Education Quarterly Reviews

Kılıç, Tahir, and Hınçal, Sabriye. (2021), The Effects of Pilates Mat Exercises on self-rated health Levels, Body Mass Index and Flexibility in Middle Age Sedentary Women. In: Education Quarterly Reviews, Vol.4, No.2, 166-179.

ISSN 2621-5799

DOI: 10.31014/aior.1993.04.02.208

The online version of this article can be found at:
https://www.asianinstituteofresearch.org/

Published by:
The Asian Institute of Research

The Asian Institute of Research *Education Quarterly Reviews* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of education, linguistics, literature, educational theory, research, and methodologies, curriculum, elementary and secondary education, higher education, foreign language education, teaching and learning, teacher education, education of special groups, and other fields of study related to education. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Education Quarterly Reviews* aims to facilitate scholarly work on recent theoretical and practical aspects of education.

ASIAN INSTITUTE OF RESEARCH
Connecting Scholars Worldwide

The Asian Institute of Research
Education Quarterly Reviews
Vol.4, No.2, 2021: 166-179
ISSN 2621-5799

DOI: 10.31014/aior.1993.04.02.208

The Effects of Pilates Mat Exercises on self-rated health Levels, Body Mass Index and Flexibility in Middle Age Sedentary Women*

Tahir Kılıç[1], Sabriye Hınçal[2]

[1] Department of Physical Education and Sport Education, Faculty of Sports Science, Akdeniz University, Turkey.
[2] Fitness coach Akdeniz University, Turkey.

Correspondence: Tahir Kılıç, Department of Physical Education and Sport Education, Faculty of Sports Science, Akdeniz University, Turkey. Tel:09005304095533. E-mail: tkilic@akdeniz.edu.tr

Abstract
Goal: This study examines the effects of 10-week Pilates Mat exercises on body mass index (BMI), flexibility and self-rated health level in middle aged women. Method: The experimental group comprises middle aged female voluntary participants in the Pilates mat exercise program at Akdeniz University Sports Facilities in Antalya (n28), and the control group includes middle aged sedentary volunteers (n14). The experimental group members were given 60 minutes of Pilates mat exercise 3 days a week for 10 weeks. The control group members did not participate in any exercise program. Flexibility test, BMI measurements and the questionnaire about self-rated health level were applied to both groups before and after the exercises. Statistical results were obtained using the SPSS 21.0 package program. As the experimental group showed normal distribution, the parametric test of Paired Sample T-Test was applied. Since the normal distribution was not applicable and the sample volume was not large enough in the control group, a nonparametric test, the Wilcoxon Signed Rank Test, was used. Findings: There was no statistically significant difference in BMI values between the pretest and posttest averages in the experimental group ($p>0.05$), while a statistical significance was found in the flexibility values and self-rated health levels ($p<0.05$). There is no statistically significant difference in BMI and flexibility values between the pretest and posttest averages ($p>0.05$) in the control group, while the self-rated health levels were statistically lower in the control group ($p<0.05$). Conclusion: It was revealed that regular 10-week Pilates exercises increase self-rated health and flexibility values in middle age women. These results indicate that Pilates exercise is a substantial method in improving flexibility performance. Pilates exercises should be performed regularly, as they have positive effects on quality of life.

Keywords: Pilates, Flexibility, Self-Rated Health, Body Mass Index

* This research was derived from Sabriye HINÇAL's Master's Thesis, which was conducted in Akdeniz University, Institute of Health Sciences, Department of Mobility and Training Sciences, Thesis Advisor Assist.Prof.Dr. Tahir KILIÇ.

1. Introduction

The increasing impact of technological innovations on daily life, their effects on convenience in housework and transportation, the frequent use of social media have restricted people's energy expenditure and hence limited their physical activities (Çolakoğlu, 2003). A sedentary lifestyle causes serious health problems. The sedentary lifestyle negatively affects health while causing numerous disorders (Biçer et al., 2005; Çolakoğlu, 2003).

The sedentary lifestyle habit is recently considered one of the most important diseases affecting human health (Aydos and Dönmez, 2000). Avoiding negative conditions caused by inactivity, keeping our metabolism fit and healthy necessitate physical activities, exercise and active life preference. An active lifestyle increases a person's energy and mobility and liberates the person from a sedentary life (Arcury et al., 2006). Healthy life and improving quality of life currently centralizes physical activity with a consensus towards it as a necessity. Physically active people consider their active lifestyles to be a key factor in increasing the sleep and quality of life for a long and healthy life (Haskell et al., 2007; McGrath et al., 2011; Teculescu et al., 2010). This exercise approach, often referred as Pilates, based on the teachings of Joseph Pilates (Chang, 2000), was initially for, almost exclusively, rehabilitation for inpatient treatment (1880-1967). He later became a successful physical trainer who helped well-known dancers recover from injuries, rehabilitation, and performance enhancement (Pilates, 1934). However, in recent years Pilates has become a popular trend in rehabilitation and fitness fields (Chang, 2000). Exercise is currently considered a principle of a healthy life. Pilates strengthens the core of the body, improves muscular endurance, balance, coordination, flexibility, provides mind-body integrity and reduces stress. Therefore, exercise is a necessity in our daily life (Cozen, 2000). These exercises help improve balance, coordinative motor skills, muscle strength and flexibility. Flexibility is a synonym for joint mobility and defined as the ability to perform active and passive movements with the joints at the greatest possible width (Herodek, 2006). While the anatomical structure of each joint defines the point where mobility can extend, muscle flexibility is a prerequisite for successful mobility in the combined muscle function. There are two types of flexibility (active and passive) depending on whether the movement is performed under the influence of internal (muscle) or external (gravity, inactivity, the force of the other exerciser) forces. The flexibility level is affected by several factors such as temperature, fatigue, fitness, gender, and chronological age. If the individual does not participate in the educational process or an organized exercise, individual flexibility deteriorates in childhood and adolescence (Obradovic, 1999). It is argued that the male and female ligaments are physiologically different. However, the mechanisms that contribute to these differences are not completely understood. Estrogen might have a role in this difference since estrogen receptors are found in tendons and ligament fibroblasts, which can alter collagen synthesis and affect tissue behavior (Kjaer & Hansen, 2008). "The smaller, weak, loose muscle tendons and weak muscle tonus in women provide more mobility to the joints" (Zorba, 2001). Although contemporary scholarship hints at Pilates exercises' positive effect on flexibility and body composition and muscular endurance, experimental studies on these issues are yet to approve this argument. Despite the scholarship on the Pilates method arguing that it strengthens the core of the body, and increases flexibility, there are few relevant experimental studies (Siler, 2000; Bernardo, 2007; Katafçı et al., 2014).

In light of these arguments, the study aims to determine the effects of 10-week Pilates mat exercises on body mass index (BMI), flexibility and self-rated health level in middle aged women. After the initial tests, the experimental group was given 60 minutes long Pilates mat exercise 3 days a week for 10 weeks, while the control group did not exercise. The final measurements were applied to all participants in the study. The experimental group and the control group were compared as the statistical analysis was performed. The research spans over 12 weeks in total including the initiation, exercise phase and outcome measurements.

1.2 Explore Importance of the Problem

State why the problem deserves new research. For basic research, the statement about importance might involve the need to resolve any inconsistency in results of past work and/or extend the reach of a theoretical formulation. For applied research, this might involve the need to solve a social problem or treat a psychological disorder. When research is driven by the desire to resolve controversial issues, all sides in the debate should be represented in balanced measure in the introduction. Avoid animosity and ad hominem arguments in presenting

the controversy. Conclude the statement of the problem in the introduction with a brief but formal statement of the purpose of the research that summarizes the material preceding it. For literature reviews as well as theoretical and methodological articles, also clearly state the reasons that the reported content is important and how the article fits into the cumulative understanding of the field.

1.3 Describe Relevant Scholarship

Discuss the relevant related literature, but do not feel compelled to include an exhaustive historical account. Assume that the reader is knowledgeable about the basic problem and does not require a complete accounting of its history. A scholarly description of earlier work in the introduction provides a summary of the most recent directly related work and recognizes the priority of the work of others. Citation of and specific credit to relevant earlier works are signs of scientific and scholarly responsibility and are essential for the growth of a cumulative science. In the description of relevant scholarship, also inform readers whether other aspects of this study have been reported on previously and how the current use of the evidence differs from earlier uses. At the same time, cite and reference only works pertinent to the specific issue and not those that are of only tangential or general significance. When summarizing earlier works, avoid nonessential details; instead, emphasize pertinent findings, relevant methodological issues, and major conclusions. Refer the reader to general surveys or research syntheses of the topic if they are available. Demonstrate the logical continuity between previous and present work. Develop the problem with enough breadth and clarity to make it generally understood by as wide a professional audience as possible (Beck & Sales, 2001). Do not let the goal of brevity lead you to write a statement intelligible only to the specialist.

1.4 State Hypotheses and Their Correspondence to Research Design

After you have introduced the problem and have developed the background material, explain your approach to solving the problem. In empirical studies, this usually involves stating your hypotheses or specific question and describing how these were derived from theory or are logically connected to previous data and argumentation. Clearly develop the rationale for each. Also, if you have some hypotheses or questions that are central to your purpose and others that are secondary or exploratory, state this prioritization. Explain how the research design permits the inferences needed to examine the hypothesis or provide estimates in answer to the question.

2. Method

2.1. Participants

The experimental group comprises middle aged women voluntarily participating in the Pilates mat exercise program at Akdeniz University Sports Facilities in Antalya during the 2017-18 period (n28) and the control group includes middle aged sedentary volunteers (n14). The experimental group and the control group were informed about the study through a Helsinki Declaration distributed, and the informed consent form was approved by signature.

2.2. Application

The experimental group had performed 60 minutes long Pilates mat exercise 3 days a week for 10-weeks. The control group members did not participate in any exercise program. The general form of the exercise program applied is provided in the table below (Table 1). The experimental group data was collected through pretest before the exercises and posttests afterwards (after 10 weeks in total). The control group did not perform the exercises as the pre-exercise, and post-exercise tests were applied. Moreover, a questionnaire on self-rated health was applied to the experimental and control groups before and after the exercises. The study covers a 12 weeks' timeline, including the initiation, exercise, and outcome measurements.

Table 2.1: Exercise Program for Experimental Group

Movement Names	Repetition Quantity	Exercise Week (Progress)
Supine breathing	5 min	Week 1-10
Pelvic clock	5 min	Week 1-4
Femur arcs	6 repetitions for each side	Week 1-4
Basic Bridging	6 and 8 repetitions	Week 1-8
Assisted roll up	6 repetitions	Week 1-4
Quadruped series	6 and 8 repetitions	Week 1-8
Swan	6 repetitions	Week 1-4
Femur circles	6 repetitions for each side	Week 1-4
Side-lying Series	3-6 repetitions for each side	Week 1-4
Hundred	1 set of 100 reps	Week4-12
Single leg stretches	3-6 repetitions for each side	Week4-8
Roll up	6 and 8 repetitions	Week4-8
Rolling like a ball	6 and 8 repetitions	Week4-8
Swan dive I & II	3-6 reps	Week4-8
Single leg kick	6 and 8 repetitions	Week4-8
Leg circles	3-6 repetitions for each side	Week 4-10
Sidekick	6 repetitions for each side	Week 4-10
Spine stretch (extension)	6 and 8 repetitions	Week 4-10
Spine twist	6 and 8 repetitions	Week 4-10
Mermaid	3-6 repetitions for each side	Week 4-10
Standing balance with hip flexion	4 repetitions for each side	Week 4-10
Standing balance with hip extension	4 repetitions for each side	Week 4-10
Single straight leg stretches	6 and 8 repetitions	Week 4-10
Swimming	3-6 reps	Week 7-10
Push-ups	3-6 reps	Week 7-10
Leg pull	3-6 reps	Week 7-10
Leg pull front	3-6 reps	Week 7-10

Source: (Kao et al., 2015)

2.3 Applied Tests in Research

The tests include a Flexibility Test (Sit and Reach), Weight and Height measurements, Body Mass Index measurements and the self-rated health Questionnaire.

2.3.1. Flexibility Test

Flexibility was measured by the sit-and-reach test. The person is seated on the ground, and the soles of the feet are leaning against the bench without bending the knees, and the hands are stretched forward gently as far as possible, and they are told to remain in that position for about 2 seconds. They performed two attempts. The best position reached by a person is the test score. The advantages of a sit-and-reach test are that the procedures are simple, easy to manage, and require minimal skill training (Hoeger & Hopkins, 1992). This test measures the lower back and hamstring muscle flexibility (Özer, 2001). The correlation between the lower back and hamstring muscle flexibility and the pain in the lumbar region is utilized in most test batteries (Balcı and Tamer, 2005; Baltacı et al., 2003; Afyon et al., 1999; Katayıfçı et al., 2014; Şahiner and Balcı, 2010).

2.3.2. Height and Weight Measurements

Weight measurement was performed according to standard values with a scale with a precision of ±0.1 kg (Tanita SC 330S Series-bioelectric impedance analyzer), with bare feet, leggings and t-shirts on the tests. The height measurement was performed in the length meter, with a precision of 0.5 cm, as participants were bare

feet, with a caliper moving on the scale parallel to the floor as it touched their head in a standing position. Height and bodyweight is measured in meter and kilograms (Ergün & Erten, 2001).

2.3.3 Body Mass Index Measurements

Body Mass Index is used in weight assessments in relation to height and is calculated by dividing bodyweight by height per kilogram square (kg/m²) (Arena & Lavie, 2010). BMI is calculated with the formula BMI = (kg)/height (m²). The body mass index below 18.5 kg/m² indicates underweight, as a score between 18.5-24.9 kg/m² shows normal weight, and an index 25 and above kg/m² is considered overweight while over 30 kg/m² is designated as obesity. The ready-available BMI charts provide an easier calculation (Segal et al., 1988). The World Health Organization (WHO) has a segmentation based on the body mass index which is provided in the table below (Seidell, 2002).

Table 2.2: Adult BMI Classification of the World Health Organization

Classification	**BMI kg/m²**	**Disease Risk**
Low weight	<18.5	Low
Normal	18.5-24.9	-
Overweight	25>	Moderate
Pre-obese	25.0-29.9	Increased
1st degree obese	30-34.9	Moderate
2nd degree obese	35-39.9	Severe
3rd degree obese	40>	Very Severe

Source: (Heyward, 2002)

2.3.4. Questionnaires Regarding Demographics and Self-rated health

Self-rated health is based on the subjective health level assessment of a person. “How would evaluate your present health?” The answers were determined as “poor (1)”, “fairly poor (2)”, “average (3)”, “fairly good (4)” and “good (5)”. It is reported that the self-rated health question reveals the physical health within a short and ergonometric form and can be influenced by the cultural environment (Jylha, 1998). Self-rated health is divided into two groups according to WHO’s definition of “health is not only the absence of illness and disability but a complete state of well-being in physical, spiritual and social aspects” as “good and fairly good,” “rated health as good” and “average, fairly poor and poor,” “rated health as poor” (Fişek, 1983). Currently, exercise is one of the most fundamental principles of a healthy life. Being healthy means feeling well mentally, physically and socially (https://sbu.saglik.gov.tr, Accessed 05 April 2019).

2.3.5. Limitations of the Study

The entire research population has been included in the study. The experimental group was limited to 28 middle aged women doing Pilates in the sports facilities of Akdeniz University in Antalya, and the control group to 14 sedentary middle-aged women who did not exercise at these facilities. The study is limited to height, bodyweight BMI, sit and lie flexibility and self-rated health Questionnaire data.

2.3.6. Personal Information Form

The personal information form prepared by the author was used.

2.3.7. Data Analysis

Statistical results were calculated using the SPSS 21.0 (IBM Statistical Analysis 21.0) package program. Descriptive statistics like frequency (N), arithmetic mean ( ), minimum, maximum values and standard deviation of the measured and tested variables of n28 middle aged female participants who do Pilates in Antalya's Akdeniz University Sports Facilities were calculated. Kolmogorov Smirnov test was applied to test the normality of the data in the study. Based on the results of the Kolmogorov Smirnov test, it was found that the data were statistically suitable for a normal distribution. As the experimental group showed normal distribution, the parametric test of Paired Sample T-Test was applied. In the control group, the non-parametric Wilcoxon Signed Rank Test was used, as the sample volume was not large enough, and because it was not suitable for normal distribution due to violation of the central limit theory and the sample volume was not large enough.

3. Results

This study aims to examine the effects of Pilates mat exercises on body mass index, flexibility and self-rated health level in middle aged women. The experimental group attended 60 minutes long Pilates mat exercise 3 days a week for 10 weeks while the control group did not participate in any exercise program. The findings of the statistical analyzes regarding the experimental and control groups before and after the 10 weeks-long exercise are presented below.

Table 3.1: Descriptive Statistics of Experimental Group

Variables		N	Minimum	Maximum	Mean	Standard Deviation
Age	Pretest	28	26	54	43,64	8,04
	Posttest	28	26	54	43,64	8,04
Weight (kg)	Pretest	28	45	79	62,07	7,61
	Posttest	28	44	78	62,26	7,67
Height (cm)	Pretest	28	149	176	162,46	6,59
	Posttest	28	149	176	162,46	6,59
Body Mass Index (kg/m^2)	Pretest	28	17,7	31,5	23,63	3,54
	Posttest	28	17,2	31,4	23,63	3,58
Flexibility (cm)	Pretest	28	6	46	33,46	8,10
	Posttest	28	10	49	38,57	8,72
Self-rated Health Level	Pretest	28	2	5	3,82	0,67
	Posttest	28	4	5	4,96	0,19

The age average of the experimental group participants, as shown in Table 3.1, was 43.64±8.04, the pretest weight average was 62.07±7.61 kg, the posttest average was 62.267±7.67 kg, the height average was 162.46±6.59 cm. Moreover, the pretest BMI average was 23.63±3.54 kg/m² while the posttest BMI average was 23.63±3.58 kg/m2, the pretest flexibility average was 33.46±8.10 cm as the posttest flexibility average was 38.57±8.72 cm, and the pretest self-rated health level average was 3.82±0.67 with a posttest average of 4.96±0.19.

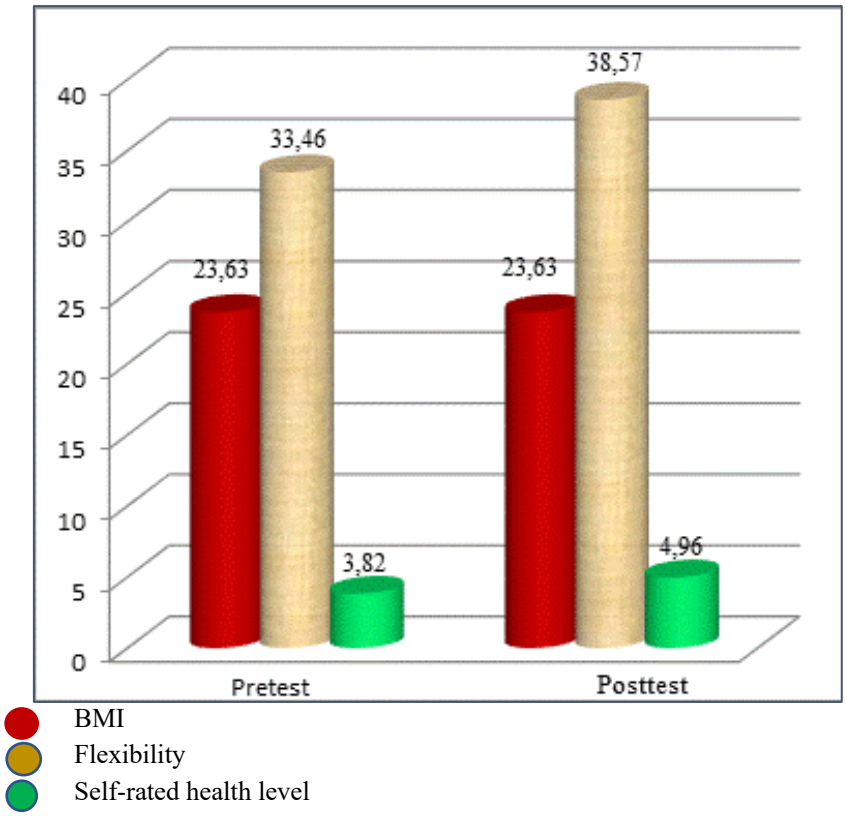

Figure 3.1: Average Values of the Experimental Group Before and After Exercise

Table 3.2: Test Results of the Control Group Before and After Exercise

Variable		**N**	**Avg.±SD**	**p- value**
Body Mass Index (kg/m^2)	Pretest	14	26,19±4,43	0,777
	Posttest	14	26,31±4,33	
Flexibility (cm)	Pretest	14	31,71±6,81	0,131
	Posttest	14	30,93±7,30	
Self-rated Health Level	Pretest	14	2,79±0,98	0,002**
	Posttest	14	1,14±0,36	

*, **, and *** indicate 1%, 5%, and 10% statistical significance levels, respectively.

The statistical analysis (Wilcoxon Signed Rank Test) indicates that the BMI pretest average of the control group is 26.19±4.43 kg/m², posttest average is 26.31±4.33 kg/m², flexibility pretest average is 31.71±6.81 cm, posttest average is 30.93±7.30 cm, self-rated health levels pretest average is 2.79±0.98, posttest average is 1.14±0.36 as provided in Table 3.2. There is no statistically significant difference in BMI and flexibility values in the pretest and posttest averages of the control group ($p>0.05$), while a negative statistical significance was found for the control group regarding self-rated health levels ($p<0.05$).

Table 3.3: Test Results of the Experimental Group Before and After Exercise

Variable		N	Avg.±SD	p- value
Body Mass Index (kg/m^2)	Pretest	28	23,63±3,54	
	Posttest	28	23,63±3,58	0,938

Flexibility (cm)	Pretest	28	33,46±8,10	
	Posttest	28	38,57±8,72	0,000**
Self-rated Health Level	Pretest	28	3,82±0,67	
	Posttest	28	4,96±1,89	0,000**

*, **, and *** indicate 1%, 5%, and 10% statistical significance levels respectively.

Based on the statistical analysis (Paired T-test), the BMI pretest average of the experimental group is 23.63±3.54 kg/m², the BMI posttest average is 23.63±3.58 kg/m², flexibility pretest average is 33.46±8.10 cm, flexibility posttest average is 38.57±8.72 cm, self-rated health levels pretest average is 3.82±0.67, and self-rated health levels posttest average is 4,96±1,89 as shown in Table 3.3. There was no statistical significance regarding BMI values between the pre-exercise and post-exercise averages of the experimental group ($p>0.05$). However, the flexibility values and self-rated health levels indicate a statistical significance in favor of the experimental group ($p<0.05$).

4. Discussion

This study aimed to examine the effect of Pilates, an exercise system preferred more by women, on body mass index, flexibility and self-rated health level in women performing mat exercises with interest in sports. The experimental group, 28 middle aged women performing Pilates exercises in Akdeniz University sports facilities, were applied 60 minutes long Pilates mat exercises 3 days a week for 10 weeks, while no exercise program was applied to the control group.

The research data shows that the average age of the experimental group participants was 43.64±8.04 with an average weight (pretest) of 62.07±7.61 kg, and a posttest average weight of 62.267±7.67 kg, as average height was 162.46±6.59 cm. Similar to these findings, 42 women who participated in Şavkın's (2014) study titled "The Effect of Pilates Training on Body Composition" had an age average of 41.00±6.09, a height average of 156.62±5.03 cm, a weight average of 74.80±1.19 kg and the body mass index average was 30.54±5.05 kg/m². Keskin (2018) reported that thirty sedentary women who participated in the study titled "The Effect of Pilates Exercises on Body Composition in Women" had an age average of 36.03±9.267, with an average height of 163.13±6.201 cm, and a weight average of 67.43±12.209 kg. Kao et al.'s (2015) study included 96 women in the study titled "Effects of a 12-week Pilates course on lower limb muscle strength and trunk flexibility in women living in the community". The 53 women in the experimental group had an age average of 42.30±9.97 and a height average of 159.79±5.23 cm with a bodyweight average of 57.15±9.78 kg. The control groups had 43 women with an age average of 41.23±9.83, a height average of 158.93±5.63 cm, as the average bodyweight was 56.24±7.83 kg. The participants' age average in Öztürk's (2008) study titled "The Effects of Aerobic-Step and Pilates Exercise on Strength, Flexibility, Anaerobic Power, Balance and Body Composition" for the aerobic-step (1st group), Pilates (2nd group) were 39.26±3.19 and 38.13±2.84, respectively. Moreover, the height average of these groups was 162.36±6.53 cm and 162.76±6.69 cm, respectively. The bodyweight average for the aerobic-step group (pretest) and aerobic-step of the group (posttest) was 72.12±6.89 kg and 70.66±6.99 kg, respectively. As the pretest bodyweight average of the Pilates group was 59.88±9.21 kg, while the posttest bodyweight average of the Pilates group was found as 59.72±9.26 kg. The age average of 20 sedentary women participants in Yarabaş's (2013) study titled "Investigation of the effect of plates exercises applied 8 weeks on anthropometric features and body feeling at middle age woman" was 42.00±6.66, with a height average of 1.62±0.5 cm and pretest-posttest weight average was reported as 65.7±9.3 kg and 60.8±8.8 kg. Bastık (2018) included 58 sedentary women aged between 25-50 in the study titled "Investigation of effects of mat and reformer Pilates exercises on some physical and functional parameters for middle aged sedentary women." There were 17 participants in the control group, 21 in the mat group and 20 in the reformer group. The age average of the

control group was 36.18±6.54, with a BMI average of 29.16±5.42 kg/m², the age average of the mat group was 35.33±7.38, with a BMI average of 22.39±3.44 kg/m² as the age average of the reformer group was 35.40±7.56, with a BMI average of 21.93±2.7 kg/m². Çağlav (2005) examined 30 women aged between 40-45 in the study titled "The Effects of 8-Week Pilates Training on Flexibility and Balance in Women aged 40-45". The age average of the experimental group was 42.33±1.83, and of the control group was 41.80±1.82, with height averages of 162.80±3.09 cm and 159.33±4.62 cm, respectively. Baştuğ et al. (2014) examined 62 women (32 in the experimental group, 30 in the control group) in the study titled "Examining the effects of Pilates exercise programs on flexibility performance and body composition in women." The age average of the experimental group was 39.96±11.12 with a height average of 160.34±5.34 cm, and the age average of the control group was 38.63±12.89 with a height average of 160.76±6.11 cm. 70 women volunteers participated in Ateş's (2009) study titled "Evaluation of the physical capacity and the quality of life of the housewives." Their age average was 39.4±8.93, as the weight and height average were 68.89±8.93 kg and 159.5±5.84 cm, respectively. The study results coincide with contemporary research and relevant findings.

While the pre-exercise BMI average of the experimental group was 23.63±3.54 kg/m², the post-exercise value was 23.63±3.58 kg/m². The BMI average of the control group before exercise was 26.19±4.43 kg/m² and the post-exercise BMI average was 26.31±4.33 kg/m². The comparison of BMI values before and after exercise in the experimental group showed no statistically significant difference between pre-exercise and post-exercise measurements ($p>0.05$). Likewise, the BMI value comparison of the control group indicates no statistically significant difference between pre-exercise and post-exercise measurements ($p>0.05$). Altıntaç's (2006) study titled "Effects of Pilates Exercises on Physical Fitness" with a sample comprising 30 volunteer sedentary women over the age of 30 (mat workgroup, Reformer study group and control group). The mat work exercise (10 participants) had an average body mass index of 20.95±2.16 kg/m² before exercises and 20.67±2.18 kg/m² after exercise. The BMI value change between the first and the second measurement was not statistically significant ($p>0.05$). Katayıfçı et al. (2014) conducted a study titled "Effects of clinical Pilates exercises on physical fitness of healthy subjects" with a sample including 35 healthy individuals between the ages of 20-50 with an average body mass index of 22.9±3.3 kg/m² before exercises, and 22.9±3.3 kg/m² in the post-exercise. The participants' BMI change after Pilates exercises was not statistically significant ($p>0.05$). Baylan (2008) established separate mat and control groups from people between the ages 18-25 and 40-50 in the study titled "The Effect of Pilates Exercise on Basal Metabolism and Body Composition in Different Age Groups" and applied 1 hour-long Pilates mat exercises for 3 days a week during 10 weeks. The average BMI values of the pre-posttest comparisons of the 40-50 age group of experimental and control groups were 24.07±2.32 kg/m², 23.87±2.15 kg/m², respectively. The experimental and control groups with participants aged between 18-25 had pre-posttest comparison average BMI values as 20.756±2.34 kg/m² and 20.80±2.32 kg/m², respectively. There was no statistically significant difference in the pre-post exercise body mass index values of these two groups ($p>0.05$). The results show that similar values to contemporary attempts were reached in this study.

Altıntaç's (2006) study titled "Effects of Pilates Exercises on Physical Fitness," on 30 volunteer sedentary women over the age of 30 (3 groups from 30 volunteers as mat work group, Reformer study group and control group) showed that the Reformer exercise group (10 people) had an average body mass index before training as 21.28±3.04 kg/m² and 20.51±3.09 kg/m² after the exercises. Contrary to the study findings, there was a statistically significant decrease between the first and second measurement ($p<0.05$). Özdemir's (2014) study titled "Effect of Aerobic-step and Plates Exercises on Body Composition, Blood Lipids and Blood Glucose in Middle-Aged Women" sampled 45 sedentary women. 22 women between the ages of 24-35 and 23 women between the ages of 36-45 were grouped. A combined exercise program, aerobics-step and Pilates, during 8 weeks in total as 1 hour 3 days a week was applied. The 60-70% of the heartbeat statistics in step-aerobics was determined as the exercise intensity. Since the results of bodyweight and body mass index measurements decreased in both groups after the exercises, it was reported that there was statistical significance ($p<0.05$). Yararbaş's (2013) inquiry titled "Investigation of the effect of plates exercises applied 8 weeks on anthropometric features and body feeling at middle age woman" had a pre-exercise BMI average of 25.1±3.1 kg/m², and an average of 23.2±3.0 kg/m² after exercise ($p<0.05$). Özcan et al. (2018) conducted a study on 60 young women participants titled "Aqua-Pilates Exercises Improve Some Physical Fitness Features of Healthy Young Women." Participants were randomly divided into two groups as exercise (N=30) and control (N=30). A

60 minutes long modified Aqua-Pilates exercise program was applied to the exercise group 2 days a week for 12 weeks. The control group members did not participate in any exercise program. It was reported that there were statistically significant differences in the bodyweight (t=4.39, p=0.00), body mass index (t=5.49, p=0.00), body fat percentage (t=7.38, p=0.00), flexibility (t=-5.27 p=0.00) values between the pre-post test scores ($p<0.05$). Baştuğ et al. (2014) had an attempt titled "Examining the effects of Pilates exercise programs on flexibility performance and body composition in women" with an experimental and control group. The experimental group performed walking, running and Pilates mat exercises, while the control group did not exercise. The BMI value average of the experimental group before the exercises was 26.05±4.53 kg/m² as it decreased to 25.8±4.25 kg/m² after the exercises. There was no significant difference in BMI values before and after exercise ($p<0.01$). The control group's pretest body mass index average was 26.45±5.91 kg/m² as it increased to 26.74±6.13 kg/m² in the posttests. A statistically significant difference was found for the control group between BMI pretest and posttest values in the negative direction ($p<0.01$). These results indicate that this attempt has generated similar values with contemporary scholarship. The literature review revealed that the study generated divergent BMI values compared to the scholarship on the subject. Several studies reported that exercises such as step-aerobics, dance and aerobics decrease body fat and BMI and increase muscle mass weight (Fenkci 2006, Arslan et al. 2012, Vergili and Yalıman 2012, Tortop et al., 2010).

Tortop et al. (2010) applied a 60-90 minutes long step-aerobic exercise at the 60-80% heart rate level 3 days a week for 12 weeks for the experimental group in the study titled "The Effects of the Some Physical Fitness' Parameters during 12 Weeks Step-Aerobic Exercises' Program on the Women". Statistically significant differences were detected in the bodyweight, BMI and flexibility values of the experimental group members ($p<0.01$).

The pre-exercise flexibility average of the experimental group members was 33.46±8.10 cm, as the post-exercise flexibility average was 38.57±8.72 cm. While the control group's pre-post exercise flexibility averages were 31.71±6.81 cm and 30.93±7.30 cm, respectively. The flexibility value comparison for the experimental group indicated a statistically significant difference ($p<0.05$), while there was no statistically significant difference was found the control group ($p>0.05$). 58 sedentary women between the ages of 25-50 (control group: 17, mat group: 21 and the reformer group: 20) participated in Bastık's (2018) study titled "Investigation of effects of mat and reformer Pilates exercises on some physical and functional parameters for middle aged sedentary women." The exercise groups exhibited statistically significant differences between the pre-exercise and post-exercise test averages ($p<0.01$), while the control group's pre-post exercise averages were 21.82±5.98 cm and 21.82±6.52 cm, respectively ($p>0.01$). Segal et al. (2004) selected 45 female and 2 male volunteer participants aged over 18. They applied Pilates practices for 2, 4- and 6-months' periods. At the initial phase, participants' median fingertip-sole distance was 0.2 cm. The feet sole distance median values after 2, 4, and 6 months of exercise were 3.4 cm (1.3-5.7 cm), 3.3 cm (0.3-7.8 cm), and 4.3 cm (1.5-7.6 cm), respectively. These results showed that flexibility increased with negative values (paired nonparametric analysis, P,01). The Pilates exercise resulted in a significant difference in the level of flexibility data ($p<0.001$). Çağlav's (2005) study titled "The Effects of 8-Week Pilates Training on Flexibility and Balance in Women aged 40-45" comprised 30 sedentary women aged 40-45 (experimental group = 15, control group = 15). This study applied 60 minutes long Pilates exercise 3 days a week for 8 weeks to the experimental group. No exercise was applied to the control group. There was no statistically significant change in flexibility, balance and body fat ratio measurements of the control group ($p>0.001$). The statistical differences were observed in post-exercise measurements in bodyweight and body fat ratio ($p<0.001$), flexibility (t=-$p<0.001$), balance ($p<0.005$) values. Baştuğ et al. (2014) conducted a study titled "Examining the effects of Pilates exercise programs on flexibility performance and body composition in women" with an experimental group performing walking, running and Pilates mat exercises. The experimental group's pre-exercise flexibility average was 28.53±5.08 cm, and the post-exercise average was 29.87±5.59 cm which indicates a significant difference ($p<0.01$). The control group showed a decrease from an average of 22.53±4.84 cm to 22.06±4.63 cm. There was a significant difference in favor of the experimental group between pre-exercise and post-exercise results ($p<0.01$). Kish (1998) reported that the Pilates method significantly increased the flexibility of the adductors and hip flexor muscles ($p<0.01$). Phrompaet (2011) showed that the lumbopelvic stability and flexibility of the experimental group were significantly increased compared to the control group. These results indicate that this attempt has generated similar values with contemporary scholarship.

The self-rated health level of the experimental group in this study was 3.82±0.67 in the pre-exercise and 3.82±0.67 post-exercise average. The study revealed statistical significance in favor of the experimental group regarding the self-rated health levels between the pretest and posttest averages ($p<0.05$). The self-rated health level pretest average was 2.79±0.98, and the posttest average was 1.14±0.36 in the control group. The study revealed a statistical significance in favor of the experimental group in the self-rated health levels test averages ($p<0.05$). Self-rated health is based on the subjective health level assessment of a person. The answers to the question of "How would evaluate your present health?" were determined as "poor (1)", "fairly poor (2)", "average (3)", "fairly good (4)" and "good (5)" (Jylha M, 1998). Self-rated health is divided into two groups by the WHO definition as "health is not only the absence of illness and disability but a complete state of well-being in physical, spiritual and social aspects" as "good and fairly good," "rated health as good" and "average, fairly poor and poor," "rated health as poor" (Fişek, 1983). This study's experimental group was included in the "rated health as poor" segment before the exercises (3.82±0.67, and in the group "rated health as good" after them (3.82±0.67). The control group (2.79±0.98) was included in the "rated health as poor" group before the exercises, and it (1.14±0.36) was again in the "rated health as poor" group. It can be asserted that self-rated health level is associated with physical activity and can be improved with regular exercise. Vatansever et al. (2015) conducted a study on 302 middle aged people titled "The Relationship Between Physical Activity Level and Life Quality Among Middle Aged Individuals." The research sample comprised 171 middle-age men and 131 middle age women with an age average of 50.44±6.94. They examined the differences in physical activity and quality of life in middle aged men and women. There was no significant difference in quality of life scores by gender (Independent T-test; $p>0.05$) and physical activity category (One-Way ANOVA; $p>0.05$). A positive correlation was found between physical activity scores and physical function, physical role, pain, and social function quality of life scores. These results show that physical activity increases physical function, physical role, pain and social function and quality of life in middle aged people. This change can facilitate increasing quality of life.

Teoman et al. (2003) analyzed 81 volunteer women who naturally experienced menopause and received hormone replacement therapy (HRT) randomly divided into two groups as exercise ($n = 41$) and control ($n = 40$). The experimental group followed in a 6-week long exercise program as the control group did not exercise. This study revealed that the experimental group had higher condition and quality of life than the control group. It was also reported that the condition level and quality of life in postmenopausal women can be improved with a 6-week regular and balanced exercise program ($p<0.05$). Vural's (2010) study titled "The Relation of Physical Activity Level and Life Quality at Sedentary Profession" examined 313 people, 172 women and 141 men, with desk jobs. The author analyzed the correlation between the participants' physical activity level and their quality of life. It has been reported that the participants had low physical activity levels. There was no significant difference between physical activity levels and quality of life ($p>0.05$). Eyili's (2007) research titled "The effect of physical activity on life quality and health in woman" on sedentary participants and the ones doing regular exercise found that quality of life average and the standard deviation was 3,34±0,48 for the physical dimension sub-dimension of individuals who exercise regularly, 3,73±10,22 the social dimension value, 3,70±0,65 for the environmental dimension, and 3,64±0,47 for the environmental dimension. The physical dimension value of sedentary participants was 3.09±0.51, as the social, environmental, and the psychological dimensions were 3.23±0.78, 3.36±0.67, and 3.40±0.49, respectively. There were significant differences between the physical, social, environmental, and psychological dimension scores of those who exercise regularly and the sedentary ones ($p<0.001$). The crosstab analysis revealed that 38.5% of those who exercise regularly answered neither good nor bad and 46.2% quite well to the question of how you regard your quality of life. 50.5% of sedentary participants answered neither good nor bad, and 29.3% quite well. There were significant differences found between the group that exercise regularly and the sedentary one, according to the Chi-square analysis ($p<0.05$). The distribution of answers to the question of "How Pleased Are You with Your Health?" given by the group with participants who exercise regularly shows that 44.8% were quite satisfied. 44.4% of the participants with a sedentary lifestyle expressed a moderate opinion. The chi-square analysis revealed significant differences between the individuals that exercise and the sedentary ones ($p<0.01$).

Ateş's (2009) research titled "Evaluation of the physical capacity and the quality of life of the housewives" examined 70 women with an age average of 39.4±8.93 with a weight and height average of 68.89±8.93 kg and

159.5±5.84 cm, respectively. The participants' quality of life was measured with WHO's short questionnaire of the "Quality of Life Scale." This research discovered that there is a positive correlation between physical capacity and quality of life. It was found that women were positively affected by the decrease in fat ratio. Doing regular exercise as a lifestyle is considered important for health and a quality life.

Acknowledgments

The research revealed significant improvements in the flexibility and self-rated health values after a 10-week long Pilates exercise program applied to the experimental group. The control group showed reduced self-rated health levels with time while the flexibility values revealed no significant difference. The findings are like contemporary scholarship. The pre-posttest BMI values comparison in the experimental and control group exhibits no statistically significant difference. The scholarship on this subject includes studies that coincide and contradict the study findings. Only the studies that applied Pilates mat exercises have generated similar results with this attempt. The contradictory studies mostly applied Step-aerobics, dance, Aqua-Pilates, aerobic etc. exercises within combined exercise programs including Pilates. There are several questionnaires regarding the self-rated health level. There is no study in the literature about the self-rated health level applied in this study. There are several studies in contemporary scholarship on self-rated health and quality of life. The tendency to examine the correlation between exercise and self-rated health is like our research. It is concluded that exercise positively affects self-rated health and quality of life. Furthermore, Pilates exercises should be combined with other physical activities, and the exercise programs should be supported by a balanced and regular diet. Studies should not be limited to women only, as the scholarship on male responses to the Pilates and other exercises considered substantial.

References

Afyon YA, Yaman R, Saygın Ö. (1999). The effects of static and dynamic stretching exercises on flexibility in female athletes. Marmara University School of Physical Education and Sports, Journal of Dynamic Sport Sciences. (1): 1.

Altıntaç D. (2006). Pilates Effects of Pilates Exercises on Physical Fitness, University, Health Sciences Institute, MA Thesis, İstanbul (Supervisor: Assoc. Prof. A Pehlivan).

Arcury TA, Snively BM, Bell RA, Smith SL, Stafford, JM, At Al. (2006). Physical activity among rural older adults with diabetes. J Rural Health. 22 (2), pp:164-168.

Arena R, Lavie CJ. (2010). The obesity paradox and outcome in heart failure: is excess bodyweight truly protective? Future Cardiol.6 (1): 1–6.

Arslan F, Çakmaçı E, Taşkın H, Çakmacı O, İsmet CG. (2012). Evaluation of the effects of pilates mat exercise program on some fitness parameters and weight loss of middle aged perimenopausal sedantary women. Niğde University, Journal of Physical Education and Sports Sciences.6: 24-33.

Ateş B. (2009). Evaluation of the physical capacity and the quality of life of the housewives. Muğla University, Social Sciences Institute, MA Thesis, Muğla (Supervisor: Prof. Dr. E Zorba).

Aydos L, ve Dönmez G. (2000). The Effects of Calisthenic Exercises on Physiological and Physical Parameters in Middle Aged Sedentary Women. Gazi Journal of Physical Education and Sport Sciences. 5 (2), pp: 17-25.

Balcı ŞS, Tamer K. (2005). Physical Fitness Test Battery for 1-5th Grade Primary School Students. Selçuk University Journal of Education. 20, pp: 329-349.

Baltacı G, Un N, Tunay V, Besler A, Gerçeker S. (2003). Comparison of three different sit and reach tests for measurement of hamstring flexibility in female university students. Br J Sports Med. 37 (1): 56-59.

Bastık C. (2018). Investigation of effects of mat and reformer Pilates exercises on some physical and functional parameters for middle aged sedentary women. Gazi University Health Sciences Institute, PhD Dissertation, Ankara (Supervisor: Assoc. Prof. Hİ Cicioğlu).

Baştuğ G, Ceylan Hİ, Kalfa S. (2014). Examining the effects of pilates exercise programs on flexibility performance and body composition in women. Journal of Human Sciences. 11 (2), pp: 1274-1284.

Baylan N. (2008). Pilates The Effect of Pilates Exercise on Basal Metabolism and Body Composition in Different Age Groups. Marmara University Health Sciences Institute, MA Thesis, İstanbul (Supervisor: Prof. Dr. A Pehlivan).

Bernardo LM. (2007). The effectiveness of Pilates in healthy adults: An appraisal of the research literature.J.Bodyw Mov Ther. 4, pp: 106-110.

Biçer YS, Peker İ, ve Savucu Y. (2005). The Effects of Planned Regular Walking on Body Composition Values in Female Patients with Cardiovascular Occlusion. Fırat University Journal of Health Sciences. 19 (4), pp: 241-248.
Chang Y. (2000). Grace under pressure. Ten years ago, 5,000 people did the exercise routine called Pilates. The number now is 5 million in America alone. But what is it, exactly? Newsweek. 135: 72-73.
Cozen DM. (2000) Use of Pilates in foot and ankle rehabilitation.Sports Medicine And Arthroscopy Revıew. 8 (4), pp: 395-403
Çağlav F. (2005). The Effects of 8-Week Pilates Training on Flexibility and Balance in Women aged 40-45. Muğla University, Social Sciences Institute, MA Thesis, Muğla (Supervisor: Assist. Prof. S Ekici).
Çolakoğlu FF. (2003). The Effects of 8-Week Run-and-Walk Exercise on Physiological, Motoric and Somatotype Values in Sedentary Middle-Aged Obese Women. Journal of Gazi Education Faculty. 23 (3), pp: 275-290.
Ergün A, Erten SF. (2004). Body Mass Index and Waist Circumference in Estimation of Obesity in Students. Ankara University Journal of Medicine. 57 (2): 57-61. https://dergipark.org.tr/download/article-file/368412
Eyili MÇ. (2017). The effect of physical activity on life quality and health in woman. Gazi University, Educational Sciences Institute, MA Thesis, Ankara (Supervisor: Assist. Prof. Ö Saygın).
Fenkci S, Sarsan A, Rota S, Ardic F. (2006). Effects of resistance or aerobic exercises on metabolic parameters in obese women who are not on a diet. Adv Ther. 23: 404-13.
Fişek NH. (1983). Halk Sağlığı'na Giriş. Ankara: Çağ Press, 1-2
Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Macera CA, Heath GW, Thompson PD, Bauman A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Medicine & Science in Sports & Exercise. 116, pp: 1081-1093.
Herodek K. (2006). Opita antropomotorika (General anthropomotoric skills). Nis: Self Edition of Author. In Serbian, (http://facta.junis.ni.ac.rs/pe/pe201204/pe201204-04.pdf
Heyward VH. (2002). Advanced Fitness Assessment and Exercise Prescription, Human Kinetics, Fourth Edition. USA,
Hoeger WWK ve Hopkins DR. (1992). A comparison of the sit and reach and the modified sit and reach in the measurement of flexibility in women. Res. Q. Exerc. Sport. 63: 191–195. https://insights.ovid.com /crossref?an=00005768-200009000-00021
Jylha M, Guralnik JM, Ferrucci L, Jokela J, Heikkinen E. (1998). Is Self-Rated Health Comparable Across Cultures and Genders? Psychological Sciences and Social Sciences. 53: 144-152.
Kao YH, Liou TH, Huang YC, Tsai YW, Wang KM. (2015). Effects of a 12-Week Pilates Course on Lower Limb Muscle Strength and Trunk Flexibility in Women Living in the Community, Health Care for Women International. 36 (3): 303-319. DOI: 10.1080/07399332.2014.900062).
Katayıfçı N, Düger T, Ünal E. (2014). Effects of clinical Pilates exercises on physical fitness of healthy subjects. Journal of Exercise Therapy and Rehabilitation. 1 (1): 17-25.
Kish R. (1998). The Functional Effects of Pilates Training on Dancers. PhD thesis. California State University; Department of Kinesiology.
Kjaer M, and Hansen M. (2008). The mystery of female connective tissue. J Appl Physiol. 105: 1026–1027.
McGrath JA, O'Malley M, Hendrix TJ. (2011). Group exercise mode and health-related quality of life among healthy adults. Journal of Advanced Nursing. 67, pp: 1365-2648
Obradović, J. (1999).Motoričke sposobnosti morfološke karakteristike vežbačica aerobne gimnastike (Motor abilities and morphological characteristics in female exercisers of aerobic gymnastics). Master Thesis, Novi Sad: Faculty of Physical Culture, University of Novi Sad. In Serbian. http://facta.junis.ni.ac.rs/pe/pe201204/pe201204-04.pdf
Özcan R, İrez GB, Saygın Ö,Ceylan Hİ. (2018). Aqua-Pilates Exercises Improves Some Physical Fitness Parameters of Healthy Young Women. Niğde University Physical Education and Sports Sciences Dergisi. 12(3).
Özdemir İ. (2014). Effect of Aerobic-step and Plates Exercises on Body Composition, Blood Lipids and Blood Glucose in Middle-Aged Women. Konya University Health Sciences Institute, MA Thesis, Konya (Supervisor: Yrd. Assoc. Prof. S Harbili).
Özer Kamil. (2001). Fiziksel Uygunluk Kitabı. 2nd edition. Nobel Press; Ankara,
Öztürk NL. (2008). The Effects of Aerobic-Step and Pilates Exercise on Strength, Flexibility, Anaerobic Power, Balance and Body Composition. Gazi University Health Sciences Institute, MA Thesis, Ankara (Supervisor: Assist. Prof. N Atalay Güzel).
Phrompaet S, Paungmali A, Pirunsan U, Sitilertpisan P. (2011). Effects of Pilates training on lumbo-pelvic stability and flexi-bility. Asian J. Sports Med. 2: 16-22.
Pilates JH. (1934). Your Health. First published.

Ministry of Health, (2011). Sağlığın Teşviki ve Geliştirilmesi Sözlüğü. Ankara: Ministry of Health Essential Services Directorate Press. https://sbu.saglik.gov.tr

Segal K, Van Loan M, Fitzgerald P, Hodgdon J, Van Itallie TB. (1988). Lean body mass estimation by bioelectrical impedance analysis: a four-site cross-validation study. The American Journal of Clinical Nutrition. 47 (1): 7-14.

Segal NA, Hein J, Basford JR. (2004). The effects of Pilates training on flexibity and body composition: An observational study. Archives of Physical Medicine and Rehabilitation. 85: 1977-1981.

Seidell JC. (2002). Obezitenin Epidemiyolojisi. International Texbook of Obesity. Eds.: Björntorp P. Çev. Kahramanoğlu M. Göteborg: Wiley. pp: 23-29.

Siler B. 82000). The Pilates Body. Broadway Books, New York.

Şahiner İ. ve Balcı ŞS. (2010). Comparison of Different Sit-Reach Flexibility Tests Applied to Children, Niğde University Journal of Physical Education and Sports Sciences. 4 (1): 1-9.

Şavkın R. (2014). Pilates The Effect of Pilates Training on Body Composition. Pamukkale University Health Sciencesi Institute, MA Thesis, Denizli (Supervisor: Prof. Dr. U Baş Aslan).

Teculescu D, Chenuel B, Benamghar L, Michaely JP, Hannhart B. (2010). Is a sedentary lifestyle a risk factor for sleep-related respiratory disturbance? Revue de Maladies Respiratoires. 27, pp: 703-708.

Teoman N, Özcan A, Acar B. (2013). The Effect of Exercise on Pyhsical Fitness and Quality of Life in Postmenopausal Women. Maturitas. 47: 71–77

Tortop Y, Ön BO, Öğün ES. (2010). The Effects of the Some Physical Fitness' Parameters for 12 Weeks Step-Aerobic Exercises' Program on the Women. Selçuk University Journal of Physical Education and Sports Sciences. 12: 91–7.

Vatansever Ş, Ölçücü B, Özcan G, Çelik A. (2015). The Relationship Between Physical Activity Level and Life Quality Among Middle Aged Individuals. International Journal of Educational Sciences. 71, 2 (2): 63-73.

Vergili Ö, Yalıman A. (2012). Effects of 12-Week Calistanic Pilates Exercise Program on Flexibility and Body Composition in Sedentary Women. Bidder Journal of Medicine. 4: 17-24.

Vural Ö. (2010). The Relation of Physical Activity Level and Life Quality at Sedentary Profession. Gazi University, Health sciences Institute, Department of Physical Education and Sports Sciences, MA Thesis, Ankara (Supervisor: Assist. Prof. S Eler).

Yararbaş M. (2013). Investigation of the effect of plates exercises applied 8 weeks on anthropometric features and body feeling at middle age woman. Süleyman Demirel University, Health Sciencesi Institute, MA Thesis., Isparta (Supervisor: Assist. Prof. M Kumartaşlı).

Zorba E. (2001). Fiziksel Uygunluk, Gazi Press; 2nd Edition, Muğla.