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The Effect of 12-Week Regular Pilates, Step and Zumba Training Program on Muscle and Fat Weight

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Abstract

This study aimed to investigate the effect of Pilates, Step and Zumba exercises on muscle and fat weight in arms, legs, core abdominal area, and total body.

A total of 60 women aged 19 to 62 participated in the study. The mean age was 45±10 years, height was 160±5 cm and weight was 72.31±11.12 kg. Pilates, Step and Zumba exercise program was applied three days a week for a total of 12 weeks. Regional and total muscle and fat weights in the body were analyzed by TANITA MC780. Statistical significance level was determined as $p<0.05$. In the Pilates exercises group, there was a statistically significant difference between the pre-posttest muscle weights of the arms, core abdominal area and total body ($p<0.05$) except legs ($p>0.05$). There was no statistically significant difference between pre-posttest muscle weights in arms, legs, core abdominal area and total body in Step and Zumba exercises group ($p>0.05$). In Pilates and Step exercise groups, there is a statistically significant difference between pre-posttest fat weights in arms, legs, core abdominal area and total body ($p<0.05$) except Zumba groups ($p>0.05$). Pilates, Step and Zumba exercises groups were evaluated among themselves, there was no difference in terms of the arm, leg, core abdominal area, and total body muscle weights both in the pre-post tests ($p>0.05$). There was a statistically significant difference between all groups in terms of the arm, leg, core abdominal area and total body fat weights in both pre-posttests ($p<0.05$).

Pilates and Step exercises can be recommended to women who want to reduce their weight on arms, legs, core abdominal area and total body fat lose weight.

Keywords: fitness, physical education, sport exercises

1. Introduction

The Pilates method and related exercises were developed by Joseph Pilates in the 1920s. This method is based on the principles of centering, concentration, control, breath, precision, and fluidity (Latey, 2001). High levels of concentration, control of the body, proper breathing, and full and fluent movements are essential for Pilates exercises. Although there are not enough studies to show that Pilates exercises improve women's health but Pilates method has gained popularity in terms of physical and therapeutic improvement (Mazzarino, Kerr, Wajswelner, & Morris, 2015). The positive effects of Pilates exercise on body composition have been determined in researches (Garc á and Lain, 2011; Singh and Singh, 2014). Pilates exercises, which are performed only once a week for individuals with a sedentary lifestyle, can encourage the transition to a healthy and active lifestyle (Tolnai, Szab ó, K öteles, & Szabo, 2016).

The Step exercises are being performed with the help of a platform high above the ground. The movements are carried out in all directions, on top of the platform, besides, behind and in front. The movements during the exercise are performed with music and rhythmically.

Zumba is a dance exercise practiced by millions of people around the world and has many potential benefits in research (Delextrat, Warner, Graham, & Neupert, 2016). Zumba is defined as a Latin-inspired dance exercise program, which is usually implemented in large groups of participants, combining Latin rhythms and aerobic Steps, creating a kind of choreography that includes all body movements and is less formal than other group exercises (Luettgen, Foster, Doberstein, Mikat, & Porcari, 2012). It can be said that Zumba exercises increase flexibility and body resistance and help to fight stress and improve mood. Zumba is promoted by the fitness industries as an intensive cardiovascular exercise to help people lose weight.

The smooth functioning of the cardiovascular system is the key to a healthy life. Any problem in the cardiovascular system poses many risks. It can cause many health problems such as high blood pressure, vascular blockages and stroke. Among the reasons for the emergence of cardiovascular diseases; malnutrition, obesity, stress, and sedentary lifestyles. Regular aerobic exercise (especially aerobic dance exercises by women) positively affects the cardiovascular system and helps to control weight (Garrick & Requa, 1988). Similar to those participating in aerobic dance programs and other endurance exercises, there is an improvement in their cardiovascular system (Williford, Scharff-Olson, & Blessing, 1989).

Obesity is an important risk factor for the emergence of health problems, so many countries are looking for ways to reduce body fat in individuals to prepare obesity prevention programs (Manson, et al., 1990; Terry, Stefanick, Haskell, & Wood, 1991). Prevention programs for obesity include increasing physical activity and reducing calories (Jakicic, et al., 2001). Future health risks can be determined from body fat measurements, for example, excessive body fat causes health problems, and so there is increasing interest in body composition measurements in which variables such as body fat are identified (Jebb, Cole, Doman, Murgatroyd, & Prentice, 2000). Physical activities contribute to the improvement of body composition in the control of variables such as exercise duration and diet (Scharff-Olson, Williford, Blessing, & Brown, 1996).

Nowadays, Pilates, Zumba exercises are very popular among women in terms of weight loss and body tightening (Baştuğ, Özcan, Gültekin, & Günay, 2016). Therefore, this study is important. In this study aims to investigate the effect of Pilates, Step and Zumba exercises on muscle and fat weight in arms, legs, core abdominal area, and total body.

2. Method

This study is an experimental study that deals with the changes in arms, legs, core abdominal area, and total body muscle and fat weights of women who participate in Pilates, Step and Zumba exercises voluntarily.

2.1 Sample of Participants

There is no criterion for participation in the study. The age, height and weight values of the women participating in the exercises according to Pilates, Step and Zumba groups are shown in table 1.

Table 1. Age, height, and weight values

		Age (year)			Height (cm)			Weight (kg)		
	N	Mean±Std.	Min.	Max.	Mean±Std.	Min.	Max.	Mean±Std.	Min.	Max.
Pilates	39	48±9	24	62	159±5	150	172	74.66±11.40	56.90	101.50
Step	10	39±10	23	51	160±3	154	164	67.43±10.21	57.40	92.40
Zumba	11	37±10	19	50	162±6	150	171	68.43±9.00	54.10	82.50
Total	60	45±10	19	62	160±5	150	172	72.31±11.12	54.10	101.50

A total of 60 women; ages are in the range of 19-62 year and the average is 45±10 years, heights are in the range of 150-172 cm and the average is 160±5 cm, weights are in the range of 54.10-101.50 kg and the average is 72.31±11.12 kg.

2.2 Body Analysis Measurements

Regional and total muscle and fat weights in the body were analyzed. Regional data were obtained from the arms, legs and core abdominal area. Muscle and fat mass refer to the actual weight of muscle and fat in our body. Body analysis measurements in this study were performed with Tanita MC780. Tanita body fat analyzer was developed to estimate body fat based on the principle of bioelectrical impedance analysis (Nunez, et al., 1997). When you stand on a Tanita monitor, the data obtained by sending a very low, safe electrical signal from the four metal electrodes to your legs and abdomen than data entered into the Tanita equations and the body composition measurements are calculated in under 20 seconds ("Professional Scales", 2019). The measurements were made to ensure that the feet were dry and bare. The measurements were expected to take an average of three hours after sport, meal or sleep.

2.3 Exercise Program

There is strong evidence of both physical and psychological health benefits of low frequency (once a week) and short-term (6-10 weeks) Pilates training programs (Tolnai, Szabó, Köteles, & Szabo, 2016).

Pilates, Step and Zumba exercise programs were applied three days a week for a total of 12 weeks. Three days of Pilates exercise program includes aerobics for two days and fitness exercises for one day. It includes 40 minutes of floor exercises at a low tempo, two minutes of rest and 20 minutes of aerobic movements. The Step program includes two-step and one-day fitness exercises. 20 minutes' aerobics, 20 minutes' step, and 30 minutes' cushion movements.

There are three minutes of rest between aerobic movements and two minutes when moving from step to floor exercises. The Zumba exercise program, which is applied for three days, includes two days of Zumba and one day of fitness exercises. Movements that last for 10-13 songs take about 55 minutes. After each song, a break of 20 seconds is given. The program is completed with cool down exercises 10 minutes.

2.4 Statistics and Data Analysis

IBM SPSS 21 software was used in the calculation and evaluation of the data, the statistical significance level was determined as $p<0.05$, normality level was evaluated by Kolmogorov-Smirnov and variance equation by Levene test. Mean, standard deviation, minimum and maximum values were taken into consideration in the analysis of body analysis data. Paired Sample t test was used to compare the pre-post tests measurements for pilates, step and zumba in terms of body analysis values. One-way ANOVA was used to test the difference between the groups during the pre-posttests. Post-hoc LSD and Tamhane tests were used to determine the source of the difference between the groups.

3. Results

The relationship between the pre-post tests weight of muscle values according to Pilates, Step and Zumba groups is shown in table 2.

Table 2. The relationship between the pre-post tests weight of muscle values

Weights of muscle	Pilates (N=39)				Step (N=10)				Zumba (N=11)			
	Pre	Post			Pre	Post			Pre	Post		
	X ±Std.	X ±Std.	t	p	X ±Std.	X ±Std.	t	p	X ±Std.	X ±Std.	t	p
Arms (kg)	4.7 ±0.54	4.82 ±0.56	-3.909	.000*	4.33 ±0.5	4.43 ±0.39	-1.861	.096	4.5 ±0.67	4.52 ±0.68	-.582	.574
Legs (kg)	14.36 ±1.46	14.45 ±1.36	-.944	.351	13.76 ±1.27	14.04 ±1.1	-.504	.626	14.4 ±1.04	14.2 ±1.1	2.057	.067
Core abdominal area (kg)	26.91 ±2.92	27.53 ±3.03	-4.222	.000*	25.99 ±2.4	26.28 ±2.01	-1.134	.286	26.49 ±2.86	26.53 ±2.86	-.197	.848
Total body (kg)	45.98 ±4.82	46.8 ±4.86	-3.341	.002*	44.66 ±4.2	44.75 ±3.41	-.222	.829	45.39 ±4.5	45.26 ±4.55	.374	.716

*p<0.05

There was a statistically significant difference between the pre-posttest measurements of the arms, core abdominal area and total body muscle weight of women who participated in Pilates exercises ($p<0.05$), whereas there was no statistically significant difference between legs muscle weights pre-posttests measurements ($p>0.05$). There was no statistically significant difference between the pre-post tests measurements of arms, legs, core abdominal area and total body muscle weights of women who participated in Step and Zumba exercises ($p>0.05$).

The relationship between the pre-post tests weight of fat values according to Pilates, Step and Zumba groups is shown in table 3.

Table 3. The relationship between the pre-post tests weight of fat values

Weights of fat	Pilates (N=39)				Step (N=10)				Zumba (N=11)			
	Pre	Post			Pre	Post			Pre	Post		
	X ±Std.	X ±Std.	t	p	X ±Std.	X ±Std.	t	p	X ±Std.	X ±Std.	t	p
Arms (kg)	3,21 ±1,38	3,05 ±1,37	2,767	,009*	2,42 ±1,04	1,96 ±0,87	7,233	,000*	2,33 ±0,61	2,25 ±0,57	1,330	,213
Legs (kg)	11,6 ±2,92	11,32 ±2,98	2,532	,016*	9,2 ±2,32	8,48 ±2	5,476	,000*	9,31 ±1,89	9,37 ±1,75	-,308	,764
Core abdominal area (kg)	11,38 ±3,29	10,25 ±3,69	4,625	,000*	8,74 ±3,33	7,05 ±3,19	8,215	,000*	8,95 ±3,13	8,73 ±3,13	,740	,476
Total body (kg)	26,21 ±7,25	24,63 ±7,46	4,177	,000*	20,36 ±6,61	17,49 ±6	8,760	,000*	20,6 ±5,44	20,36 ±5,16	,490	,635

*p<0.05

There was a statistically significant difference between the pre-posttest measurements of the arms, legs, core abdominal area and total body fat weights of the women who participated in Pilates and Step exercises ($p<0.05$). There was no statistically significant difference between the pre-posttest measurements of arms, legs, core abdominal area and total body fat weights of women who participated in Zumba exercises ($p>0.05$).

The comparison weight of muscle values among Pilates, Step and Zumba groups is shown in table 4.

Table 4. The comparison weight of muscle values

Weights of muscle			Pre				Post			
	Group	N	X ±Std.	f	p	Post hoc	X ±Std.	f	p	Post hoc
Arms (kg)	Pilates	39	4.7 ±0.54	1.952	.151	None	4.82 ±0.56	2.600	.083	None
	Step	10	4.33 ±0.5				4.43 ±0.39			
	Zumba	11	4.5 ±0.67				4.52 ±0.68			
Legs (kg)	Pilates	39	14.36 ±1.46	.841	.437	None	14.45 ±1.36	.485	.618	None
	Step	10	13.76 ±1.27				14.04 ±1.1			
	Zumba	11	14.4 ±1.04				14.2 ±1.1			
Core abdominal area (kg)	Pilates	39	26.91 ±2.92	.457	.635	None	27.53 ±3.03	1.054	.355	None
	Step	10	25.99 ±2.4				26.28 ±2.01			
	Zumba	11	26.49 ±2.86				26.53 ±2.86			
Total body (kg)	Pilates	39	45.98 ±4.82	.342	.711	None	46.8 ±4.86	1.061	.353	None
	Step	10	44.66 ±4.2				44.75 ±3.41			
	Zumba	11	45.39 ±4.5				45.26 ±4.55			

Women participating in the exercises; there was no statistically significant difference between the Pilates, Step and Zumba groups in terms of pretest and posttest mean values of arms, legs, core abdominal area and total body muscle weight ($p>0.05$).

The comparison weight of fat values among Pilates, Step and Zumba groups is shown in table 5.

Table 5. The comparison weight of fat values

Weights of fat			Pre				Post			
	Group	N	X ±Std.	f	p	Post hoc	X ±Std.	f	p	Post hoc
Arms (kg)	Pilates	39	3.21 ±1.38	3.200	.048*	P>Z	3.05 ±1.37	4.392	.017*	P>S, Z
	Step	10	2.42 ±1.04				1.96 ±0.87			
	Zumba	11	2.33 ±0.61				2.25 ±0.57			
Legs (kg)	Pilates	39	11.6 ±2.92	5.235	.008*	P>S, Z	11.32 ±2.98	5.724	.005*	P>S, Z
	Step	10	9.2 ±2.32				8.48 ±2			
	Zumba	11	9.31 ±1.89				9.37 ±1.75			
Core abdominal area (kg)	Pilates	39	11.38 ±3.29	4.111	.021*	P>S, Z	10.25 ±3.69	3.552	.035*	P>S
	Step	10	8.74 ±3.33				7.05 ±3.19			
	Zumba	11	8.95 ±3.13				8.73 ±3.13			
Total body (kg)	Pilates	39	26.21 ±7.25	4.741	.012*	P>S, Z	24.63 ±7.46	5.019	.010*	P>S
	Step	10	20.36 ±6.61				17.49 ±6			
	Zumba	11	20.6 ±5.44				20.36 ±5.16			

*$p<0.05$ P=Pilates, S=Step, Z=Zumba

Pilates, Step and Zumba women who will participate in the exercises; the pretest means of fat weight in arms, legs, core abdominal area, and total body had a statistically significant difference between the groups ($p<0.05$). Women participating in the exercises; there was a statistically significant difference between the Pilates, Step and Zumba groups in terms of posttest mean values of arms, legs, core abdominal area, and total body muscle weight ($p<0.05$).

The fat weight in the legs, core abdominal area and total body of the women who will participate in Pilates exercises is statistically higher than the women who will participate in Step and Zumba exercises. Fat of arms weights of the women who will participate in Pilates exercises are significantly higher than the pretest results of women who will only participate in Zumba exercises. The pretest fat weights of the women who will participate in Step and Zumba exercises do not show any statistically significant difference, they have mathematically close values. Women who participated in Pilates exercises had significantly higher fat weights in arms and legs than those who participated in Step and Zumba exercises. Core abdominal area and total body fat weights of the women who participated in Pilates exercises were significantly higher than the posttest results of women who participated in step exercises only. Posttest fat weights of all women participating in Step and Zumba exercises did not show a statistically significant difference, they were mathematically close.

4. Discussion and Conclusions

Pilates exercises increase the arm, core abdominal area and total body muscle weights of women positively and this difference is statistically significant. As a result of Pilates exercises, there is a mathematical increase in legs muscle weights. There is a mathematical increase in arm, leg, core abdominal area and total body muscle weights of women participating in Step exercises. It is seen that there is almost no change in arm, leg, core abdominal area and total body muscle weights of women participating in Zumba exercises.

Pilates and Step exercises cause a significant decrease in the arm, leg, core abdominal area, and total body fat weights in women. On the other hand, Zumba exercises, constitute a mathematical reduction in the arm, core abdominal area, and total body fat weights.

When the groups participating in Pilates, Step and Zumba exercises were evaluated among themselves, there was no difference in terms of arm, leg, core abdominal area and total body muscle weights both in the pre-post tests. Exercises provide an increase in arm, leg, core abdominal area and total body muscle weights, but there is no difference between the groups because this increase occurs in all groups.

When the exercise groups were evaluated among themselves according to the pretest results, the leg, core abdominal area and total body fat weights of Pilates group were higher than those of Step and Zumba groups and only the Zumba group in terms of fat weight in arms. When the exercise groups were evaluated among themselves according to the posttest results, the fat weights of the Pilates group were higher in the arms and legs than in the Step and Zumba groups and in the core abdominal area and total body fat weights only in the Step group. In the Step group, the fat weight reduction in the arms was higher than in the other groups. The core abdominal area and total body fat weights of the Zumba group were also lower than those of the Pilates and Step groups.

In the literature, studies are showing the beneficial effects of Pilates exercises on body weight, body mass index (BMI), body composition and flexibility performance (Aladro-Gonzalvo, Machado-Díaz, Moncada-Jiménez, Hernández-Elizondo, & Araya-Vargas, 2012; Fourie, et al., 2013). Baştug, et al., (2014) reported that Pilates exercises are one of the most important methods in improving flexibility performance and body composition. Pilates exercises are performed 2 to 3 times a week for 5 to 12 weeks and increase the endurance of the abdominal muscles for both genders (Campos, et al., 2016).

Şavkın & Aslan, (2017) found that the 8-week Pilates exercise program had positive effects on body composition in sedentary overweight and obese women. In the same study, it was reported that fat percentage, waist, abdomen and hip circumference of women decreased significantly as a result of exercises ($p<0.05$). As a result, no significant difference was observed in fat-free body mass ($p>0.05$). There is no consensus in the literature as to whether physical activity is important for total body mass loss and improved body composition (Pedersen & Saltin, 2015). Several studies have shown that physical training leads to a reduction in fat mass and abdominal fat, in contrast to the harmful side effects of very restrictive calorie diets that cause a loss of lean mass (Ross & Janssen, 1999).

Babayigit Irez, et al., (2014), Step and Aerobic dance among college students to reduce body fat percentage or weight gain programs that are as effective as other sports. Step-aerobic exercises cause a significant decrease in body weight, body mass index, waist area and hip circumference of women (Cicek, et al., 2017). The application of Step-aerobic exercises positively affects the health of women aged 20-35 years (Masliak, 2015).

Zumba exercises were found to improve internal motivation, reduce body weight and body fat, and improve the health of obese women (Krishnan, et al., 2015). It was reported that overweight women with a mean age of 38.9 ± 9.7 who had a 12-week Zumba exercise program were positively affected in terms of health (Cugusi, et al., 2016).

CrossFit based high-intensity power training, maximum aerobic fitness and body composition were improved, a decrease in body fat ratio of women and men was detected and positive improvements in VO_2max, body weight, and body composition values were observed. Participation in regular exercises was found to cause significant changes in the waist circumference of obese people and female university students (Stensvold, et al., 2010). As a result of regular participation in an aerobic dance exercise program for 12 weeks, there are positive improvements in body composition and cardiorespiratory system in sedentary adults (Williams & Morton, 1986).

Current findings suggest that concurrent aerobic dance and resistance training have positive effects on weight loss in women (Suksom, Phanpheng, Soogarun, & Sapwarobol, 2015). Traditionally moderate walking or running programs have been proposed to improve health-related variables (Ross, 2000; Pedersen & Saltin, 2015). The effects of walking exercises vary according to gender, age, and body mass index (Mabire, Mani, Liu, Mulligan, & Baxter, 2017), so these variables should be taken into consideration when planning.

4.1 Suggestions

Pilates and Step exercises can be recommended to women who want to reduce their weight on arms, legs, core abdominal area and total body fat lose weight. One-hour Pilates, Step and Zumba exercises for 12 weeks and 3 days a week will positively affect the health of individuals. It will be socially beneficial for women who have a sedentary lifestyle and who are not actively engaged in sports to be guided to such exercises with music and in groups. There is no need for a high budget and specially designed spaces to perform exercises such as Pilates, Step, and Zumba, so everyone will be able to reach easily. It would be beneficial for public health units, schools and social community organizations to direct individuals to such exercise programs.

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