



## THE EFFECTS OF PILATES EXERCISES ON BODY COMPOSITION AND FLEXIBILITY IN SEDENTARY WOMEN

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### Abstract:

The aim of this study is to examine the effect of 6-week Pilates exercises applied to sedentary women on body composition and flexibility. A total of 18 volunteer sedentary women between the ages of 20-35 participated in the study. Two different groups were formed the experimental group (n:9 age: 28.30±4.42) and the control group (n:9 age: 28.70±5.41). A 60-minute Pilates exercise program was applied to the experimental group 3 days a week for 6 weeks. Weight, body fat percentage, body water ratio, body muscle ratio, and flexibility values were measured before and after Pilates exercises. SPSS 22.0 package program was used for the statistical analysis of the data. Mean and standard deviation values were used in the statistics of descriptive data. The Shapiro-Wilk Test was used to determine the normality of the data. Independent Samples T Test was used to evaluate the significance of the groups, and Paired Samples T Test was used for in-group comparisons. Statistical results were evaluated at p<0.05 significance level. Statistical significance was found in the weight, body fat percentage, body water ratio, body muscle ratio values, and flexibility scores of the experimental group (p<0.05). There was no statistical significance in the parameters of the control group (p>0.05). As a result, it can be said that 6-week Pilates exercises applied to sedentary women have a positive effect on body composition and flexibility.

**Keywords:** Pilates, sedentary, body composition, flexibility

### 1. Introduction

In recent years, the development of technological devices in daily life has caused people to move less. With the emergence of a sedentary life, the rates of physical activity and exercise in individuals have decreased gradually. In sedentary individuals, there is an

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increase in body weight due to lack of movement. It is known that a sedentary life, lack of movement, and weight gain lead to metabolic diseases (1, 2).

The most important way to prevent weight problems and diseases that occur with a sedentary life is to be physically active. The World Health Organization (WHO) recommends physical activity and exercises of different duration and intensities specific to age groups (3). It is known that by providing physical development with regular exercises, many diseases are prevented and the progression of existing diseases is prevented. This situation has revealed the necessity of doing physical activity and sports in order to prevent diseases caused by sedentary life and threatening public health (4, 5). It is recommended that the exercises to be done for a healthy and active life should be made into a regular and planned program and implemented. In advancing age, decreases are observed in the energy consumption of women due to a sedentary life (6). Body composition consists of a proportionate combination of fat, bone, muscle cells, other organic matter, and extracellular fluids. The energy that individuals take more than they spend leads to an increase in body fat mass and obesity as a result of sedentary life (7).

Pilates is one of the most popular physical activities and exercises in the world (8). Developed by Joseps Pilates, Pilates are exercises performed with the aim of increasing muscle strength, increasing the endurance of the muscles in a positive way, improving the flexibility of the body, increasing the balance ability of the body, and protecting the general health of the body (9). Pilates exercises are important exercises that increase balance, flexibility, muscle strength, and endurance (10). Pilates exercises are among the alternative physical activity methods that are widely used in terms of being healthy and rehabilitation of the individual (11). Pilates is at the forefront of the physical exercise activities that have been enjoyed by women recently. The increase in the number of Pilates practices performed in gyms shows this (12).

Pilates can be done using different exercise apparatuses. Movements that support each other can be performed by using different apparatuses with resistance elastics, mats, hoops, ground movements, and balls. Improving the body and muscle structure of individuals increases the development of posture and maximum movement capacity (13).

The aim of this thesis is to examine the effect of 6-week Pilates exercises applied to sedentary women on body composition and flexibility. To be able to suggest physical activity programs so that sedentary people can be active and healthy in terms of, lifelong sports.

## **2. Methods**

### **2.1. Subjects**

A total of 18 volunteer sedentary women between the ages of 20-35 participated in the study. Two different groups were formed as the experimental group (n:9 age: 28.30±4.42) and the control group (n:9 age: 28.70±5.41). A 60-minute Pilates exercise program was applied to the experimental group 3 days a week for 6 weeks. Weight, body fat

percentage, body water ratio, body muscle ratio, and flexibility values were measured before and after Pilates exercises.

## **2.2. Pilates Exercise Program**

Regular Pilates exercises were applied to the subjects 3 days a week for 6 weeks. The subjects were asked not to do any movements that required intense physical strength on the days when the exercises were not done. Pilates exercise program was done 3 days a week for 60 minutes. Mat Pilates movements were applied to the subjects as 10 minutes of warm-up, 40 minutes of Pilates exercises, and 10 minutes of cool-down exercises.

## **2.3. Physical Measurements**

The body weights of the subjects were measured with a scale with a precision of 0.1 kg, and their heights were measured with a digital height measuring instrument. The subjects were dressed in shorts and T-shirts, and the measurements were taken by standing on the scale barefoot (14).

## **2.4. Body Composition Measurement**

Bioelectrical Impedance Analysis method (Tanita Body Fat Analyzer, model BC 418) was used for the measurement of body composition. Body fat percentage, body fluid ratio, and body muscle ratio values were measured by body composition analysis using the BIA method (15).

## **2.5. Flexibility Test**

The flexibility of the subjects was measured using the stand and reach test (Takei brand Physical Fitness device). This test is a common test used to measure the flexibility of the hamstrings and lower back. Before the test, the subjects had a general warm-up. The test protocol was explained to the subjects. Subjects stood on a platform without shoes, feet together, legs stretched, and toes touching the test panel. Then, they were asked to lean forward as much as possible by touching the test panel with their fingers and to hold the reached position for 2 seconds. The best value was recorded from two measurements (16).

## **2.6. Statistical Analysis**

The statistical data of this study were analyzed using the SPSS statistical program. The G\*Power 3.1 program was used to determine the number of subjects. Shapiro-Wilk Test was applied for the normality of the data. Independent Samples T Test was applied to evaluate the significance between the experimental and control groups. Paired Samples T Test was used for in-group comparisons. Statistical results were evaluated at  $p < 0.05$  significance levels.

### 3. Results

**Table 1:** Pre-test and post-test analysis results of the experimental group

Variable	Pre-test	Post-test	df	t	p
	Mean±SD	Mean±SD			
Age (years)	28.30 ± 4.42	28.30 ± 4.42	8	-	-
Height (cm)	166.70 ± 5.18	166.70 ± 5.18	8	-	-
Weight (kg)	85.21 ± 7.14	82.41 ± 5.22	8	3.11	<b>0.001*</b>
Body fat (%)	39.16 ± 5.59	37.15 ± 6.94	8	2.51	<b>0.001*</b>
Body water (%)	43.17 ± 6.25	46.12 ± 4.85	8	-2.52	<b>0.003*</b>
Body muscle (%)	46.70 ± 6.41	49.33 ± 5.17	8	-3.24	<b>0.001*</b>
Flexibility (cm)	-2.10 ± 5.45	7.51 ± 4.81	8	-3.17	<b>0.001*</b>

\*p<0.05

In Table 1, the comparison of the pre-test and post-test measurement values after the training program was applied to the experimental group is given. Statistically significant was found in the weight, body fat percentage, body water ratio, body muscle ratio values, and flexibility scores of the experimental group (p<0.05).

**Table 2:** Pre-test and post-test analysis results of the control group

Variable	Pre-test	Post-test	df	t	p
	Mean±SD	Mean±SD			
Age (years)	28.70 ± 5.41	28.70 ± 5.41	8	-	-
Height (cm)	162.70 ± 6.70	162.70 ± 6.70	8	-	-
Weight (kg)	71.11 ± 7.79	70.59 ± 7.40	8	1.12	0.142
Body fat (%)	34.22 ± 5.18	33.96 ± 5.47	8	2.37	0.248
Body water (%)	46.58 ± 3.28	47.03 ± 3.60	8	-1.73	0.176
Body muscle (%)	43.74 ± 2.36	43.97 ± 2.74	8	2.36	0.312
Flexibility (cm)	-1.16 ± 8.87	3.10 ± 7.04	8	-1.89	0.178

In Table 2, the comparison of the pre-test and post-test measurement results of the control group is given. There was no statistical significance in the parameters of the control group (p>0.05).

**Table 3:** Comparison of the experimental and control groups

Variable	Experimental Group	Control Group	df	t	p
	Difference	Difference			
	Mean±SD	Mean±SD			
Weight (kg)	2.80 ± 0.82	0.52 ± 0.69	16	2.102	<b>0.001*</b>
Body fat (%)	2.01 ± 0.51	-0.26 ± 0.17	16	2.174	<b>0.001*</b>
Body water (%)	-2.95 ± 0.14	-0.45 ± 0.07	16	-2.458	<b>0.001*</b>
Body muscle (%)	-2.63 ± 0.54	-0.23 ± 0.29	16	-1.378	<b>0.012*</b>
Flexibility (cm)	-9.61 ± 2.18	-4,26 ± 1.89	16	-1.126	<b>0.001*</b>

\*p<0.05

The comparison of the measurement results of the experimental and control groups participating in the research is shown in Table 3. Significance was found between the

groups in favor of the experimental group in terms of weight, body fat percentage, body water ratio, body muscle ratio, and flexibility values ( $p<0.05$ ).

#### 4. Discussion

In our study, a significant and positive difference was found in body composition and flexibility values after the 6-week Pilates exercise program applied to the experimental group ( $p<0.05$ ). No change was detected in the control group ( $p>0.05$ ). In the comparison of the groups, a significant difference was found in the weight, body fat percentage, body water ratio, body muscle ratio values, and flexibility values in favor of the experimental group ( $p<0.05$ ).

Planned and regular Pilates exercise programs provide improvement in body composition and posture. It increases the body's ability to reach a more flexible structure and increases muscle strength and endurance (17).

Bastuğ et al. (2014), in their study on women, found that there was a significant decrease in body weight values (18). In another study, it was found that Pilates exercise program for healthy and sedentary obese women caused a decrease in body weight and waist circumference (2). In a study conducted on 28 women who did Pilates exercises, a decrease in body fat ratio, body mass index, weight, waist and hip circumference values, and an increase in body flexibility were found (19). Çakmakçı (2012) determined that 10-week mat Pilates exercises on sedentary women had a positive effect on body weight (20). Rodrigues et al. (2009) stated in their study that Pilates movements have a positive effect on body composition (21). In another study, it was found that Pilates exercises performed on adults had a decrease in body fat compared to the control group (22). Şavkın (2014) found in his study that Pilates exercises have a positive effect on body composition parameters (23).

Our study is similar to the information given in the literature. It can be said that the positive and significant decrease in body composition values in the experimental group in our study is the result of regular Pilates exercises.

Muscolino and Cipriani (2004), after their studies on adults with Pilates movements, found a positive increase in flexibility test measurements (24). In another study, it was determined that Pilates exercises expand the range of motion of the joints, increase flexibility, and increase muscle strength and endurance (25). Kılıç et al. (2018) found that there was a significant increase in flexibility values after a regular reformer Pilates exercise program, 3 days a week for 6 weeks, on female volunteer subjects (26).

In a study, it was determined that the flexibility and hand grip strength values of volunteer participants increased as a result of aero-pilates exercises (27). In another study, a statistically positive improvement was found in the flexibility and balance measurements of Aerobic-Step and Pilates movements (28).

In the literature, it is generally stated that flexibility values increase after the Pilates exercises program. In our study, it can be said that the significant difference in flexibility values in the experimental group is due to the interaction between the muscle and the

muscles, depending on the muscle strength development as a result of the Pilates exercises.

As a result, it can be said that Pilates exercises applied to sedentary women have a positive effect on body composition and flexibility. Regular Pilates exercise programs can be recommended for sedentary individuals to improve their quality of life and to have optimal body composition values.

### **Conflict of interest statement**

There are no potential conflicts of interest between the authors of this article.

### **About the Authors**

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