to the result of this investigation.

Imamoğlu et al. (2002) in sedentary female study, Body weight found before 3 months aerobic exercise program, a decrease of 9.6 % in body weight. Koca (2017) found at the end of the three months exercise program, a decrease 11.74% in hip circumference and 3.46% in waist circumference. In this study, found during 10 weeks exercise program, a decrease of 6.47 % in body weight, 6.86 % in Body mass index, 5.46 % hip circumference and 1.47 % waist circumference in Bosu cardio group. There was decrease of 5.42 % in body weight, 4.95 % in Body mass index, 4.01% hip circumference and 0.69 % waist circumference in aerobic steps group (Table 2). The effects of Bosu cardio and Aerobic steps exercises are on Body weight, Body mass index, hip and waist

circumference since ($p<0.01$). These results are similar to those of Imamoğlu (2002) Koca (2017) and Kolukısa & Yılmaz (2016).

Multiple meta-regression analyses demonstrated that subjects with a body mass index (calculated as weight in kilograms divided by height in meters squared) less than 28 and total cholesterol level of 220 mg/dL [5.7 mmol/L] or more experienced an approximately 2.1-mg/dL (0.054-mmol/L) larger increase in HDL-C level than those with a body mass index of 28 or more and total cholesterol level less than 220 mg/dL (5.7 mmol/L), (Kodama et al., 2007). When we think of effect of exercise which are on plasma lipid and lipoprotein we see that exercıses which have not low and low densıty and enough period (6-8 weeks) reduce body mass, body fat percentage and total serum cholesterol (Dufaux, 1982). We accept that physical activity changes lipid and lipoprotein profıles (Stein, 1990). In this study is about enough density and strength exercise, HDL-C (High Density Lipoprotein-Cholesterol) level raises, LDL-C level falls down (Massarei, 1982). Massarei et al, found that long period of exercıse increases HDL-C with aerobic capacities increase and reduce heart illness risk.

In another study, females who were (60-70%) obese, rode bicycle and made usual, special and passive gymnastic, for a month. At the end, they couldn't found significant variance of triglyceride, total cholesterol, LDL-C, was decreased, HDL-C was increased (Sacaklı, 1992).

Yanagibari et al. (1993), investigated 12 weeks walking effect of exercise on serum lipids and lipoproteins of mıddle aged female. They compared both group females and determıned in both groups an increase in HDL-C and a decrease in total cholesterol and LDL-C.

İmamoğlu et al. (1998) investigated the effect of short time exercise on serum lipids of sedentary females before and after menopause and determined to increase in HDL-C (27.76 %) and to decrease in LDL-C (20.06%), Total cholesterol (12.96 %) triglyceride (27.76 %). George et al (2004): Reductions of approximately 2%, 3%, and 5%, respectively, were observed for TC, LDL-C, and TG, whereas an increase of 3% was observed for HDL-C.

İmamoğlu et al. (2002) investigated the effect of short time exercise on serum lipids of sedentary females before and after menopause and they determined an increase in HDL-C (16.49 %) and a decrease in LDL-C (27.65%), total cholesterol (13 %), and triglyceride (31.61%). In this study, was found in Bosu Cardio Group after 10 weeks exercise routine, a decrease of 15.95 % in fat ratio, 7.57 % in cholesterol, 8.13 % in Triglyceride, and 8.38% in LDL-C. However, there were increases of 1.82% in HDL-C. There was in Aerobics Step Group at the after of exercise routine, a decrease of 10.06 % in fat ratio, 2.62% in cholesterol, % 2.94 in Triglyceride, and %3.56 in LDL-C. However, there were increases of %1.78 in HDL-C (Table 2). Routine of the 10 weeks exercise has produced significant effect on cholesterol, Triglyceride, HDL-C and LDL-C ($p<0.05$ and $p<0.001$). It can be said that cardio Bosu exercises are more effective than aerobic step exercises when done in the same period.

In middle-aged women who prefer recreational aerobic exercise track: pre-test and post-test body weight decreased from 79.20 kg to 72.70 kg (Kolukısa, 2017) The Body Mass Index was 29.26 for the pre-test and 26.22 for the post-test. Pre-test and post-test Body weight and Body mass index were found to be significant ($p < 0.001$). Regular aerobic exercise modestly increases HDL-C level. It appears the existence of a minimum exercise volume for a significant increase in HDL-C level. Exercise duration per session was the most important element of an exercise prescription. Exercise was more effective in subjects with initially high total cholesterol levels or low body mass index (Kodama et al., 2007). In this study, the same conclusion was found.

Our meta-analysis indicated that the effect of aerobic training resulted in a 2.53-mg/dL (0.065-mmol/L) elevation of net HDL-C change. In a previous observational study, every 1-mg/dL (0.026-mmol/L) increment in HDL-C level was reported to be associated with a 2% and 3% decreased risk of CVD in men and women, respectively. If this observation were applied to our results, the increase in HDL-C level by exercise determined by this analysis would, by a rough estimate, result in a CVD risk reduced by approximately 5.1% in men and 7.6% in women (Kodama et al., 2007). Coroner heart disease risk decreased by %1.5 caused a decrease %1 of HDL-C so that, in this study, decrease of LDL-C and increases of HDL-C have decreased the risk of CHD. A substantial increase in aerobic physical activity within the population might be recommended to reverse adverse lipid abnormalities, especially in subjects with a higher cardiovascular risk. Regular aerobic exercise modestly increases HDL-C level. It appears the existence of a minimum exercise volume for a significant increase in HDL-C level. Exercise duration per session was the most important element of an exercise prescription. Exercise was more effective in subjects with initially high total cholesterol levels or low body mass index (Kodama et al., 2007). This study found similar conclusions.

The periodic risk of heart disease can be estimated by dividing TC to HDL-C. As a result of the estimation, 4.5-5 levels show important cardiovascular disease risk, 3.8-4 levels show low cardiovascular disease risk (Rosat, 1990; Werner et al., 1990). In another, the risk factor is high if TC/HDL-C ratio is higher than 5; the risk factor is low if the ratio is lower than 3.5 (Edward et al., 1992).

Imamoğlu et al (2005) found cardiovascular risk ratios of 4.53 mg/100cc in wrestlers, 4.14 mg/100cc in male students, 3.32 mg/100cc in female students and 3.33 mg/100cc in sedentary. In this study, the cardiovascular risk ratios were found before from exercise 3.91 mg/100cc and after exercise 3.55 mg/100cc in Bosu Cardio group. Cardiovascular risk ratios were found in Aerobic steps exercise group before 3.64 mg/100cc and after 3.48 mg/100cc (Table 3). The prevalence of cardiovascular risk in sedentary women after exercise was reduced compared to the pre-exercise status. The cardiovascular risk ratio of Aerobic Step group are little higher than Bosu cardio group; resulting that Bosu cardio exercises are a better alternative than Aerobic step exercises.

5. Conclusion

In sedentary women, low intensity Bosu Cardio and Aerobics Step exercises have shown the fact that such exercises could be an improvement by the changes of body fat and the blood parameters because it reduces body parameters. The risks for cardiovascular problems are reduced. While doing Cardio Bosu and aerobic step exercise, the nutritional status of sedentary women should be checked. You can increase the effect by adding more exercises or performing the existing exercises for a longer period of time.

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