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Investigation of the Effects of Eight Weeks of Pilates and Step-Aerobic Exercises on Physical Performance and Self Esteem Scores of Females

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Abstract

The aim of this study was to investigate the effects of eight weeks of step- aerobics and pilates training on structural, biomotor and psychological variables of sedentary women. A total of 20 women (39.5 ± 3.7 years average age) participated in the study voluntarily. Participants were randomly divided into two experiment groups (step aerobics n:10, pilates n:10). Body height and body weight, flexibility, balance, leg and abdominal strength, and self-esteem scale (Marsh 1994) were measured before and after the eight week training. SPSS was used for analysis. The results showed statistical differences in flexibility, balance, leg strength, abdominal strength, BMI, health, general physical condition, appearance, strength and self confidence in comparisons of the pretest – posttest measurements of the pilates group ($p < 0.05$). There were statistical differences found in flexibility, balance, leg strength, abdominal strength, BMI, health, and strength when the pretest – posttest measurements of the step aerobic group were compared ($p < 0.05$). Mann Whitney U test was performed to compare differences between the pretest- posttest measurements of both groups and analysis showed that there is no statistical differences between the groups ($p > 0.05$). In conclusion, it is possible to say that eight weeks of step aerobics and pilates training has positive and similar effects on structural, biomotor and psychological variables of sedentary women.

Keywords: Sport, exercise, step aerobics, pilates, sedentary.

Introduction

For centuries humanity worked by using their bodies, currently with the opportunities offered by technology mobility is limited. Today in many countries, making people mobile again has become a state policy, because it is scientific fact that it is possible to protect health with exercise. The results obtained from medical methods (pharmaceutical treatment, surgery, etc.) are not positive when compared with the money spent on these processes. But it is possible to prevent a large proportion of health spending by allotting 10-15 minutes per day to exercise (Açıkada and Ergen, 1990). Among the keystones to creating a healthy society of healthy individuals, the large place held by sport is accepted by all countries in the world.

Regular exercise is known to prevent the development and progression of some disorders and to develop physical fitness of the individual. Physical fitness is composed of the elements of cardiovascular endurance, muscle strength, balance, muscular endurance, body composition and flexibility (Kin, 1996).

The majority of medical, health and exercise scientists agree that fitness has a positive effect on physical health in terms of ability to complete certain movements and achieve results. As this effect directly develops the physiological functions of many organs and systems, the development of an emotional state caused by movement is observed (Stanford et al. 1993). Additionally, exercise lowers blood pressure, develops balance and movement ability, lowers the risk of losing balance and falling and injury risks (hip or wrist fractures), slows the loss of muscle and bone mass in the body, increases flexibility, preserves ideal weight, ensures regular sleep, relieves tension and stress and provides a healthy and long life (Fox et al., 1999).

Physical activity is a necessary basic function for the healthy development of the human organism. The importance of physical activity for middle-aged and elderly people has been systematically studied in the last 20 years (Akgün, 1993).

It has been shown that in healthy women with no risk of injury, aerobic training with or without equipment has a positive effect on cardiorespiratory fitness, body composition and muscle strength (Kravitz et al., 1994).

Aerobic step and dance work is required to develop and preserve fitness. Aerobic dance promoted by Jakise Stevenson in the 1970s is very similar to continuous calisthenic exercise, but includes dance steps to the rhythm of music. Beginning with low intensity and continuing to moderate intensity, this type of exercise does not cause tiredness as there is not much lactic acid accumulation. The most important characteristics of aerobic step exercise are the step, regular rhythm and regular breathing without going into deficit which allow energy to be created due to oxygen sent to muscles and uses up more energy compared to other types of aerobic exercise. Step exercise is effective on body composition, and as with repeated low intensity exercise, is helpful in reducing fat ratios. Excess body fat increases the weight of the body and causes a hypokinetic disease of being overweight. Being overweight is related to the development of many diseases like diabetes, coronary heart disease, psychological disorders, kidney disease, hypertension, stroke, lung disease and back and foot problems.

Though pilates is an exercise with lower intensity compared to other aerobic and dance exercises, the concentration, control, focus, flowing movement rhythm, certainty of movement and breathing techniques during positions play a very important role in a healthy body. Studies have shown that pilates reduces the risk of heart diseases, prevents osteoporosis, gives the body a good form and develops balance, flexibility and strength

(Solomon, 2003). Aerobic exercises and pilates are considered to have positive effects on general fitness and many physiological and physical parameters. As individuals advance along the well-being path of health and vitality, they are stepping along the road to a healthier society.

The aim of the study is to investigate the effects of 8 weeks of step aerobics and pilates programs on leg strength, flexibility, balance, abdominal strength and self-esteem of middle-aged sedentary women.

Methodology

The study included 20 female volunteers living in Çanakkale province, who did not participate in sport and had no health problems.

Training program

In the study, participants did a 60 minute program of aerobics-step or pilates exercises 3 days a week for 8 weeks. Women participating in the aerobics-step first had 5 minutes low tempo warm-up movements, followed by a certain pattern of body movements of moderate intensity accompanied by music and rhythm for 20 minutes. In the second portion, the step (length 70 cm, width 30 cm, height 10 cm) was used and again exercises were completed including stepping up and down at certain intervals accompanied by music and rhythm for about 20 minutes. Later subjects did 10 minutes of floor exercises for abdominals and legs, with a final 5 minute cool-down. Pilates exercises for subjects participating were all accompanied by low rhythm natural music. Exercise equipment included a 65 cm soft gymnastic ball, pilates ring and elastic bands. The exercise began with 10 minutes slow tempo warm-up on foot, later compression, stretching and balance exercises with or without equipment were done on foot for 10 minutes. Mat or floor exercises led by back and abdominal exercises with or without equipment were performed by subjects for nearly 20 minutes. Finally to relax all muscle groups, muscle lengthening exercises, or stretching gymnastic movements, were performed for 10 minutes.

Participant selection

This study included 20 female volunteers living in Çanakkale provincial center aged from 35-45 years with no health problems and no previous participation in sport. Participants were randomly divided into two groups. The first group performed eight weeks of pilates, while the second group performed eight weeks of aerobic-step exercises. At the beginning and end of the study, participants completed structural, motor and psychological tests.

Data collection tools

The study data were collected in an eight week period from February-March 2014 with the experimental method and survey technique. The self-esteem scale by Hülya Aşçı was used. The survey was administered face-to-face. Data were obtained from tests measuring structural and motor characteristics and the scale measuring psychological characteristics.

Flexibility measurement: Flexibility measurements used the sit-reach test. For the flexibility test, a sit-reach flexibility box was used. Subjects attempted to reach as far forward as possible without bending their knees. Subjects had the farthest distance reached in 1-2 seconds recorded with the best value from three attempts noted by the researcher in cm on the measurement assessment form. **Balance measurement:** Balance was measured using the

flamingo balance test. Participants attempted to keep their balance for 1 min on a balance board. The best of two attempts was recorded (Koç and Aslan 2010).

Leg strength measurement: The standing long jump test was used to measure leg strength. From the zero point the subjects jumped to the furthest point possible on both legs without gaining speed. The best of two attempts was recorded (Koç and Aslan 2010).

Abdominal strength measurement: The sit-up test was used to measure abdominal strength. Subjects lay on a mat with soles of the feet at the end of the mat and did sit-ups for 1 minute (Pense and Serpek 2010).

Self-esteem measurement: Developed by Marsh et al. (1994) and adapted to Turkish by Aşçı (2000), self-esteem was assessed using a physical description inventory. The scale includes a total of 70 questions with 11 sub-dimensions. The scale has 6-point Likert form with reliability points of 0.87-0.98 Cronbach alpha.

Statistical Analysis

Data obtained in the study were assessed with the SPSS program. For comparison of the pretest-posttest measurements of the groups, the t test for independent groups was used. To compare the differences between pretest and posttest measurements, the Mann Whitney U test was used. Results at $p < 0.05$ were accepted as significant.

Ethics

This study received permission from Çanakkale Onsekiz Mart University Human Research Ethics Committee dated 01.08.2012 numbered 2013-15. Additionally information was given to participants before the study and voluntary participation was ensured.

Findings

Table 1. Demographic characteristics of participants

Variables	Groups			t	p
	Pilates (n:10)	Step Aerobic (n:10)	Total (n:20)		
	X±SD	X±SD	X±SD		
Age (years)	39.02±3.7	39.07±3.8	39.4±3.6	-0.297	0.770
BMI (Kg/m ²)	25.8 ±3.4	29.2±6.1	27.5±5.1	-1.532	0.143
Monthly income (TL)	1650.1±1328.5	1140.0±1211.2	1395.1±1264.6	0.897	0.382

Data relating to demographic characteristics of participants are shown in Table 1. Accordingly 20 participants were included (10 pilates and 10 aerobic-step) and the mean age, BMI and monthly income were 39.4±3.6 year, 27.5±5.1 kg/m² and 1395.1±1264.6 TL. T test analysis results for these variables found no statistical differentiation. The groups composed of participating individuals were identified to have similar characteristics.

Table 2. Comparison of pretest-posttest measurements in the pilates group

	Pretest	Posttest	T	Sd	P
Flexibility	5.9±4.9	7.5±6.1	-3.637	9	0.05
Balance	6.9±4.6	5.2±4.3	6.530	9	0.01
Leg strength	100.0±22.4	104.3±22.1	-10.864	9	0.01
Sit-ups	42.5±14.3	53.0±16.1	-9.229	9	0.01
BMI	25.8±3.4	24.8±3.2	8.419	9	0.01
Health	31.7±5.5	31.6±5.3	.264	9	0.79
Coordination	12.6±1.6	13.6±1.4	-2.121	9	0.06
Physical Activity	7.1±1.8	7.7±1.8	-1.765	9	0.11
Body Fat	22.3±4.5	23.5±3.4	-1.724	9	0.11
Sporting Ability	14.9±3.5	15.9±2.1	-1.677	9	0.12
General Physical Sufficiency	21.9±4.5	24.0±3.8	-2.641	9	0.02
Appearance	25.7±3.9	27.0±4.1	-3.284	9	0.01
Strength	20.3±5.6	21.7±4.6	-2.585	9	0.02
Flexibility	16.2±3.1	17.2±2.4	-1.936	9	0.08
Endurance	7.9±1.8	8.3±1.8	-1.309	9	0.22
Self-confidence	36.7±7.8	38.2±7.3	-3.308	9	0.01

In the pilates group, the comparison of pretest and posttest results before and after the eight week training are shown in Table 2. When Table 2 is investigated, there was a statistically significant difference between the pretest and posttest measurements when flexibility, balance, leg strength, sit-ups, BMI, health, general physical sufficiency, appearance, strength and self-confidence ($p < 0.05$) are considered. Based on this data, eight weeks of pilates exercise was identified to have a positive effect on the variables listed above.

Table 3. Comparison of pretest-posttest measurements in the step aerobics group

	Pretest	Posttest	T	Sd	P
Flexibility	6.1±5.4	8.4±5.9	-6.273	9	0.01
Balance	6.4±3.7	4.9±3.5	6.708	9	0.01
Leg strength	101.5±29.5	105.9±28.6	-5.766	9	0.01
Sit-ups	48.2±12.8	56.7±11.6	-9.888	9	0.01
BMI	29.2±6.1	28.0±5.7	8.264	9	0.01
Health	29.8±2.4	29.2±3.0	.699	9	0.50
Coordination	14.1±2.5	14.9±3.0	-1.500	9	0.16
Physical Activity	6.5±0.9	8.0±3.3	-1.513	9	0.16
Body Fat	23.4±1.4	24.1±2.2	-1.137	9	0.28
Sporting Ability	15.8±2.8	17.0±2.2	-2.343	9	0.04
General Physical Sufficiency	24.0±1.5	25.4±2.0	-1.801	9	0.10
Appearance	26.7±1.5	27.0±2.2	-.345	9	0.73
Strength	21.2±1.3	23.7±3.2	-2.825	9	0.02
Flexibility	17.1±2.0	17.9±3.0	-1.238	9	0.24
Endurance	7.4±0.6	8.7±3.4	-1.329	9	0.21
Self-confidence	42.3±1.9	41.7±3.8	.439	9	0.67

Table 4. Comparison of structural, motor and psychological characteristics in the groups based on pretest-posttest variation

	Group	N	Row mean	Row total	U	P
Flexibility Difference	Pilates	10	9.00	90.00	35.000	0.244
	Step aerobic	10	12.00	120.00		
	Total	20				
Balance Difference	Pilates	10	9.75	97.50	42.500	0.518
	Step aerobic	10	11.25	112.50		
	Total	20				
Leg strength Difference	Pilates	10	11.05	110.50	44.500	0.670
	Step aerobic	10	9.95	99.50		
	Total	20				
Sit-ups Difference	Pilates	10	11.95	119.50	35.500	0.269
	Step aerobic	10	9.05	90.50		
	Total	20				
Health Difference	Pilates	10	10.20	102.00	47.000	0.810
	Step aerobic	10	10.80	108.00		
	Total	20				
Coordination Difference	Pilates	10	10.50	105.00	50.000	1.000
	Step aerobic	10	10.50	105.00		
	Total	20				
Physical activity Difference	Pilates	10	10.55	105.50	49.500	0.965
	Step aerobic	10	10.45	104.50		
	Total	20				
Body Fat Difference	Pilates	10	10.60	106.00	49.000	0.939
	Step aerobic	10	10.40	104.00		
	Total	20				
Sporting ability Difference	Pilates	10	9.25	92.50	37.500	0.319
	Step aerobic	10	11.75	117.50		
	Total	20				
General physical sufficiency Difference	Pilates	10	10.60	106.00	49.000	0.939
	Step aerobic	10	10.40	104.00		
	Total	20				
Appearance Difference	Pilates	10	11.35	113.50	41.500	0.506
	Step aerobic	10	9.65	96.50		
	Total	20				
Strength Difference	Pilates	10	9.40	94.00	39.000	0.397
	Step aerobic	10	11.60	116.00		
	Total	20				
Flexibility Difference	Pilates	10	10.50	105.00	50.000	1.000
	Step aerobic	10	10.50	105.00		
Endurance Difference	Pilates	10	9.85	98.50	43.500	0.577
	Step aerobic	10	11.15	111.50		
Self-confidence Difference	Pilates	10	12.75	127.50	27.500	0.078
	Step aerobic	10	8.25	82.50		
BMI Difference	Pilates	10	11.10	111.00	44.000	0.650
	Step aerobic	10	9.90	99.00		

In the aerobic-step group, the comparison of pretest and posttest results of variables before and after the eight week study is shown in Table 3. When Table 3 is investigated, the step aerobic group had statistically significant differences between pretest and posttest measurements of flexibility, balance, leg strength, sit-ups, BMI, and strength ($p < 0.05$). When the analysis results are noted, eight weeks of step and aerobic exercise was identified to have a positive effect on the variables above.

The Mann Whitney U analysis results of the difference between pretest and posttest points for structural, motor and psychological variables before and after eight weeks of either pilates or step aerobic exercise are shown in Table 4. When the differences in measurements before and after training are compared between the pilates and step aerobic groups, it was found there was no significant difference in terms of statistics ($p > 0.05$). It can be said that eight weeks of pilates and step aerobic training had similar rates of effect on the variables monitored.

Discussion and Conclusion

In light of research, the importance of exercise is increasing every day. The importance of sporting activities necessary to solve a range of health and psychological problems occurring in individuals choosing an immobile life is shown in all areas of life. Exercise in fitness programs undertaken after a sedentary lifestyle has negatively affected human life had a protective effect generally on human health and physical fitness. Regular exercise aids in developing aspects relating to physical fitness. Aspects of physical fitness related to health include cardiovascular endurance, muscle strength, muscle endurance, body composition, flexibility and nerve-muscle relaxation (Heyward, 1991). The results of this study determined that there were positive developments in physical performance with regular exercise. There were statistically significant differences observed in measurements before and after exercise for the variables of flexibility, abdominal and leg strength, balance and body mass index (BMI) especially ($p < 0.05$).

Degree of flexibility is high in the childhood period, but flexibility reduces as age advances. In other words, there is an age-linked reduction. While this reduction may be large in sedentary individuals, it is less in individuals with an active lifestyle. In fact, there was an increase in flexibility of individuals with regular exercise. Another effect of flexibility and stretching exercises is that the person feels relaxed and is protected from potential injury. In the absence of flexibility, acute and chronic injury and back pain problems increase. Regular stretching movements ensure gains for everyone and are a particular requirement for older people because elasticity traits reduce with age.

There is a substantial amount of information relating to the benefits of regular exercise for middle-aged and elderly individuals, with awareness of the positive effects of physical exercise on quality of life at advanced age (Aydos and Kürkçü, 1997). Segal et al. (2004) found a significant increase in flexibility values at the $p < 0.001$ level as a result of pilates exercises performed for 2, 4 and 6 month periods by adults (42 females, 2 males). Similar results were found in the study by Akdur et al. (2007). Zorba et al. had middle-aged sedentary women perform 45 minutes of high tempo step exercise 3 days per week for 8 weeks and identified a significant increase in flexibility at the end of training. The results of our study determined a significant increase in flexibility values for individuals in the pilates and step aerobic groups. This result is in parallel with the literature.

Balance is a complicated process including coordinated activities of many sensory, motor and biomechanical components. The environmental components within balance include the somatosensorial, visual and vestibular systems. The central nervous system combines the environmental inputs from these systems, controlling body position and posture on a support base choosing many appropriate muscle responses. In a special position or during movement posture and balance are maintained and controlled which is fundamental for physical activity. The ability of a person to balance is described as a determinant factor for development of other motor systems (Erkmen et al., 2007).

Hall (1998) researched the effect of pilates on the static and dynamic balance of 31 males and females aged from 65-85 years and found a significant difference between the pretest and posttest results after 10 weeks of exercise. In parallel with these results, our study found the balance performance in participants in the study was significantly improved.

Turan et al. (1997) in a study of subdermal fat thickness of sedentary individuals and training sports people at Cumhuriyet University, found that sports people had lower fat mass. Regular physical activity is known to prevent and delay weight gain. A study researching the correlation between physical activity and BMI in adults found a significant difference when they compared the BMI of individuals participating in regular physical activity and sedentary individuals (Sevimli, 2008). The positive effect of exercise on reducing subdermal fat tissue was observed in individuals participating in our study. The BMI values of participants in both groups were significantly reduced ($p < 0.05$).

There are findings encountered in the literature on the positive effects of pilates and step aerobic exercise on strength. Previous studies have indicated positive effects of aerobic exercise on back, leg and hand grip strength (Babayiğit et al., 2002; Dönmez and Aydos, 2000; İmamoğlu et al., 2002; Karacan and Çolakoğlu, 2003; Kurt et al., 2010). In parallel with the literature, this study found a significant increase in the leg and abdominal muscle strength of individuals participating in step aerobics after training. Similar results were observed for pilates exercises, with significant changes in back, leg and abdominal muscle strength as a result of pilates exercises identified by researchers (Fourie et al., 2012; Betül et al., 2010). These results support the results of our study.

Self-esteem begins to develop at birth, continuing to develop until the adult period, and is a mental, societal and partially physical case affected by life events in adulthood (Yörükoğlu, 1985). In the mental development process, many factors affect self-esteem, with family having a major effect. In the literature, research indicating a linear correlation between obesity and reduced esteem values are in the majority (Bryan and Tiggemann, 2001; Telch, 1994; Werrij et al., 2006; Annis et al., 2004; Mond et al., 2011). A study in Turkey found that self-esteem of obese people was significantly low compared to non-obese people (Tezcan, 2009). Another study determined that self-esteem of overweight people was lower compared to people of normal weight ($p < 0.001$); that self-esteem of obese people was correlated with BMI; and as BMI increased there was a reduction in self-esteem (Yücel, 2008). The self-esteem points of individuals participating in our study differed in measurements before and after exercise. Individuals in the pilates group especially showed significant variation in sub-dimension variables of self-esteem of health, general physical sufficiency, appearance, strength and self-confidence ($p < 0.05$). Similar findings were found for the strength subdimension in the step aerobics group. These results are in parallel with the literature.

In the pilates group, when pretest and posttest results from before and after eight weeks of training are compared, there were statistically significant differences observed for flexibility,

balance, leg strength, sit-ups, BMI, health, general physical sufficiency, appearance, strength and self-confidence ($p<0.05$). Based on this data, eight weeks of pilates exercises may be said to have a positive effect on these variables.

In the aerobic-step group, the comparison of variables before and after the eight week study found the step aerobic group had statistically significant differences between pretest and posttest measurements of flexibility, balance, leg strength, sit-ups, BMI, and strength ($p<0.05$). When the analysis results are noted, eight weeks of step and aerobic exercise was identified to have a positive effect on the variables above.

When the differences in measurements before and after eight weeks of pilates and step aerobic training are compared between the groups, there was no significant difference found in terms of statistics ($p>0.05$). It can be said that eight weeks of pilates and step aerobic training have similar rates of effect on the variables monitored

In conclusion, eight weeks of step aerobics and pilates training had a positive effect on the structural, motor and some psycholocial characteristis of sedentary women. It was also determined that the effects of these two different exercise types on the observed variables over eight weeks were statistically similar.

Conflict of Interest

The authors have not declared any conflicts of interest.

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