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THE EFFECT OF PILATES EXERCISE ON STATIC BALANCE

Research Assistant Mucahit SARIKAYA

Van Yuzuncu Yıl Üniversity, Pysical Education and Sport Deparment, Van /TURKEY, ORCID: 0000-0002-4062-0752

Associate Professor Muzaffer SELCUK

Van Yuzuncu Yıl Üniversity, Pysical Education and Sport Deparment, Van / TURKEY, ORCID: 0000-0003-4349-7718

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ABSTRACT

Objective: The aim of this study was to investigate the effect of pilates exercise on static balance.
Methods: This study included 14 women aged 21-24 years. Pilates exercises were performed to participants 8 weeks a week, 3 days a week. Before and after the study; age, height, weight, BMI and CAT 3000 with double leg eye open, double leg eye closed, right leg, left leg (Average CoPX, Average CoPY, Forward Backward Standard Deviation, Forward Backward Standard Speed, Medium Lateral Standard Speed, Perimeter, Ellipse Area) static equilibrium values were taken. Spss 22.0 package program was used to analyze the data.
Results: As a result of the study, the experimental group and the control group had double leg eye open, double leg eye closed, right leg, left leg (Average CoPX, Average Coax, Medium Lateral Standard Deviation, No statistically significant difference was observed between the static equilibrium values of Speed, Perimeter, Ellipse Area.
Conclusion: Pilates exercise has no effect on static balance.
Key Words: Pilates, Balance

ÖZET

Amaç: Bu çalışmanın amacı pilates egzersizinin statik denge üzerine etkisinin araştırmaktır.
Yöntem: Bu çalışmaya 21-24 yaş Aralığında 14 bayan katılmıştır. Katılımcılara 8 hafta, haftanın 3 günü, günde 40 dakika pilates egzersizi yaptırılmıştır. Çalışmadan önce ve sonra bireylerin; yaş, boy, kilo, VKİ ve KAT 3000 ile bireylerin çift bacak göz açık, çift bacak göz kapalı, sağ bacak, sol bacak (Average CoPX, Average CoPY, Forward Backward Standard Deviation, Medium Lateral Standard Deviation, Forward Backward Standard Speed, Medium Lateral Standard Speed, Perimeter, Ellipse Area) statik denge değerleri alınmıştır. Verilerin analizi için Spss 22,0 paket programı kullanılmıştır.
Bulgular: Yapılan çalışma sonucunda deney grubu ve kontrol grubu çift bacak göz açık, çift bacak göz kapalı, sağ bacak, sol bacak (Average CoPX, Average CoPY, Forward Backward Standard Deviation, Medium Lateral Standard Deviation, Forward Backward Standard Speed, Medium Lateral Standard Speed, Perimeter, Ellipse Area) statik denge değerleri karşılaştırıldığında istatiksel olarak anlamlı bir fark görülmemiştir (p>0,05).
Sonuç: Pilates egzersizinin statik denge üzerine etkisinin olmadığı görülmüştür.
Anahtar Kelimeler: Pilates, Denge

1. INTRODUCTION

Pilates was developed by Joseph Hubertus Pilates. Pilates was born in 1880 in Germany; rickets, asthma and rheumatoid fever. Because of this medical condition, he has dedicated his life to the healing of diseases caused by muscle weakness and physical strengthening. As she grew older, she became interested in yoga and zen meditation, fencing, boxing, wrestling and gymnastics and sports to improve her health and body (Andesrson and Spector, 2000; Ebers and Sadoynick, 1994; Selcuk, Bilen, Temur,

Oner and Kinaci, 2017). Pilates used his work to improve his health in the rehabilitation of soldiers wounded during the First World War. His experiences helped him develop the physical and mental work he took to America in 1923. In 1926, he opened his first Pilates studio in New York. He first worked with dancers, and in his work with dancers, he developed an exercise program that improved body awareness, emphasized proper posture, and focused on the essential muscles responsible for the continuation of postural control and balance (Bilgic, Pancar, Sahin & Ozdal, 2016; Ebers and Sadoynick, 1994; Karadag, Cinar and Oner, 2018; Selcuk, Cinar, Sarikaya, Oner & Karaca, 2018).

Balance is one of the critical elements that form the basis of movement, which facilitates performance in functional skills. Balance is achieved by the integrity of vestibular, proprioceptive, motor and visual neurophysiological structures. If one of them is inadequate, it is affected negatively. Vestibular system; Hearing, vision and muscular structures, such as information from many systems in various environments with the body's upright position, walking concerning gravity plays an important role in maintaining balance. If the vestibular system is temporarily or permanently disabled for any reason, it may cause physiological and psychological problems such as disorientation in movement, disturbance of balance during gait, changes in heart rate and pressure, fear, irritability and panic. Balance is divided into static and dynamic (Cinar, Akbulut, Oner, Pancar and Karaman 2016; Kitis, Buker, Eren & Aydin, 2015; Selcuk, Cinar, Sarikaya & Oner, 2018; Temur, Selcuk, Oner & Karaman, 2017).

2. METHOD

A total of 14 women (7 experimental and 7 control groups) aged 21-24 years participated in this study. The participants were given pilates exercises for 8 weeks, 3 days a week, 40 minutes a day. Before and after exercise; The age, height, weight, BMI and KAT 3000 of the individuals with double legs (eye open - eye closed), single leg, (right leg - left leg) static balance tests were taken. Spss 22.0 package program was used for data analysis

Pilates exercise: The participants were administered 40 minutes a day for 8 weeks, 3 days a week. Before the exercise, the participants were warmed for 15 minutes. The swan-dif, The sidekick, The neck pull, The rocking, The boomerang, The double leg stretch) were applied and at the end of the exercise, the exercise was completed by cooling the participants.

Heigth: Freely height meter scale was used. (Oner, Ozbar, Cinar, Kilic and Olcucu, 2016)

Weight: Freely Weight meter scale was used

2.1. Balance KAT 3000

KAT 3000 was developed for use in balance therapy and evaluation. It is easy to apply and less costly than force perturbation platforms. With KAT 3000, the balance can be evaluated separately statically and dynamically. The KAT 3000 system consists of a movable platform supported by a pivot from its center point and a sensor monitor located in front of the platform that transmits the tilt of the platform relative to the reference point to the computer. The stability of the platform is regulated by the pressure in the pneumatic pad between the platform and the base of the unit. Individuals standing on the platform try to move the platform as desired in the test with the movement of the body center of gravity. In doing so, they can monitor their movements on the computer screen at eye level. In front of the platform is a tilt sensor connected to the computer. This inclination sensor records the deviation of the platform from the reference position during the test 18.2 times per second.

In each record, the distance from the center of the platform to the reference position is measured; an equilibrium index is calculated with the sum of these distances. The reference point changes in static and dynamic investigations. In static evaluations, the individual is asked to keep the X mark (body center of gravity) on the computer screen at the center of the screen. In dynamic balance evaluation, the individual is asked to move with the moving ball that circles on the screen. Individuals should be able to draw circles by shifting the center of gravity to the front and back, right and left (Hansen, Dieckmann, Jensenk and Jakobsen, 2000; Ozdal, Bicer and Pancar, 2019). The equilibrium index (D1) measures the ability of the individual to hold the platform near the reference point. The Score Range ranges from 0 to 6000, and a low balance index score indicates a person's ability to maintain and maintain balance (Hansen et al, 2000). A score of 250 or less at 5 PSI (Pounds per Square Inch) is a successful result in

static balance assessment tests. 500 is good, score above 750 is a sign of a problem in equilibrium. For dynamic balance assessment tests, the score between 750-950 was successful, a score between 1350-1550 was good and a score between 1950-2150 was poor. But successful, good or at risk values vary from individual to individual (Hansen et al, 2000).

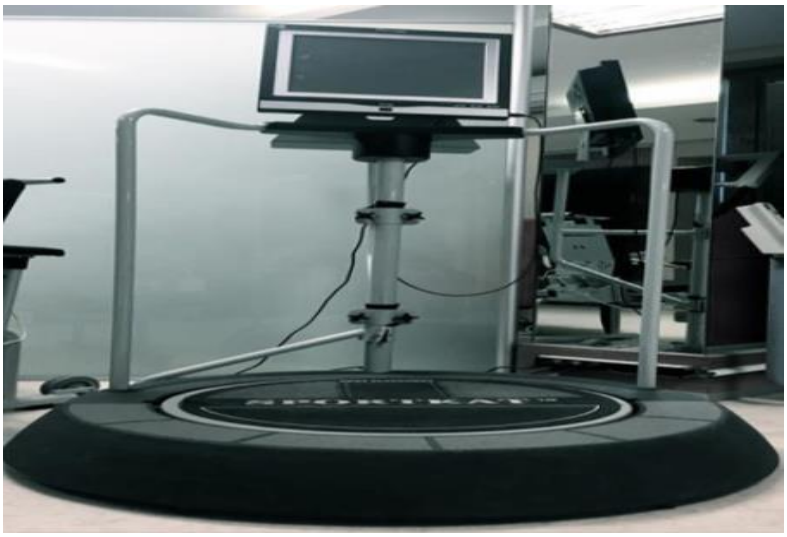

Image.1: KAT 3000

3. FINDINGS

Tablo 1. Experimental Group Pre-test – Post- test Comparison

Experimental Group	Mean	N	Stad. deviation	T	Df	P
Wide Average Copx Pre-Test	-1,71	7	2,69	-0,1	6	0,924
Wide Average Copx Post-Test	-1,42	7	8,24			
Wide Average Copy Pre-Test	-14,2	7	17,5	1,13	6	0,301
Wide Average Copy Post- Test	-24,5	7	18,4			
Wide Forward Backward Standard Deviation Pre-Test	4,57	7	1,71	-0,62	6	0,555
Wide Forward Backward Standard Deviation Post-Test	5	7	2,88			
Wide Medium Lateral Standard Deviation Pre-Test	3	7	0,57	-1,54	6	0,172
Wide Medium Lateral Standard Deviation Post-Test	3,57	7	1,13			
Wide Average Forward Backward Speed Pre-Test	7,85	7	2,48	0,73	6	0,489
Wide Average Forward Backward Speed Post-Test	7,14	7	1,21			
Wide Average Medium Lateral Speed Pre-Pre-Test	6,14	7	1,34	-0,89	6	0,407
Wide Average Medium Lateral Speed Post- Test	6,57	7	1,51			
Wide Perimeter Pre-Test	347	7	82,3	-0,98	6	0,364
Wide Perimeter Post- Test	441	7	203			
Wide Ellipse Area Pre- Test	266	7	86,6	-0,94	6	0,384
Wide Ellipse Area Post- Test	307	7	102			
Close Average Copx Pre- Test	-2,71	7	2,05	0,97	6	0,368
Close Average Copx Post- Test	-5,28	7	6,57			
Close Average Copy Pre -Test	-6,42	7	15,5	1,2	6	0,273
Close Average Copy Post- Test	-19,4	7	21,6			
Close Forward Backward Standard Deviation Pre- Test	6,142	7	2,47	1,11	6	0,308
Close Forward Backward Standard Deviation Post-Test	5,28	7	0,75			
Close Medium Lateral Standard Deviation Pre- Test	4,42	7	1,9	-0,71	6	0,499
Close Medium Lateral Standard Deviation Post-Test	5,14	7	2,11			
Close Average Forward Backward Speed Pre Test	10	7	3,46	-0,82	6	0,441
Close Average Forward Backward Speed Post Test	11,4	7	4,96			
Close Average Medium Lateral Speed Pre- Test	8,57	7	2,5	-0,88	6	0,41
Close Average Medium Lateral Speed Post- Test	10,2	7	5,15			
Close Perimeter Pre- Test	467	7	102	-0,85	6	0,477
Close Perimeter Post Test	521	7	211			

Tablo 1. Experimental Group Pre-test – Post- test Comparison (*Cont.*)

Experimental Group	Mean	N	Stad. deviation	T	Df	P
Close Ellipse Area Pre- Test	521	7	319	0,21	6	0,635
Close Ellipse Area Post Test	501	7	247			
Right Average Copx Pre- Test	4,85	7	4,45	-0,45	6	0,667
Right Average Copx Post- Test	6	7	4,93			
Right Averade Copy Pre-Test	6,71	7	17,2	4,91	6	0,003*
Right Average Copy Son Test	-16,1	7	22,7			
Right Forward Backward Standard Deviation Pre- Test	4,28	7	8,34	-0,81	6	0,447
Right Forward Backward Standard Deviation Post- Test	6,71	7	0,95			
Right Medium Lateral Standard Deviation Pre- Test	5,28	7	0,95	2,02	6	0,086
Right Medium Lateral Standard Deviation Post Test	4,28	7	0,48			
Right Average Forward Backward Speed Pre Test	24,8	7	8,09	2,55	6	0,043*
Right Average Forward Backward Speed Post Test	18,1	7	3,43			
Right Average Medium Lateral Speed Pre- Test	23,8	7	7,69	2,05	6	0,085
Right Average Medium Lateral Speed Post- Test	18,8	7	2,54			
Right Perimeter Pre- Test	1120	7	335	2,76	6	0,033*
Right Perimeter Post- Test	733	7	187			
Right Ellipse Area Pre- Test	819	7	514	0,87	6	0,416
Right Ellipse Area Post- Test	631	7	244			
Left Average Copx Pre- Test	4,57	7	3,1	-0,77	6	0,466
Left Average Copx Post- Test	-3,14	7	6,06			
Left Averade Copy Pre- Test	3,71	7	18,8	2,64	6	0,038*
Left Averade Copy Post- Test	-7,14	7	17,16			
Left Forward Backward Standard Deviation Pre- Test	12,5	7	5,34	2,47	6	0,048*
Left Forward Backward Standard Deviation Post-test	6,85	7	1,86			
Left Medium Lateral Standard Deviation Pre- Test	5,42	7	1,81	1,89	6	0,108
Left Medium Lateral Standard Deviation Post- Test	4,14	7	0,69			
Left Average Forward Backward Speed Pre- Test	25,8	7	13,3	1,65	6	0,15
Left Average Forward Backward Speed Post- Test	17,7	7	3,45			
Left Average Medium Lateral Speed Pre- Test	22,8	7	8,43	1,4	6	0,211
Left Average Medium Lateral Speed Post-Test	17,8	7	3,67			
Left Perimeter Pre- Test	1137	7	497	0,18	6	0,121
Left Perimeter Post- Test	723	7	196			
Left Ellipse Area Pre- Test	1105	7	702	0,18	6	0,112
Left Ellipse Area Post-Test	656	7	247			

As a result of the statistical analysis, it was seen that the average Open CoPX pre-test average of the experimental group was -1.71 ± 2.69, and the post-test average was -1.42 ± 8.24 (p:0,924). When the Wide Average Copy pre-test averages of the experimental group were examined, it was found that -14.2 ± 17.5, and the post-test averages were -24.5 ± 18.4 and no statistically significant result was observed (p: 0,301). When the Open Forward Backward Standard Deviation pretest average of the experimental group was examined, it was found that the mean of post-test was 4.57 ± 1.71 and the final test average was 5.00 ± 2.88 (p: 0.555). When the pre-test average of Wide Medium Lateral Standard Deviation of the experimental group was examined, it was seen that the mean of post-test was 3,00 ± 0,57 and post-test mean was 3,57 ± 1,13 and no statistically significant result was found (p: 0,172). Backward Speed pretest averages of 7.85 ± 2.48 and post-test averages of 7.14 ± 1.21 were found to be statistically significant (p: 0.489). When the mean average Lateral Speed pre-test average of the experimental group was examined, it was found to be 6.14 ± 1.34, and the post-test average was 6.57 ± 1.51 and no statistically significant result was observed (P: 0.407). Open Perimeter pretest averages of the experimental group were 347 ± 82.3 and 441 ± 102, respectively, and there was no statistically significant result (P: 0.364). Open Ellipse Area pretest mean of the experimental group was 266 ± 86.6 and post-test mean was 307 ± 102, but no statistically significant result was found (P: 0.384).

Tablo 2. Control Group Pre-Test – Post-Test

Control Group	Mean	N	Stand. deviation	T	DF	P
Wide Average Copx Pre-Test	-1,71	7	3,8	-0,51	6	0,622
Wide Average Copx Post-Test	-0,71	7	4,75			
Wide Average Copy Pre-Test	-25,7	7	13,8	-1,42	6	0,205
Wide Average Copy Post- Test	-15,5	7	17,6			
Wide Forward Backward Standard Deviation Pre-Test	4	7	1	-1,19	6	0,03
Wide Forward Backward Standard Deviation Post-Test	4,71	7	0,48			
Wide Medium Lateral Standard Deviation Pre-Test	3,14	7	0,69	2,82	6	0,078
Wide Medium Lateral Standard Deviation Post-Test	2,57	7	0,53			
Wide Average Forward Backward Speed Pre-Test	7,85	7	2,6	2,12	6	0,689
Wide Average Forward Backward Speed Post-Test	6,57	7	1,51			
Wide Average Medium Lateral Speed Pre-Test	6,14	7	1,95	0,42	6	0,363
Wide Average Medium Lateral Speed Post- Test	6	7	1,91			
Wide Perimeter Pre-Test	336	7	112	0,98	6	0,644
Wide Perimeter Post- Test	313	7	73,9			
Wide Ellipse Area Pre- Test	204	7	86,6	0,48	6	0,853
Wide Ellipse Area Post- Test	194	7	43,8			
Close Average Copx Pre- Test	-1,85	7	1,67	0,19	6	0,912
Close Average Copx Post- Test	-2,28	7	5,82			
Close Average Copy Pre -Test	-18,4	7	16,3	-0,11	6	0,654
Close Average Copy Post- Test	-17,7	7	17,7			
Close Forward Backward Standard Deviation Pre- Test	5,28	7	2,36	-0,47	6	1
Close Forward Backward Standard Deviation Post-Test	5,57	7	1,9			
Close Medium Lateral Standard Deviation Pre- Test	3,85	7	0,69	-0,44	6	0,673
Close Medium Lateral Standard Deviation Post-Test	3,85	7	1,46			
Close Average Forward Backward Speed Pre Test	10	7	2,94	0,52	6	0,617
Close Average Forward Backward Speed Post Test	10,2	7	3,14			
Close Perimeter Pre- Test	446	7	122	-0,27	6	0,789
Close Perimeter Post Test	458	7	126			
Close Ellipse Area Pre- Test	387	7	218	-0,27	6	0,916
Close Ellipse Area Post Test	401	7	225			
Right Average Copx Pre- Test	9,28	7	4,02	11	6	0,09
Right Average Copx Post- Test	9,57	7	5,34			
Right Averade Copy Pre-Test	0	7	17,4	2,02	6	0,321
Right Average Copy Son Test	-13	7	13,8			
Right Forward Backward Standard Deviation Pre- Test	6,14	7	2,11	-1,08	6	0,407
Right Forward Backward Standard Deviation Post- Test	7,42	7	1,39			
Right Medium Lateral Standard Deviation Pre- Test	4,28	7	1,25	0,89	6	0,245
Right Medium Lateral Standard Deviation Post Test	3,85	7	0,69			
Right Perimeter Pre- Test	960	7	276	1,72	6	0,772
Right Perimeter Post- Test	847	7	137			
Right Ellipse Area Pre- Test	516	7	336	-0,3	6	0,927
Right Ellipse Area Post- Test	559	7	89,9			
Left Average Copx Pre- Test	-8,42	7	10,7	-0,09	6	0,156
Left Average Copx Post- Test	-8	7	7,14			
Left Averade Copy Pre- Test	-3,57	7	19,5	1,62	6	0,74
Left Averade Copy Post- Test	-13,8	7	12,6			
Left Forward Backward Standard Deviation Pre- Test	7	7	5,74	-0,34	6	0,356
Left Forward Backward Standard Deviation Post-test	7,57	7	2,63			
Left Medium Lateral Standard Deviation Pre- Test	3,85	7	0,37	-0,01	6	0,407
Left Medium Lateral Standard Deviation Post- Test	4	7	0			
Left Perimeter Pre- Test	881	7	210	-0,57	6	0,578
Left Perimeter Post- Test	915	7	207			
Left Ellipse Area Pre- Test	568	7	167	0,63	6	0,55
Left Ellipse Area Post-Test	534	7	204			

When the mean Open CoPX pre-test averages were found to be 1.71 ± 3.8, the post-test averages were -0.71 ± 4.78, a significant difference (P): 0924).

4. DISCUSSION

As a result of the studies performed, there was a statistically significant difference between the static equilibrium parameters (Average CoPX, Average CoPY, Forward Backward Standard Deviation, Medium Lateral Standard Deviation, Forward Backward Standard Speed, Medium Lateral Standard Speed, Perimeter, Ellipse Area) in the experimental and control groups. could not be found. In the literature review, it can be concluded that there are many studies on various exercises and static balance in studies, but there is the limited number of studies examining the relationship between Pilates and static balance

Gur and Ersoz (2017) to evaluate the effect of core training on the core strength, static and dynamic balance characteristics of tennis players in the 8-14 age group, this study was conducted on the 12-week training program of the 10 force and 9 control groups. As a result of the statistical analysis, there was no significant difference between static balance and dynamic balance of the trainings. Although the above studies did not yield significant results on static equilibrium, some studies showed that it affected static equilibrium. Damdelen (2016), the effect of Pilates exercises on static balance and dynamic balance was investigated in healthy individuals. The study was conducted on 30 individuals who performed Pilates and 30 sedentary individuals. As a result of statistical analysis, it was determined that Pilates exercise affected static balance and dynamic balance. However, Pilates exercise didn't affect static balance. The reason for this is thought to be due to the small number of people in the steal compared to other things (Damdelen, 2016).

Eris (2018), in study, the effect of 12-week core exercises on some anthropometric values, static balance and core strength was investigated in badminton athletes. Paste the research on 10 experimental and 10 control groups. Badminton training and core strength training were given to the experimental group. As a result of statistical analysis, it was determined that badminton and core strength training had an effect on static balance and core strength. When we look at the literature, it is seen that the studies on Pilates generally work with women. Pilates is supported by some clinical trials that women do more often than men do. A study by Chang showed that Pilates was widely preferred among women (Chang, 2000). Selcuk, Bilen, Temur and Oner (2018), found significant results on balance in their study on biathlon.

In conclusion, Pilates exercise doesn't affect static balance. In the literature, there are almost no studies in this field. The lack of any effect of Pilates exercise on static balance may be due to the short duration of the exercise. It may be recommended to keep the exercise time longer or increase the number of people.

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