Orta Yaşlı Popülasyonlarda Kas Kuvveti ve Dayanıklılığının İyileştirilmesi İçin Kinesis ve Pilates: Randomize Kontrollü Bir Çalışma

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Öz

Çalışma Pilates ve Kinesis olmak üzere iki farklı fonksiyonel egzersizi değerlendirmeyi amaçlamaktadır. Bu çalışmaya herhangi bir düzenli fiziksel aktiviteye katılmayan toplam 22 kadın (yaş 39.59 ± 3.12; kilo 62.45 ± 6.20; boy 164.41 ± 8.86; ort. ± SS) katıldı. Katılımcılar Pilates (n=11) ve Kinesis (hareket bilimi) (n=11) gruplarına rastgele belirlendi. Kinesis grubunda antrenman dikey düzlemde, Reformer Pilates egzersizlerinde ise yatay düzlemde antrenman yapıldı. Eğitim, sekiz hafta boyunca haftada iki kez gerçekleştirildi. Sonuçlar, her iki grupta da üst vücut, üst gövde bölgesinde, alt vücut ve alt gövde bölgesinde kuvveti ve dayanıklılığında önemli bir gelişme olduğunu göstermektedir. Mevcut çalışma, iki farklı fonksiyonel antrenman yönteminin spor deneyimi olmayan kişiler için daha keyifli ve rahat olduğunu göstermektedir.

Anahtar kelimeler: Fonksiyonel antrenman, Direnç antrenmanı, Kuvvet antrenmanı, Dayanıklılık antrenmanı

Kinesis and Pilates for Improvement of Muscle Strength and Endurance in Middle-aged Papulations: A Randomized Controlled Trial

Abstract

The study aims to evaluate two different functional exercises, Pilates and Kinesis. A total of twenty-two women (age 39.59 ± 3.12; weight 62.45 ± 6.20; height 164.41 ± 8.86; mean ± SD) who did not participate in any regular physical activity participated in this study. Participants were randomly assigned to Pilates (n=11) and Kinesis (n=11) groups. In the Kinesis group, training was performed in the vertical plane, and in the Reformer Pilates exercises, training was performed in the horizontal plane. The training was conducted twice a week for eight weeks. The results show a significant improvement in both groups' upper and lower body and core strength and endurance. The current study suggests that the two different methods of functional training are more enjoyable and comfortable for people with no sporting experience.

Keywords: Functional training, Resistance training, Strength training, Endurance training

Introduction

Resistance training, also known as strength training, is one of the most well-known forms of exercise to increase muscle quality and quantity (Peeri, Shahidi, & Azarbayjani, 2014; Seyed Houtan Shahidi, Kingsley, Svensson, Taşkıran, & Hassani, 2021; Seyed Houtan Shahidi et al., 2020). Resistance training effectively improves an individual's physical function by increasing strength and muscle mass. In the majority a significant improvement in both groups' upper and lower body and core strength and endurance (Seyed Houtan Shahidi et al., 2020; Seyed H Shahidi, Williams, & Hassani, 2020). In this way, the person sits and the resistance is loaded in a fixed and linear path that dictates a single muscle training pattern (Balachandran et al., 2016). Therefore, one of the limitations of this type of machine or barbell exercise is limited to just one muscle and also not very interesting and convenient for middle-aged adults who have not experienced any exercise (Belachew & Mengistu, 2018). Today, however, the new training concept is referred to as functional training. Freeform training with free weights or cables is one of the most popular forms of functional training. Like everyday activities, freeform training allows resistance to be moved in multiple planes and works multiple joints and muscles simultaneously (Bohannon et al., 2018). Functional training, therefore, aims to mimic everyday activities and allows greater freedom than fixed forms of training such as weight machines or barbells (Chen et al., 2003). According to the American College of Sports Medicine's Physical Activity and Health Guidelines, the numerous health benefits of physical activity and the risks of inactivity are clear (Bushman & Medicine, 2017; Medicine, 2012, 2013). Developing exercise programs that address the specific problems of physical inactivity that are accessible, fun, comfortable, and have proven health benefits for the middle-aged population is an undeniable public health mandate (Collins, 2012). Pilates, named after its founder Joseph Pilates, is a mind-body exercise program that can be performed on a mat or on specialized machines like the Reformer (Cruz-Ferreira et al., 2011). Reformer Pilates consists of a gliding platform in a wooden or metal frame connected to a system of springs, pulleys, and ropes (Roller et al., 2018). It allows users to vary resistance when working the extremities while focusing on postural alignment and lumbopelvic stability (Wells, Kolt, & Bialocerkowski, 2012). Reformer Pilates is suitable for middle-aged people, which provides a gentle form of exercise and supports the joints, and the resistance can be changed by modifying the springs and pulleys, changing the direction of the body with respect to gravity (Twietmeyer, 2010). Additionally, Reformer Pilates exercises focus on maintaining neutral posture and proper body alignment, all of which challenge and re-educate balance and functional movements (Sekendiz, Altun, Korkusuz, & Akın, 2007). The study examined the effect of Pilates exercises three times a week for five weeks on abdominal and lower back strength, abdominal endurance, and posterior trunk flexibility in sedentary adult women (Schott, Johnen, & Holfelder, 2019). The authors showed that after the completion of five weeks of Pilates training, a positive effect of Pilates on abdominal and lower back muscle strength, abdominal muscle endurance, and posterior trunk flexibility was observed in sedentary adult women (Roller et al., 2018). On the other hand, kinesis training is an inexpensive tool that can be placed anywhere and requires no support for its stance. A wide range of exercises and natural movement is possible with Kinesis instruments (Lange, Unnithan, Larkam, & Latta, 2000). The product offers zero-impact exercises, even when working on strength, balance, and flexibility. The Kinesis machine contains elastic cables that are stretched by the subject to perform the following four types of exercises: foot press, front pull, vertical pull, and overhead press can be performed on Kinesis machines designed for strength training (Guimarães, Azevedo, Simas, Machado, & Jonck, 2014; Kloubec, 2010). Interestingly, no study has examined the comparative benefit of free-form exercise versus fixed-form exercise such as kinesis and Pilates in older adults on physical capacity. Therefore, this study aimed to examine the effects of vertical plane kinesis and horizontal plane Reformer Pilates exercises, which have been popular in recent years, on strength, endurance, and range of motion. We hypothesized that standing cable and Pilates exercises would have a positive effect on physical capacity in middle-aged adults.

Materials and Methods

The study was an 8-week randomized controlled trial to determine the effects of Reform Pilates vs. Kinesis exercises on exercise capacity in middle-aged populations. Twenty-two women (age 39.59 ± 3.12; weight 62.45 ± 6.20; height 164.41 ± 8.86; mean ± SD) who were members of the Fitkon sports studio in Ataşehir, Istanbul, Turkey participated in this study. The criteria for inclusion in the study were between the ages of 30 and 50 as middle-aged adults with no experience in sports or physical activity. Exclusion criteria were neurological impairments that would affect balance and any type of muscle or joint injury. Before the start of the study, the participants gave informed consent to the information about the study and possible side effects such as soreness in the abdominal and back muscles due to fatigue. Participants were randomly assigned to the Kinesis or Pilates groups. The duration of the intervention was set at eight weeks and the participants completed a total body workout twice a week. Intensity ranged from moderate to severe intensity (5-7) on a 0-10 RPE scale; The volume was 2 sets of 12 reps; A 1-2 minute rest was provided between each set. Before starting the training program, pre-test and post-test evaluations were conducted at the end of the 8-week program. The 1-hour resistance training system was created for each session. A physical education teacher with five years of experience and certification in Pilates exercises initiated the exercise (EÇ). Pilates and Kinesis exercise training programs were shown in Tables 1 and 2. Before the exercise program and testing began, all procedures were well-defined for all subjects and an informed consent form was signed. The study was approved by the Ethics Committee of Istanbul Gedik University (E-71457743-050.01.04-2022.137548.19).

Table 1. Kinesis Exercise program

Exercise	Frequency (Per week)	Repetition	Resistance	Borg Scale (0 – 10)	Duration (Minutes)
Chop from Half Kneeling With Cable Bar	2	12-18	5	5-7	60
Reverse Fly	2	12-18	2	5-7	60
Shoulder Press	2	12-18	3	5-7	60
Push Down	2	12-18	3	5-7	60
Biceps Curl	2	12-18	2	5-7	60
Chest Press	2	12-18	4	5-7	60
Horizontal Torso Rotation	2	12-18	5	5-7	60
Anti-Rotational Static Hold	2	12-18	4	5-7	60
Twisting Punches	2	12-18	3	5-7	60
Back Row Application	2	12-18	4	5-7	60
Squat	2	12-18	6	5-7	60
Lunge	2	12-18	4	5-7	60
Bent Over Lateral Raise	2	12-18	1	5-7	60
Straight Down	2	12-18	4	5-7	60
Front Lifting	2	12-18	4	5-7	60

Outcome Measurement

The Physical Performance Battery Test (PPBT) was used to assess the endurance and strength of lower, upper, and flexibilities muscles in middle-aged adults. The test was well designed for the three days; On the first day, the subjects' body mass and height were assessed. On the second day, the strength and endurance of the upper body muscles were assessed. And on the final day, lower body strength and endurance, and muscle flexibility were assessed.

Trunk Abdominal Endurance Test

The subject is placed on the back with shoulders straight and head straight. The subject's legs are positioned bilaterally at 45 degrees from the knee and 90 degrees from the hips. Subjects are asked to do as many repetitions as possible in one minute. The number of correct repetitions during one minute will be recorded. The trunk-abdominal endurance test was highly reliable for the women (R = 0.94) and men (R = 0.88) studied (Knudson & Johnston, 1995).

Table 2. Reformer Pilates Exercise Program

Exercise	Frequency (Per week)	Repetition	Resistance	Borg-Scale (0 – 10)	Duration (Minutes)
Footwork	2	12-18	2 Red 1 Yellow	5-7	60
Hundred	2	12-18	Red	5-7	60
Straight Back	2	12-18	Red	5-7	60
Biceps Curl	2	12-18	Red	5-7	60
Straight Forward	2	12-18	Red	5-7	60
Pectoralis	2	12-18	Red	5-7	60
Stomach Massage	2	12-18	1 Red 1 Yellow	5-7	60
Twist	2	12-18	Red	5-7	60
One leg pull	2	12-18	Yellow	5-7	60
Long stretch	2	12-18	Red	5-7	60
Down stretch	2	12-18	Red	5-7	60
Hip lift	2	12-18	Red	5-7	60
Shoulder Presing	2	12-18	Red	5-7	60
Control Front	2	12-18	Green	5-7	60
Feet in strerps	2	12-18	1 Red 1 Yellow	5-7	60
Back exstansion	2	12-18	Red	5-7	60

Lateral Flexors (Side Bridge) Test

Subjects are positioned on the right side with their right elbow over the test surface. Subjects are asked to extend the upper foot in front of the lower one so that both legs are straight and supported. Endurance time is measured in seconds until the subject's hips fall to the test surface after holding the shoulder, as previously shown (McGill, Childs, & Liebenson, 1999).

Endurance of Extensors Test

Subjects are positioned in the prone position and the lower body joint is fixed from the knee to the hip. The upper body should be extended beyond the test surface and the hands should be on the chair (First Position). For the test, the subject's arms are crossed in front of the chest. The upper

body is pushed up from the chair so that it is flush with the test surface (Second Position). The time that elapses until the body loses its horizontal position and falls is measured with a stopwatch and recorded.

Prone Bridge Test

Subjects stand with elbows on the test surface and slightly bent. The elbows are shoulder-width apart and the feet are close together but not touching. Subjects are asked to lift their pelvis off the test surface and touch the test surface with their forearms and fingertips. The time is recorded from the start moment until the subject's position deteriorates and is recorded in seconds as described previously (Bohannon et al., 2018).

Back Bridge Test

Subjects are supine with knees bent 90 degrees. The distance between the feet is narrow, but open so that they do not touch. The hands are at the level of the ears. The subject is asked to lift the pelvis off the test surface and keep the shoulders, hips and knees in a straight line as previously described (Chen et al., 2003).

Bent Arm Hang Test

Subjects are asked to grab the bar overhead and lift themselves up. The arms are bent and the chest is brought closer to the bar. Subjects try to keep their chin over the bar for as long as possible without excessive body movement.

Medicine Ball Throwing Test

The subjects are asked to throw the 2 kg medicine ball by taking 1 step behind the starting line. Scoring is done by measuring the distance from the starting line to the point where the ball lands. The medicine ball toss was very reliable, with all reliability estimates being above the acceptable level of 0.80 (Davis et al., 2008).

Upside-Down Medicine Ball Throwing Test

Subjects hold the 2-pound medicine ball with their arms at shoulder height and straight in front of their body. Subjects flex their shoulders, lift the medicine ball back from shoulder height, and stretch it overhead.

Minutes Push-Up Test

In this test, the hands are in front and under the shoulders, the back is straight, the head is up, and the toes are on the ground.

Long jump test

The subjects are asked to make 3 jumps in a row from one leg to the other while standing. On the final jump, care is taken to place both feet on the ground at the same time.

One Min Squat Test

Subjects performed a series of squats in a good position without rest for one minute as previously described (Belachew & Mengistu, 2018).

Evaluation of Hip Flexors Test

The subjects are in the supine position with both extremities resting on the stable test surface. The hip is flexed and extended so that the fixed arm of the goniometer is parallel to the body and the movable arm is parallel to the thigh. When limb movement is complete, the measurement is recorded.

Evaluation of the Latissimus Dorsi Muscle Test

Subjects are in the supine position with arms and elbows extended to the sides. The goniometer (Model 12-1000) Fabrication Enterprises is placed at the glenohumeral joint. The fixed arm of the goniometer is placed horizontally along the midaxillary line. The movable arm of the goniometer is aligned from the lateral epicondyle along the humerus. The degree of flexion of the shoulder is measured from the horizontal point.

Pectoralis Major Muscle Evaluation Test

The subject is in lateral rotation with the shoulder in 135 degrees of abduction. The elbows are fully extended, the forearm is in supination, and the lumbar spine is apartment on the test surface. Measured from the line to the degree of shoulder flexion, the axis is placed in the shoulder joint.

Borg Scale

Ratings of perceived exertion (RPE) were recorded by each subject after completion of each exercise session. The CR -10 BORG scale was used to measure RPE, with 0 representing "rest" and 10 representing "maximal" effort. The CR 10- BORG scale is an effective method for measuring perceived effort during strength training.

Data Analysis

Descriptive statistics include mean (m), standard deviation (SD), and confidence interval (95% CI). Normality tests (Shapiro- Wilk) were performed for all variables before statistical analysis because all distributions were normal. Pretest and posttest change in group means were performed using the paired-samples T-test, and for posttest comparison between groups, the independent-samples T-test was used. All significance tests were two-sided tests, and the alpha level was set at 0.05. All statistical analyzes were performed with the SPSS statistical package, version 25 (IBM SPSS Statistics, Armonk, NY).

Results

All participants attended all training sessions and there were no injuries or dropouts from the study. The results of

the paired-samples T-test were used to compare the mean values of the physical performance tests before and after training in the Kinesis and Pilates groups (Table 2). The results of the descriptive statistics for each group are shown in Table 3.

Table 3. Paired - Sample T-test for Kinesis and Pilates Groups

Kinesis Group; Age (38.55 ± 3.14); Height (166.09 ± 10.04); Mean ± SD				
Physical Performance Test	**Mean ± SD**	**95% CI**	**t**	**Sig.**
Weight (Kg)	1.37 ± 0.84	0.80 - 1.93	5.403	0.001***
Trunk Abdominal Endurance (N)	-2.54 ± 1.86	-3.79 - 1.29	-4.53	0.001***
Lateral Flexors Side Bridge (S)	-9.72 ± 4.14	-12.51 - 6.94	-7.775	0.001***
Endurance of Extensors (S)	-10.545 ± 4.94	-13.86-7.22	-7.07	0.001***
Prone Bridge (S)	-14 ± 7.16	-18.81-9.18	-6.477	0.001***
Back Bridge (S)	-5.81 ± 7.89	-11.12 - 0.51	-2.444	0.035*
Bent Arm Suspension (S)	-5.09 ± 4.28	-7.97 - 2.22	-3.951	0.003**
Minutes Push-Up (N)	-2.45 ± 1.91	-3.74 - 1.16	-4.248	0.002**
Medicine Ball Throwing (M)	-0.32 ± 0.26	-0.50 - 0.14	-4.097	0.002**
Upside Down Medicine Ball Throwing (M)	-0.69 ± 0.83	-1.25 - 0.12	-2.739	0.021*
Long Jump (M)	-0.23 ± 0.17	-0.35-0.11	-4.32	0.002**
Minutes Squat (N)	-1.81 ± 1.83	-3.05-0.58	-3.288	0.008*
Range of Motion (G)	0.54 ± 1.03	-0.15-1.24	1.747	0.111
Evaluation of Hip Flexors (G)	0.54 ± 2.06	-0.84-1.93	0.875	0.402
Evaluation Of The Latissimus Dorsi Muscle (G)	1 ± 3.03	-1.03 - 3.03	1.093	0.3
Pectoralis Major Muscle Evaluation (G)	-1.54 ± 3.61	-3.97-0.88	-1.418	0.187
Pilates Group ; Age (40.64 ± 2.87); Height (162.73 ± 7.61); Mean ± SD				
Weight (Kg)	1.10 ± 1.15	0.33 - 1.88	3.181	0.01**
Trunk Abdominal Endurance (S)	-1.09 ± 2.11	-2.51-0.33	-1.707	0.119
Lateral Flexors Side Bridge (S)	-6.18 ± 5.30	-9.74-2.61	-3.863	0.003**
Endurance of Extensors (S)	-3.72 ± 2.64	-5.50 - 1.94	-4.666	0.001**
Prone Bridge (S)	-7.54 ± 5.12	-10.98-4.10	-4.882	0.001***
Back Bridge (S)	-4.09 ± 7.44	-9.09-0.91	-1.821	0.099
Bent Arm Suspension (S)	-2.29 ± 3.29	-4.50-0.08	-2.31	0.043*
Minutes Push-Up (N)	-1.72 ± 1.95	-3.04-041	-2.932	0.015*
Medicine Ball Throwing (CM)	-0.19 ± 0.14	-0.28-0.09	-4.379	0.001***
Upside Down Medicine Ball Throwing (CM)	-0.40 ± 0.35	-0.64-0.17	-3.839	0.003**
Long Jump (CM)	-0.16 ± 0.18	-0.28-0.03	-2.885	0.016*
Minutes Squat (N)	-2.18 ± 1.66	-3.29 _ -1.06	-4.353	0.001***
Range of Motion (G)	-0.90 ± 2.07	-2.30 _ 0.48	-1.456	0.176
Evaluation of Hip Flexors (G)	-0.45 ± 2.58	-2.19 _ 1.28	-0.584	0.572
Evaluation Of The Latissimus Dorsi Muscle (G)	-1.54 ± 3.14	-3.65 _ 0.56	-1.631	0.134
Pectoralis Major Muscle Evaluation (G)	-1.81 ± 3.06	-3.87 _ 0.23	-1.971	0.077

Note; Kg = Kilogram; N = Number; S = Seconds; M = Meter; G = Goniometer; CM = Centimeter

In the Kinesis group, a significant difference was found in most physical performance tests ($p < 0.05$), however, there is no significant difference in the assessment of range of motion, hip flexor assessment, latissimus dorsi muscle assessment, and pectoralis major muscle assessment ($p > 0.05$). Also in the Pilates group, as in the Kinesis group, a significant difference was found in almost all physical performances ($p < 0.05$), instead, trunk abdominal endurance, back bridge, range of motion, hip flexor assessment, latissimus dorsi muscle assessment, and pectoralis major muscle assessment were not significantly different ($p = 0.015$). The results of the T-test for independent samples are shown in Table 4. There are some differences between the two groups in comparison that in Kinesis group the score was much higher than Pilates groups in; Post Lateral Flexors Side Bridge ($p = 0.006$), Post Endurance of Extensors ($p < 0.05$), Post Medicine Ball Throwing Test ($p = 0.015$), Post Upside Down Medicine Ball Throwing Test ($p = 0.015$), and Post Long Jump Test ($p = 0.022$) (Table 4).

Table 4. Independent Samples Test between Kinesis and Pilates in the post-test

Category	**Groups**	**Mean ± SD**	**t**	**MD**	**95% CI**	**Sig.**
Trunk Abdominal Endurance (S)	Kinesis	27.73 ± 4.96	1.911	5.364	-0.49 - 11.21	0.07
	Pilates	22.36 ± 7.87				
Lateral Flexors Side Bridge (S)	Kinesis	66.82 ± 9.86	3.073	13.273	4.26 - 22.28	0.006*
	Pilates	53.55 ± 10.38				
Endurance of Extensors (S)	Kinesis	134.09 ± 14.83	2.6	20	4.24 - 35.75	0.015*

	Pilates	114.09 ± 20.18	48			
Prone Bridge (S)	Kinesis	65.09 ± 19.55	1.181	14.818	-11.35 - 40.98	0.251
	Pilates	50.27 ± 36.72				
Bent Arm Suspension (S)	Kinesis	20.3 ± 10.71	0.881	4.3727	-5.98 - 14.72	0.389
	Pilates	15.927 ± 12.49				
Back Bridge (S)	Kinesis	68.73 ± 15.72	0.861	9	-12.80 - 30.80	0.399
	Pilates	59.73 ± 30.89				
Minutes Push Up (S)	Kinesis	27.82 ± 8.42	1.211	4.364	-3.15 - 11.88	0.24
	Pilates	23.45 ± 8.47				
Medicine Ball Throwing	Kinesis	5.073 ± 0.80	2.651	0.8364	0.17 - 1.49	0.015*
	Pilates	4.236 ± 0.67				
Upside Down Medicine Ball Throwing	Kinesis	6.6 ± 1.37	2.651	1.3636	0.29 - 2.43	0.015*
	Pilates	5.236 ± 1				
One Min Squat	Kinesis	48.45 ± 4.71	1.277	3.727	-2.36 - 9.81	0.216
	Pilates	44.73 ± 8.45				
Long Jump	Kinesis	4.855 ± 0.60	2.481	0.5727	0.09 - 1.05	0.022*
	Pilates	4.282 ± 0.46				
Range of Motion	Kinesis	84.18 ± 5.4	0.889	1.545	-2.07 - 5.17	0.384
	Pilates	82.64 ± 2.01				
Evaluation of Hip Flexors	Kinesis	25.64 ± 4.43	1.177	2.091	-1.63 - 5.81	0.256
	Pilates	23.55 ± 3.93				
Evaluation of The Latissimus Dorsi Muscle	Kinesis	173 ± 3.63	0.123	0.182	-2.15 - 3.26	0.903
	Pilates	172.82 ± 3.28				

Note; S = Seconds;

Discussion

To the authors' knowledge, this is the first study to examine the effects of two different exercise modalities, such as Pilates and Kinesis, in middle-aged adults in a randomized trial. The results of this study show that Pilates and Kinesis exercises are efficient training modalities that produce significant changes in upper, lower, and core muscle strength and muscular endurance in sedentary adult women. The result shows that exercise training such as Pilates or Kinesis performed twice a week for 8 weeks can improve endurance and strength in middle-aged adults who have no exercise experience. Kinesis and Pilates exercises can be included in exercise programs as effective methods for individuals who want to improve their strength and endurance (Shahidi, Doğan, Kingsley,Taşkıran, 2022). In the strength tests, it was found that both groups doing Kinesis and Pilates had a positive effect. Also, in some parameters, the results were better in the Kinesis group. In the Pilates group, the training was done in a sitting and horizontal position, while in the Kinesis group it was done in a standing and vertical position. To date, there has been no study of work with the Kinesis machine. The study looked at differences in functional strength training in the elderly. They recruited 24 older people who were divided into two groups: a seated machine and a standing cable. The training protocol consisted of two sessions per week over a 12-week period and physical performance battery and functional testing. The results of their study show that both types of functional training improved functional abilities, with no difference between the two groups. The authors suggest that both types of training have a positive effect and are not superior to each other (Cruz-Ferreira et al., 2011). On the other hand, Pilates and Kinesis exercises were not observed to have a positive effect on range of motion or flexibility of the upper and lower tests. For the development of flexibility and mobility, stretching exercises can be performed in addition to Pilates or Kinesis exercises (Kloubec, 2010; Knudson & Johnston, 1995). According to the study results, Pilates and Kinesis exercises can be considered as a method for developing strength and endurance in the upper, middle and lower ranges. In parallel with the research findings, the study showed that there is no evidence that strength training improves flexibility even when both agonist and antagonist muscles are trained throughout the range of joint motion. Therefore, prolonged stretching should be part of the strength training program (McGill et al., 1999; Nestler et al., 2017). In another study, the authors demonstrated that inactive middle-aged men and women who exercised Pilates twice 60 minutes per week for 12 weeks achieved a statistically significant increase in muscular endurance in the abdominal and upper body regions. Pilates is an exercise method commonly used for rehabilitation and physical conditioning. Exercises are performed based on six traditional principles: Centering, Control, Concentration, Breath, Precision, and Flow (Collins, 2012; Cruz-Ferreira et al., 2011; del-Ama, Gil-Agudo, Rovira, & Moreno, 2015). These principles unite the body and the mind, while the exercises can increase muscular strength, endurance, and balance (Shahidi, Doğan, et al., 2022; Shahidi et al., 2021; Shahidi, Kingsley, Taşkıran, 2022). In conclusion, this study has shown that to improve body strength and muscle endurance, the form of Pilates and Kinesis can be helpful. Nowadays, middle-aged adults who have not experienced sports during their life are not motivated to do fitness sports. Otherwise, they would like to do an activity that is more fun and more related to daily life. Therefore, instead of the barb or the virgin in the gym,

this study suggests focusing on the mıuscle and individual joints, instead using the functional exercises such as Pilates and Kinesis, which can involve more muscle groups in the different joints.

Strengths and Limitations

The current study had several strengths: First, to our knowledge, this is the first randomized controlled trial to examine the effects of Pilates and Kinesis training on physical performance in middle-aged adults. In addition, the authors maintained similar training intensity in both groups, as shown by the RPE value of the sessions in both groups. It is important to point out that the study had some limitations. The first limitation is the small number of subjects who regularly participated in the 8-week training program. The second limitation of the current stıdy is that we do not have the male group in addition to the females to compare the gender between the groups. Also, we do not have control groups for the Pilates and kinesis training groups to accurately compare the two groups. Another limitation of the current study is that it was difficult for the authors to improve the training intensity for each group in terms of the overload principle. In the training session, we found that the training intensity and training volume were sufficient for this population because they did not have training experience in their background, so we decided to keep this training intensity.

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Declarations

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