

Examination of the Effects of Pilates Exercises on Sleep Quality and Physical Activity

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Abstract

This study aimed to investigate the effects of an 8-week Pilates exercise program on physical activity levels and sleep quality among university students. A total of 40 students from Nevşehir Hacı Bektaş Veli University, comprising 20 females and 20 males, participated voluntarily. The International Physical Activity Questionnaire (IPAQ), Pittsburgh Sleep Quality Index (PSQI), and demographic information forms were administered. The experimental group engaged in Pilates exercises twice a week for 90 minutes each session over the 8-week period. The control group continued their daily lives without doing any regular sports. Data collected before and after the intervention were compared. Normality of the data was tested using the Kolmogorov-Smirnov and Shapiro-Wilks tests, while Pearson correlation analysis was applied to examine relationships between normally distributed variables. Independent Sample T-Tests were conducted to compare group differences, with a 95% confidence interval and significance level set at $p < 0.05$. According to the results of the analysis, there were significant improvements in the Sleep Quality score of the experimental group ($p = 0.041$), Physical Activity total score ($p = 0.000$), and physical activity sub-dimensions (High, Moderate, Walking) compared to the control group. Additionally, a moderate positive correlation ($r = 0.637$) was found between total physical activity score and its sub-dimensions. In conclusion, regular Pilates exercises were found to significantly enhance both daily physical activity levels and sleep quality in participants, suggesting that Pilates can be recommended to improve these aspects of health.

Keywords: Physical activity, pilates, sleep quality.

Pilates Egzersizlerinin Uyku Kalitesi ve Fiziksel Aktivite Üzerine Etkilerinin İncelenmesi

Özet

Bu çalışmada, 8 haftalık bir Pilates egzersiz programının üniversite öğrencileri arasında fiziksel aktivite düzeyleri ve uyku kalitesi üzerindeki etkilerini araştırmak amaçlanmıştır. Nevşehir Hacı Bektaş Veli Üniversitesi'nden 20'si kadın ve 20'si erkek olmak üzere toplam 40 öğrenci gönüllü olarak katılmıştır. Katılımcılara Uluslararası Fiziksel Aktivite Anketi (IPAQ), Pittsburgh Uyku Kalitesi İndeksi (PUKİ) ve demografik bilgi formları uygulanmıştır. Deney grubu, 8 hafta boyunca haftada iki kez, her biri 90 dakika süren Pilates egzersizlerine katılmıştır. Kontrol grubu ise düzenli herhangi bir spor yapmadan günlük hayatına devam etmiştir. Araştırma öncesi ve sonrasında toplanan veriler karşılaştırılmıştır. Verilerin normalliği Kolmogorov-Smirnov ve Shapiro-Wilks testleri ile değerlendirilmiş, normal dağılım gösteren

değişkenler arasındaki ilişkileri incelemek için Pearson korelasyon analizi uygulanmıştır. Grup farklılıklarını karşılaştırmak için Bağımsız Örneklem T-Testi kullanılmış olup, %95 güven aralığı ve $p < 0,05$ anlamlılık düzeyi olarak belirlenmiştir. Analiz sonuçlarına göre, deney grubunun Uyku Kalitesi skoru ($p=0,041$), Fiziksel Aktivite toplam skoru ($p=0,000$) ve fiziksel aktivite alt boyutlarında (Yüksek, Orta, Yürüme) kontrol grubuna kıyasla anlamlı iyileşmeler görülmüştür. Ayrıca, toplam fiziksel aktivite skoru ile alt boyutları arasında orta düzeyde pozitif bir korelasyon ($r=0,637$) bulunmuştur. Sonuç olarak, düzenli Pilates egzersizlerinin katılımcıların günlük fiziksel aktivite düzeylerini ve uyku kalitesini anlamlı derecede artırdığı tespit edilmiş, bu bulgular ışığında Pilates'in bu sağlık alanlarını iyileştirmek için önerilebileceği sonucuna varılmıştır.

Anahtar kelimeler: Fiziksel aktivite, pilates, uyku kalitesi.

INTRODUCTION

It is widely acknowledged that engaging in physical activity yields beneficial effects on both physical and mental well-being of individuals. These effects are beneficial in both prevention and treatment of diseases (7, 37). Studies show that physical activity positively affects health-related quality of life (7, 12, 32). Additionally, participating in such activities helps diminish feelings of inadequacy or inferiority experienced in social interactions to some extent (37). It is known that those who participate in physical activity have better physical performance and experience lower social-physical anxiety (20). Research on physical activity's health impacts indicates it lowers cardiovascular disease risk, aids weight management, decreases diabetes risk, guards against cancer, supports musculoskeletal health, and yields psychological benefits like reducing depression, stress, and anxiety. It also fosters positive social effects (24).

The prevalent sedentary lifestyle seen today adversely impacts individuals' quality of life and disrupts their sleep patterns (22). Given the persistence of these problems and their health ramifications, it's crucial to assess them within society (5). Sleep, which covers approximately 20-25 years of human life, has received special emphasis in academic research due to the increase in complaints, the potential of poor quality sleep to cause various diseases and the strong link between good sleep and physical and psychological health (6). Researches have indicated a correlation between insufficient physical activity and the occurrence of insomnia (23, 8). Exercises are recommended as an alternative treatment because they are non-pharmacological, low-cost and easily accessible. The anxiety-reducing and antidepressant effect of exercises are being very important factor in alleviating the aetiology of insomnia and subsequent psychological comorbidities (8, 31). Regular exercisers often encounter fewer issues with insomnia. Exercise can enhance sleep quality by facilitating a smoother transition between sleep cycles and stages. Engaging in moderate-intensity exercises for 20-30 minutes, four to five times weekly, can promote improved sleep (34).

Pilates is an exercise method created to increase muscle strength, flexibility and muscle control (27, 13, 4, 3). Pilates, popular among women, blends elements of yoga, gymnastics, and other sports with mental concentration and specialized breathing techniques drawn from Eastern and Western philosophies (3). Pilates exercises, which can be easily applied by people of all age groups, including disabled individuals, are performed on a mat or with specially designed tools (reformer, cadillac, etc.) (18). Literature findings demonstrate that exercise enhances body composition, lowers the risk of coronary artery disease and diabetes, diminishes pain and depression, extends life expectancy, improves quality of life, and combats obesity (11). Pilates exercises are a type of exercise developed by Joseph Pilates, aiming to make the mind and body work in a holistic way, improving balance and respiratory system (17). In addition, Research has revealed beneficial effects associated with pilates exercises on psychological, physical and motor functions (25).

Considering that Pilates is based on principles that aim to work the body as a whole (18), it wouldn't be wrong to state that it is a suitable physical activity for healthy and sick individuals. A 12-week pilates programme was observed to improve sleep quality and reduce delayed sleep in individuals with sleep problems. In addition, it was determined that 16-week pilates exercises in geriatric individuals increased the PSQI scores of the patients and regulated their sleep quality (23). In studies conducted in patients with chronic heart failure, it was found that regular personalised Pilates programme improved sleep quality for 10 weeks. Pilates requires professional guidance at the beginning of regular practice and training (28). Therefore, Pilates is recommended as a regular exercise programme to deal with sleep disorders. Based on all this information,

our current study was conducted to evaluate the effects of an 8-week Pilates exercise program on sleep quality and physical activity among university students.

METHOD

This section includes information about the research group, procedure, data collection tools and data analysis. In this study, experimental design with control group was used and correlational research method was used to examine the effect of pilates exercises applied to university students for 8 weeks on sleep quality and physical activity scores.

Participants

A total of 40 volunteer sports science students, 20 male and 20 female, with a mean age of 19.63 ± 1.606 years took part in the study (Table 1). Sample size efficiency was calculated using G*Power software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany). When $(1-\beta)$ was set to 0.80 and α was set to 0.05 in G-Power, the calculation using G-Power indicated that each group should consist of at least 18 participants. Before the study, each athlete was given accurate knowledge of the research and the potential risks, and permission to participate was gained by reading the declaration of consent. Individuals who had sustained an injury during the previous six months were excluded from the trial.

Table 1. Descriptive statistics of participants

Variables	Gender	N	\bar{x}	SD	Min	Max
Age (Year)	Male	19	19,63	1,61	18	22
	Female	21	19,62	1,43	18	23
Class	Male	19	1,47	,513	1	2
	Female	21	1,52	,512	1	2
Experimental Group	Male	9	19,23	20,75	19	23
	Female	11				
Control Group	Male	10	18,50	,946	18	22
	Female	10				

Ethical approval and institutional permission

Within the scope of the study, permission was given from Nevşehir Hacı Bektaş Veli University Non-Interventional Clinical Research Ethics Committee (Ethics Committee Document No: 2300082004; Meeting No: 12; Decision Number 2023/07) and all measurements were performed in accordance with the Declaration of Helsinki.

Data Collection Tools

Demographic Information: After explaining the process related to the study, demographic information will be collected with the demographic information form. Participants were asked questions such as age, gender and sports age.

International Physical Activity Questionnaire (IPAQ): The abbreviated version of the International Physical Activity Questionnaire (IPAQ), devised by Craig et al. (16) was used to assess the engagement of participants in physical activity. The Turkish version of the questionnaire for university students was conducted by Öztürk (30), yielding valid and reliable results for this demographic. Participants were asked for their assessment the questionnaire they were given before starting the study and after 8 weeks of pilates practices by thinking about what changes in their physical activity levels. The questionnaire consisted of seven items that asked about time spent sitting, low level intensity activities (such as walking), and moderate and high level intensity activities. A score of "MET/minute/week" was calculated by multiplying the survey's minute, day and MET values. The computation took into account 3.3 METs for walking, 4.0 METs for moderate-intensity physical activity, and 8.0 METs for vigorous-intensity physical activity. Physical activity was classified into three levels: inactive (<600 MET-min/week), marginally active (600-3000 MET-min/week),

and sufficiently active (>3000 MET-min/week). The quantity of time spent sitting was assessed independently during the investigation.

Pittsburgh Sleep Quality Index (PSQI): The PSQI is a self-report scale designed to evaluate sleep quality and disturbances experienced over a one-month timeframe. The PSQI was developed by Buysse et al. in 1989 and has been demonstrated to possess sufficient internal consistency (0.83), test-retest reliability and validity (10). Ağargün et al. evaluated the scale's validity and reliability in Turkey, revealing an internal consistency coefficient of 0.80 for Cronbach's alpha. The PSQI examination has 18 components for scoring (1). The PSQI has seven subcomponents: subjective sleep quality, sleep latency, sleep length, sleep medication usage, habitual sleep efficiency, sleep disruption, and daytime dysfunction. Certain components are represented by a single object, but others are created by putting many elements together. Each item is scored on a scale of 0 to 3, and the total PSQI score is the sum of the seven component values. An overall score on the PSQI defines as ≤ 5 indicates "good sleep quality," whereas > 5 indicates "poor sleep quality" (1).

Data Collection Process

First of all, the participants informed with all the details about the purpose and process of the study. The volunteers participating in the study were administered the IPAQ scale to determine their physical activity levels, the PSQI scale to assess their sleep quality, and personal information forms indicating their age, gender and sports age as pretests. The participants were split into two groups as experimental and control groups with equal numbers of men and women by random sampling method. The participants who were part of the experimental group practiced pilates exercises for 8 weeks, 2 times a week, 90 minutes a day, accompanied by an expert trainer. Detailed information about the pilates exercise applied is given in Figure 1. The control group was not involved in any application and continued their standard lives. After the 8-week period for Pilates exercises was over, the IPAQ and PSQI scales administered to the participants at the beginning of the study were re-administered to the participants and the measurement and exercise process of the study was completed and the data obtained were recorded for analysis.

1. Week	Set	Repeat	Rest	Intensity	Frequency(Day)	5. Week	Set	Repeat	Rest	Intensity	Frequency(Day)
Hundred	2	8-10	1:1	%70	2	Front Back Up	2	10-12	1:1	%80	2
Roll up	2	6-8	1:1	%70	2	Inner Thigh Lift	2	12-15	1:1	%80	2
One Leg Circle	2	6-8	1:1	%70	2	Beats on Belly	2	12-15	1:1	%80	2
Teaser	2	4-6	1:1	%70	2	Teaser	2	3-5	1:1	%80	2
2. Week	Set	Repeat	Rest	Intensity	Frequency(Day)	6. Week	Set	Repeat	Rest	Intensity	Frequency(Day)
Rolling Like a Ball	2	6-8	1:1	%70	2	Teaser one Leg	2	6-8	1:1	%80	2
Single Leg Stretch	2	10-12	1:1	%70	2	Swimming Prep	2	6-10	1:1	%80	2
Double leg Stretch	2	10-12	1:1	%70	2	Push Up	2	6-8	1:1	%80	2
Single Straight Leg	2	10-12	1:1	%70	2	Mermaid stretch	2	3-5	1:1	%80	2
3. Week	Set	Repeat	Rest	Intensity	Frequency(Day)	7. Week	Set	Repeat	Rest	Intensity	Frequency(Day)
Double Straight Leg	2	10-12	1:1	%70	2	Double Straight Leg	2	10-12	1:1	%80	2
Cross Cross	2	10-12	1:1	%70	2	Cross Cross	2	10-12	1:1	%80	2
Spine Stretch For.	2	6-8	1:1	%70	2	Spine Stretch For.	2	6-8	1:1	%80	2
Corkscrew	2	6-8	1:1	%70	2	Corkscrew	2	6-8	1:1	%80	2
4. Week	Set	Repeat	Rest	Intensity	Frequency(Day)	8. Week	Set	Repeat	Rest	Intensity	Frequency(Day)
Saw	2	6-8	1:1	%70	2	Rolling Like a Ball	2	6-8	1:1	%80	2
Swan neck Roll	2	3-5	1:1	%70	2	Single Leg Stretch	2	10-12	1:1	%80	2
Rest Position	2	10 sn	1:1	%70	2	Double leg Stretch	2	10-12	1:1	%80	2
Shoulder Bridge	2	6-8	1:1	%70	2	Single Straight Leg	2	10-12	1:1	%80	2

Figure 1: Pilates exercise programme

Analysis of the Data

The normality of the data gathered was established employing the Kolmogorov-Smirnov and Shapiro-Wilk tests, and the analysis of Pearson correlation was employed to evaluate correlations among variables with normal distributions. Variables were compared using the Independent Sample T Test. The confidence range was 95%, and values below $p < 0.05$ were considered significant.

FINDINGS

Table 2. Comparison of control and experiment group pre-test and post-test

Variables	Group	Pre-Test (n=20)			Post-Test (n=20)		
		\bar{x} \pm SD	t	p	\bar{x} \pm SD	t	p
PUKİ	Experimental	7,20 \pm 2,17	0,63	,950	5,45 \pm 2,01	-2,113	,041*
	Control	7,15 \pm 2,81			7,05 \pm 2,72		
MET Total	Experimental	6043,65 \pm 1610,69	-,188	,852	6648,10 \pm 1555,75	,149	,543
	Control	6145,70 \pm 1814,03			6315,50 \pm 1856,30		
High	Experimental	2880,50 \pm 1173,54	,009	,993	3010,00 \pm 1254,94	,251	,628
	Control	2877 \pm 1212,14			3030 \pm 1441,26		
Moderate	Experimental	923,90 \pm 637,55	-,074	,941	1290 \pm 759,40	,274	,129
	Control	938,40 \pm 597,73			946,50 \pm 636,34		
Walking	Experimental	2239,25 \pm 1308,86	-,217	,829	2534,60 \pm 1177,29	,782	,630
	Control	2330,30 \pm 1341,77			2339 \pm 1365,40		

*p<0,05

When Table 2 was analyzed, no differences of statistical significance were discovered between the groups in Total Sleep Quality (PSQI), Physical Activity Level total score (MET Total), High, Moderate and Walking pre-test values ($p < 0.05$). In the post-test values, while there was a statistically significant difference in favor of the experimental group in Total Sleep Quality (PSQI) values, there was no statistically significant difference in Physical Activity Level total score (MET Total), High, Moderate and Walking post-test values ($p < 0.05$).

Table 3. Pretest and Post test Comparison of Control and Experimental Groups According to Gender Variable

Variables	Gender	Pre-Test			Post-Test		
		\bar{x} \pm SD	t	p	\bar{x} \pm SD	t	p
PUKİ	Male	8,26 \pm 2,40	2,879	,007*	7,37 \pm 2,45	2,946	,005*
	Female	6,19 \pm 2,16			5,24 \pm 2,12		
MET Total	Male	5,805,16 \pm 1788,69	-,1,029	,310	6094,32 \pm 1711,03	-1,388	,173
	Female	6356,62 \pm 1601,52			6832 \pm 1649,75		
High	Male	2743,16 \pm 1134,20	-,688	,496	2772,63 \pm 1293,52	-,693	,493
	Female	3001,43 \pm 1230,08			3065,71 \pm 1373,26		
Moderate	Male	863,68 \pm 625,49	-,661	,513	963,68 \pm 603,24	-1,142	,261
	Female	992,19 \pm 603,48			1240,48 \pm 794,48		
Walking	Male	2198,32 \pm 997,71	-,393	,697	2338 \pm 954,93	-,466	,644
	Female	2363 \pm 1559,66			2526,19 \pm 1506,18		

*p<0,05

As it appears on Table 3, a statistical significant difference favoring female participants was identified in both pre-test and post-test Total Sleep Quality (PSQI) scores, based on the gender variable. There was no statistically significant difference in Physical Activity Level total score (MET Total), High, Moderate and Walking values in both tests according to gender variable ($p < 0.05$).

Table 4. Pre-Test and post-test comparison results within the group

Variables	Group	Experimental Group (n=20)			Control Group (n=20)		
		\bar{x}	SD	p	\bar{x}	SD	p
MET Total	Pre-Test	6043,65	1610,691	,000**	6145,70	1814,03	,206
	Post-Test	6648,10	1555,752		6315,50	1856,30	
High	Pre-Test	2880,50	1173,54	,019*	2877	1212,14	,218
	Post-Test	3010,00	1254,94		3030	1441,36	
Moderate	Pre-Test	923,90	637,55	,000**	938,40	596,73	,729
	Post-Test	1290,50	759,40		946,50	636,34	
Walking	Pre-Test	2239,25	1308,86	,002**	2330,30	1341,77	,859
	Post-Test	2534,60	1177,29		2339	1365,40	
PUKİ	Pre-Test	7,20	2,17	,000**	7,15	2,82	,629
	Post-Test	5,45	2,01		7,05	2,72	

*p<0,05, **P<0.01

When Table 4 is reviewed, a statistical significant difference was identified in the experimental group Total Sleep Quality (PSQI), Physical Activity Level total (MET Total), High, Moderate and walking pre-test and post-test values ($p < 0.05$). In the control group, there was not a statistically significant difference found in Total Sleep Quality (PSQI), Physical Activity Level total score (MET Total), High, Moderate and Walking pre-test and post-test values ($p < 0.05$).

Table 5. Table of the relationship between physical activity total score and physical activity subscales

Variables	MET Total	High	Moderate	Walking
MET Total	Pearson's r	1	,637**	,294
	p		,000	,065
	N	40	40	40
High	Pearson's r	,637**	1	,013
	p	,000		,936
	N	40	40	40
Moderate	Pearson's r	,294	,013	1
	p	,065	,936	
	N	40	40	40
Walking	Pearson's r	,509**	-,201	-,183
	p	,001	,214	,259
	N	40	40	40

*p<0,05

When Table 5 was reviewed, there was a positive, moderate, statistically significant relationship found between the Physical Activity Level total score (MET Total) and High ($r=.637$) and Walking ($r=.509$), which are sub-dimensions of physical activity. No statistically significant relationship was found between the total score of Physical Activity Level (MET Total) and Moderate exercise ($p < 0.05$).

DISCUSSION AND CONCLUSION

The aim of this study was to investigate the changes in physical activity and sleep quality levels after 8 weeks of Pilates exercises applied to the students from Faculty of Sports Sciences of Nevşehir Hacı Bektaş Veli University. A total of 40 volunteer sports science students, 20 male and 20 female, with a mean age of 19.63 ± 1.606 years participated in the study.

In the classification for physical activity; low level: individuals with a value below 600 MET-min/week, medium level: individuals with a value between 600-3000 MET-min/week and high level: 3000 MET-min/week (16). When evaluating the total sleep quality score, it is stated that individuals with a score of " ≤ 5 " have good sleep quality, whereas individuals with a score of " > 5 " have poor sleep quality (1).

According to our findings, no statistically significant difference was observed between the two groups in Total Sleep Quality (PSQI), Physical Activity Level total score (MET Total), High, Medium and Walking pre-test values ($p < 0.05$). This shows that both groups are distributed homogeneously. In the post-tests, a statistically significant difference was observed in Total Sleep Quality (PSQI) values that favor the experimental group (Experimental Group: pre test Mean:7.20, post test Mean:5.45, Control Group: pre test Mean:7.15, post test Mean:7.05). Although there were increases in Physical Activity Level total (MET Total) score, High, Medium and Walking values from post-test that favor the experimental group, no statistically significant difference was detected ($p < 0.05$). When reviewing the literature, it is commonly stated that pilates training generally improves the sleep quality of individuals, but the effects are not clear in individuals after the age of 40 and more studies are needed. It has been observed that regular physical activity and Pilates exercises, which are usually performed between 8 and 16 weeks, improve sleep quality and reduce delayed sleep in individuals with sleep problems in young, middle-aged and older ages (21). Similarly, it is noteworthy that Pilates exercises improve sleep quality in individuals with chronic heart disease (28). Leopoldino et al. (26) stated that 12-week Pilates training had positive effect on improving the life quality and sleep quality. Our study's results are similar to the studies conducted. Therefore, Pilates is recommended as a regular exercise program in the fight against sleep disorders.

When we looked at the values from pre-test and post-test that collected from the participants according to the gender variable, a statistically a significant differences was found between the Total Sleep Quality (PSQI) score averages. Accordingly, it was found that females had better sleep quality scores than males in both pre-test ($t=2.879$, $p=.007$) and post-test ($t=2.946$, $p=.005$) values. This suggests that some factors affecting sleep quality such as sleeping hours, adaptation to common living spaces and similar factors are better practiced by female students than male students. However, Işık et al. (22) reported that men had higher physical activity scores than women, while women had higher total sleep quality and depression scores than men. There are studies reporting similar results in the literature. This situation is considered to be influenced by personal lifestyle habits and the living environment.

The experimental group had significantly higher scores in Total Sleep Quality (PSQI) ($p=.000$), Physical Activity Level Total (MET Total) ($p < 0.05$), High ($p < 0.01$), Moderate ($p=.000$), and Walking ($p < 0.01$) compared to the control group. Accordingly, it is seen that 8-week regular pilates exercises caused positive changes in Total Sleep Quality (PSQI) and Physical Activity Level total (MET Total) scores of university students. In the literature, similar to our study results, Garcia-Soidan et al. (21) reported that the general activity value was 12,539.7 on average in the pre-test data of the study and 13,095.8 in the post-test data, which provided an increase of approximately 10.9% in the Pilates group, but there was no change in the control group. Bulgurluoğlu et al. (9) reported that online pilates trainings increased physical activity, quality of life, depression levels and sleep quality scores in favor of the experimental group ($p < 0.05$). According to the results obtained in the study conducted by Saltan (33), it was reported that Pilates-based exercises in women were effective on BMI, emotional state, waist hip ratio and posture, which are sub-parameters of quality of life assessment. Similarly, Vergili (36) investigated the effect of 12 weeks of Pilates-based exercise on quality of life in 153 sedentary women and reported that exercise positively affected parameters such as quality of life and mobility, respiration, excretion, normal activities, and mental function in women.

We investigated the connection between the participants' Physical Activity Level Total (MET Total) scores and the Physical Activity sub-dimensions. Table 5 shows a positive and moderate link between Physical Activity Level total score and High Intensity Exercises ($r=.637$) and Walking Exercises ($r=.509$). According to these results, it is seen that all of the exercises performed as physical activity such as high intensity, moderate or walking positively affect the total Physical Activity scores. We think that regular pilates exercises increase the physical activity level of the individuals and accordingly increase their self-confidence while walking, going up and down and encourage them to physical activity.

Many studies in the literature have reported that physically active participants have improved mental states such as fatigue, anxiety, depression, self-efficacy, etc. However, as in our current study, there are studies that applied pilates for physical activity and reported positive effects on the sleep quality of the participants (14, 15, 26, 2).

As a result, both the pre-test and post-test Physical Activity Total Scores of the University students were in the category classified as high. We think that this reflects the participants' habits of practicing sports on their level of physical activity participation in daily life. However, regular pilates exercises provided statistically significant differences in physical activity total score and physical activity sub-dimensions even in participants with a sports experience and increased the daily physical activity level. In addition, there were improvements in the sleep quality scores of the participants after Pilates exercises.

For all these reasons, it is seen that Pilates exercises positively improve the daily physical activity levels of people and as frequently stated in the literature (9, 21, 28, 33, 36), there are significant changes in sleep quality, depression perceptions, quality of life, mobility, etc. with increasing physical activity.

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