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The Impact of Long-Term Exercise Programs on Sedentary Women's Anthropometric Measurements

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Abstract: This study aims at identifying the impact of three to six month-programs for step aerobics and aerobic gymnastics on sedentary women's anthropometric measurements. This study covered a total of 44 volunteer women who have never done exercise before and with the average age of 38.25±6.43 years, the average height of 162.04±5.53 cm and the average weight of 69.88±14.61 kg. The 1st group is composed of 20 participants while the 2nd group consists of 24 participants. Those who did exercise for three months make up the 1st Group whereas the 2nd Group is composed of those who did exercise for six months. At the heart rate of 50-60 %, the 1st group was made to do exercise for 60 minutes and 3 days a week during a 12-week span as the 2nd group did exercise for 60 minutes and 3 days a week during a 24-week span. The 1-hour exercise program includes 5-minute warming up, 15-minute aerobics, 20-minute step aerobics, 15-minute floor gymnastics and 5-minute cooling down. The intensity of the exercise was determined by identifying the target heart rate in accordance with the heart rate reserve method (Karvonen). The subjects were measured in weight, height and body mass % on a Tanita scale. The statistical analysis of the data acquired was conducted by the SPSS package program. The groups were compared on a paired simple t-test. $P<0.05$ was deemed significant. It was concluded from the study on comparison of the groups that the age and VFR 2 scores were statistically significant at the level of $p<0.01$ and $p<0.05$ respectively. There was no statistically significant difference between other variables in spite of some numerical differences ($p>0.05$). As a conclusion, the age difference between two groups indicates that people tend to exercise less as they grow older and that results from the decline in regular exercise in the society as people age. The numerical values indicate that doing exercise has a positive impact on women's body mass % whereas no statistically significant result and instability in values result from subjects' age range, constantly sitting down at work, metabolic or hormonal reasons, malnutrition and social habits.

Key words: Sedentary Women's · Anthropometric Measurements · Aerobics and Aerobic Gymnastics

INTRODUCTION

In today's world, manpower is increasingly replaced by ever-developing technological devices in many professions that previously required physical effort. This lowers the level of one's activity as days go by. Physical inactivity, the most insidious disease of the time, is one of the major problems threatening human health most. Ever-decreasing physical activity and increasing habit of fast food consumption lead to excessive weight as well. Physical inactivity gave rise to the emergence of a new disease called Hypokinetic Diseases (conditions of sedentary life) [1]. Cardiovascular diseases lead the group in this respect. Inactive and sedentary people suffer more frequently from numerous diseases such as muscular weakness, postural disorder, diabetes and particularly obesity and cardiovascular diseases billed as the diseases of the time [1-4]. A sedentary lifestyle leads to calcification, disk problems, sciatic risks on lumbar vertebra, excessive subcutaneous fat mass, abnormality in blood, high cholesterol and triglyceride, abnormality in blood glucose, tendency for high blood pressure, lack of

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flexibility around rib cage, poor respiration capacity, coronary diseases, weak abdominal and back muscles, postural disorders, indigestion and excretory difficulties, postnatal sagging abdomen, femur abnormality, loss of strength, flexibility and function in all muscles and muscle groups, weight issues, disfigure, osteoporosis, calcification, joint issues and injury in skeletal structure, a weak body, tendency for illnesses and difficulty to recover (3). The body fat amount of men and women increases by 0.2 to 0.8 kg per year between the age of 30-35 and 50-60 as muscles weaken almost by the same percent. For this reason, an increase in fat mass despite stability in weight gives rise to a decrease in body density and an increase in body volume. Women's body fat percent is higher than men's. Areas where fat is most accumulated in body depend on sex. Depending on sex, the most fat accumulated area in a woman's body is around hips and calf. Regular exercise is expected to decrease subcutaneous fat thickness and increase fat-free muscles in body [5].

Exercise reduces body fat mass. However, the extent of the reduction depends on the type, intensity and frequency of exercise. The more fat body has, the less fat-free muscles are as aerobic capacity of the body weight per kg reduces and thus oxidative energy metabolism required to activate one-kg body mass [6].

Exercise is regarded as one of the fundamental principles to lead a healthy life. A healthy life through exercise can only be possible by proper exercise programs. Exercise protocols, therefore, should be tailored to the age and sex of individuals in a mode that fits for purpose [7, 8]. One of these activities is step aerobics. Various methods in step aerobics exercises with heavy interest increase participation in this type of exercise. Step aerobics is an entertaining method of exercise that is adopted particularly to lose weight and makes muscle groups work in an intensive fashion.

This study was carried out in an attempt to identify the impact of three to six month-programs for step aerobics and aerobic gymnastics on sedentary women's anthropometric measurements.

MATERIALS AND METHODS

The sample group of the study is composed of 44 volunteer women who have a job and do exercise after work and who have never done exercise. The 1st group is composed of 20 women while the 2nd one consists of 24 women. Those who did exercise for three months make up the 1st Group whereas the 2nd Group is composed of those who did exercise for six months. Volunteers of the study read and signed the informed consent form drawn up for them and were subject to measurements as a subject.

At the heart rate of 50-60 %, the 1st group was made to do exercise for 60 minutes and 3 days a week during a 12-week span as the 2nd group did exercise for 60 minutes and 3 days a week during a 24-week span. 1-hour exercise program includes 5-minute warming up, 15-minute aerobics, 20-minute step aerobics, 15-minute floor gymnastics and 5-minute cooling down. The 1st and the 2nd group were periodically measured 3 times as of the onset of the study. The intensity of the exercise was determined by calculating the target heart beat rate in line with the heart rate reserve method (Karvonen) [9] and the heart beat rates of the subjects were measured at the end of each exercise in an effort to identify whether the desired number of heart beat rate is achieved or not. The analysis of the research data was conducted by the SPSS package program. The arithmetical averages and standard deviations for all data were identified. The difference between the measurements of two groups were defined by a paired simple t-test. The level of significance was found out to be 0.05.

RESULT

Table 1 shows minimum, maximum, arithmetic averages and standard deviation scores of three measurements for the groups that did regular exercise for 3 months and 6 months respectively.

Table 2 shows in comparison that the age and VFR 2 scores were statistically significant at the level of $p<0.01$ and $p<0.05$ respectively. There was no statistically significant difference between other variables in spite of some numerical differences ($p>0.05$).

DISCUSSION AND CONCLUSION

The study indicates that there is a statistically significant difference between age averages of the groups. The age average of the group that did exercise for 6 months is lower. No significant difference was identified between the height averages of both groups. In spite of a numerical difference in the first, the second and the third measurements of weight for the groups, no statistically

Table 1: Statistical Distribution of groups that did regular exercise for 3 months and 6 months respectively.

Variables	n	Min	Max	Mean	S_D
Age (year)	44	24.00	50.00	38.2500	6.43076
Height (cm)	44	150.00	177.00	162.0455	5.53616
Body weight (kg) 1	44	51.00	122.60	69.8864	14.61728
Body weight (kg) 2	40	50.80	119.20	68.8650	14.36118
Body weight (kg) 3	28	50.60	106.60	68.9607	13.72528
BMI (kg/m^2) 1	44	19.00	42.40	26.6591	5.42875
BMI (kg/m^2) 2	40	19.50	41.20	26.2750	5.33632
BMI (kg/m^2) 3	28	19.50	36.90	26.0679	4.75286
BMR 1	44	1205.00	2055.00	1386.8409	163.30766
BMR 2	40	1205.00	2014.00	1376.2500	158.32663
BMR 3	28	1200.00	1820.00	1384.3214	153.26594
FAT %1	44	17.00	46.80	33.8000	7.11657
FAT %2	40	19.40	47.00	33.2750	7.02102
FAT %3	28	19.80	46.20	32.8607	6.57066
FATMASS 1	44	8.70	56.90	24.5023	10.28081
FATMASS 2	40	10.10	54.60	23.7800	10.12487
FATMASS 3	28	10.00	47.80	23.4500	9.48303
FFM 1	44	39.20	65.70	45.4591	4.93635
FFM 2	40	39.10	64.60	45.0875	4.76753
FFM 3	28	39.10	58.80	45.5107	4.69407
TWB 1	44	28.70	48.10	33.2432	3.61852
TWB 2	40	28.60	47.30	33.0100	3.49210
TWB 3	28	28.60	43.00	33.3250	3.43884
VFR 1	44	2.00	14.00	5.7045	3.04676
VFR 2	40	1.00	13.00	5.5500	3.06301
VFR 3	28	2.00	12.00	5.4286	2.75451

(BMI: Body mass index, BMR: Basal metabolic rate, FAT%: Fat percentage, FAT MASS: Fat mass,

FFM: Fat-free mass, TBW: Total body water, VFR: Visceral fat rate)

Table 2: Comparison of groups that did regular exercise for 3 months and 6 months respectively.

Variables	Group	n	Mean	S_D	t	p
Age (year)	1	20	41.3000	5.34199	3.157	.003**
	2	24	35.7083	6.23789		
Height (cm)	1	20	161.7000	6.40805	-.374	.710
	2	24	162.3333	4.81543		
Body weight (kg) 1	1	20	72.3950	15.28864	1.040	.304
	2	24	67.7958	14.01200		
Body weight (kg) 2	1	20	72.1750	14.42494	1.480	.147
	2	20	65.5550	13.86353		
Body weight (kg) 3	1	15	70.9867	13.43008	.831	.412
	2	13	66.6231	14.22616		
BMI (kg/m^2)1	1	20	27.6700	5.18410	1.131	.261
	2	24	25.8167	5.59182		
BMI (kg/m^2) 2	1	20	27.5600	4.85152	1.550	.129
	2	20	24.9900	5.60694		
BMI (kg/m^2) 3	1	15	27.0533	4.56162	1.181	.246
	2	13	24.9308	4.89241		

Table 2: Comparison of groups that did regular exercise for 3 months and 6 months respectively.

Variables	Group	n	Mean	S_D	t	p
BMR 1	1	20	1398.9000	187.63007	.432	.660
	2	24	1376.7917	143.33845		
BMR 2	1	20	1404.6000	177.18453	1.137	.263
	2	20	1347.9000	135.52700		
BMR 3	1	15	1391.3333	160.75521	.256	.800
	2	13	1376.2308	150.23934		
FAT %1	1	20	35.8100	5.71921	1.751	.079
	2	24	32.1250	7.82456		
FAT %2	1	20	35.2500	5.41261	1.832	.075
	2	20	31.3000	7.97971		
FAT %3	1	15	34.7533	5.27567	1.652	.102
	2	13	30.6769	7.41790		
FAT MASS 1	1	20	26.6150	10.04198	1.253	.217
	2	24	22.7417	10.35298		
FAT MASS 2	1	20	26.0750	9.42432	1.454	.154
	2	20	21.4850	10.51261		
FAT MASS 3	1	15	25.2600	8.86589	1.078	.286
	2	13	21.3615	10.09022		
FFM 1	1	20	45.7850	5.75063	.385	.694
	2	24	45.1875	4.25076		
FFM 2	1	20	46.1050	5.46631	1.365	.180
	2	20	44.0700	3.82032		
FFM 3	1	15	45.7267	4.97845	.257	.799
	2	13	45.2615	4.53166		
TBW 1	1	20	33.5100	4.20938	.430	.661
	2	24	33.0208	3.11908		
TBW 2	1	20	33.7500	4.00730	1.354	.184
	2	20	32.2700	2.79645		
TBW 3	1	15	33.4800	3.63401	.252	.803
	2	13	33.1462	3.33707		
VFR 1	1	20	6.7000	2.84882	2.051	.047
	2	24	4.8750	3.01175		
VFR 2	1	20	6.5000	2.54434	2.039	.048*
	2	20	4.6000	3.29912		
VFR 3	1	15	6.3333	2.63674	1.963	.060
	2	13	4.3846	2.59931		

($p<0.05$)*, ($p<0.01$)**

(BMI: Body mass index, BMR: Basal metabolic rate, FAT%: Fat percentage, FAT MASS: Fat mass,

FFM: Fat-free mass, TBW: Total body water, VFR: Visceral fat rate)

significant difference was identified. As a part of a study conducted by Carol and *et al*. [10], no significant difference was observed in terms of weight for both groups. In another study, 31 healthy women were put on a 6-month exercise program including resistance for 5 days a week and aerobics combinations and consequently the pre and post exercise body weight averages were found out to be 66.5-64.8 kg as fat weight averages were 24.7-22.1 kg and fat-free body weight averages were 41.8-42.7 respectively. It was found out at the end of the exercise that there was a decrease in body weight for 2.2 %, in fat weight for 10 % and an increase in fat-free body weight for 2.2 % [11]. This study identified variance in measurements in a similar vein. The measurements, however, were not statistically significant.

It is indicated that body mass index is an indicator of overweight and depends on age and sex [12]. In addition, low body mass index may result from high body fat percentage, the length of torso, arms, legs and the muscle ratio [13]. Measurements for body mass index are not statistically significant whereas they tend to numerically decrease in time. The study also points to a decrease in basal metabolic rate, body fat percentage and fat density. However, this decrease was not statistically significant. Basal metabolic rate is influenced by physical activity, sex, age, height, weight, genetic factors, race, sleep pattern, body temperature, ambient temperature, climate, sympathetic stimulation, epinephrine and norepinephrine, thyroid hormones, growth hormones, sex hormones and pregnancy[14,15]. It is thought that the energy percentage of dietary fat is a major determinant of body fat [16] as no statistically significant difference in measurements of women for the study may result from fat percentage in their diets.

As a result of another study where women were divided into three groups the 1st one of which was made to do step aerobics, the 2nd of which was made to do exercise for jogging and the 3rd one of which was made to follow a diet, it was found out that there was a statistically significant difference in the 1st and the 2nd group of women for body weight, body fat percentage, body mass index and total cholesterol level [17]. Karacan and Çolakoğlu [2] point out in the study that a 12-week aerobic exercise significantly decreases body weight, fat percentage, body mass index, fat weight and fat-free body weight for both groups .As a conclusion, the study points to a significant decrease in resting blood pressure as well as in systolic blood pressure, body weight, body fat percentage, body mass index, total cholesterol, LDL cholesterol and triglyceride [1]. Another 8-week step aerobics exercise refers to a significant decrease in resting blood pressure, blood pressure following a five-minute exercise on a treadmill, body fat percentage and systolic blood pressure [18].

The study points to an increase in fat-free body mass whereas there is no statistically significant difference between two groups. A 12-week aerobic and resistance exercise for middle-aged women and men leads to a statistically significant difference of final tests in body weight, body mass index, body fat percentage, fat-free muscle mass, waist circumference, hip circumference, waist-hip ratio, gripping strength, systolic blood pressure and diastolic blood pressure [19]. It was also found out that an 8-week aerobic exercise followed 3 days a week for an 1 hour has a positive impact on body composition, blood values, physical characteristics, flexibility measurements, blood pressure and body fat percentage[20]. Another study where an eight-week step aerobic exercise was followed three days a week for an hour identified significant differences in women's body mass index, body weight, fat percentage, basal metabolic rate and fat-free body mass [21]. It was also found out that young women's body mass, body mass index and fat density decrease in an individual exercise program followed for maximum fat density.

It was also suggested that an eight-week aerobic exercise with and without the use of a slimming belt decreased the fat percentage and body mass index [22]. In a study carried out with old-grown women, the 1st, the 2nd and the 3rd groups followed an exercise program for one day, two days and three days a week respectively for 90 minutes during a 12-week span. The third group produced significant differences in body weight, coordination and cardio respiratory when compared to other two groups [23]. It is likely to observe some physiological and functional decrease in some values as people grow older. The more one's age is, the less his/her muscle density and strength are. The studies point to the benefits of exercise in this respect. For instance, it is suggested that 2 to 3-day a week regular exercise makes a contribution to muscle strength, muscle mass, bone density and avoidance of dependency [24]. Another study on young and middle-aged women refers to the impact of exercise on some blood values [25]. As a part of another study, middle-aged sedentary women did medium-density walking and swimming exercises three days a week for 12 months including 6-month uncontrolled and 6-month controlled tests. It was underlined that swimming exercise, when compared to walking, leads to an improvement in body weight, body fat density and fat measurements in the long run. There was no statistically significant difference between the groups in total body water. The study also pointed to a statistically significant difference between the groups in VFR 2 (Visceral Fat Rating) values. The measurements of the groups declined in time. It is therefore safe to say that regular exercise can decrease fat deposition around innards that threaten health. The 1st group tended to produce higher values in each period. This can be associated with the difference in length of exercise and age average. It is because aging increases fat deposition in body.

As a conclusion, the age difference between two groups indicates that people tend to exercise less as they grow older and that results from the decline in regular

exercise in the society as people age. The numerical values indicate that doing exercise has a positive impact on women's body mass percentage whereas no statistically significant result and instability in values result from subjects' age range, difference in daily physical activities, malnutrition and social habits. The fact that middle-aged and above people in particular need to do regular exercise in order to lead a high-quality life is corroborated by the findings of the study.

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