

# Effect of Pilates Exercises on Fatigue in Postmenopausal Women

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## ABSTRACT

**Background** a lot of changes occur in women's post-menopausal period, one of these symptoms is fatigue or a lack of energy which is a potential symptom of menopause, it can be one of the most difficult symptoms to manage. Few studies are concerned with postmenopausal fatigue treatment. Pilates is a mind body exercise focusing on muscle strength, core stability, endurance, muscle control, posture, and respiration which seems to improve both the physical and psychological components in postmenopausal women. The purpose was to determine the effect of Pilates exercises on fatigue in postmenopausal women.

**Methods** Fifty-two postmenopausal women suffering fatigue, their ages ranged from 50 to 55 years, their body mass index (BMI) below 30 kg/m<sup>2</sup> and they all became menopause at least for one year ago. The patients were selected randomly from out clinic of El Kasr EL-Aini hospital and randomly divided into two equal groups. Group A composed of twenty-six patients received Pilates exercises and medical standard care for fatigue and group B, twenty-six patients received medical standard care for fatigue only. It was a randomized controlled trial for 8 weeks, the outcome measures were FAS and IL-6. **Results** there was a significant decrease in fatigue assessment scale (FAS) ( $P < 0.00001$ ), and interleukin-6 test (IL-6) ( $P < 0.00001$ ) after treatment for group A while there was no significant reduction for group B. **Conclusions** Pilates exercises is considered an effective modality to reduce fatigue in postmenopausal women.

**Key Words:** Fatigue, Pilates, Post-Menopause, Interleukin 6.

## INTRODUCTION

In the transition phase of menopause, there will be significant changes in the gonadal hormones. Many women develop somatic and psychological symptoms cluster called postmenopausal syndrome (1).

The signs and symptoms of menopause are characterized by onset of irregular menses, hot flushes and night sweats. Menopause is known to be associated with changes in biopsychosocial changes, e.g. mood swings, anxiety, sexual dysfunction, stress, forgetfulness, sleep disturbances and fatigue. During menopause estrogen levels decline, leading to sleep impairment, depressive disorders, cognitive decline and various physical ailments like osteoporosis, vaginal atrophy and sexual dysfunction (2).

Menopausal symptoms, such as hot flashes, may ease gradually for many women. However, some women continue to experience menopausal symptoms for a decade or longer after the menopause transition, unless they receive the proper intervention (3).

Postmenopausal fatigue exacerbates menopausal symptoms such as anxiety, poor concentration and a lack of confidence. The main cause of menopausal fatigue is the change in hormone levels estrogen, progesterone, thyroid and adrenal hormones are all involved in regulating cellular energy in the body which when compromised can lead to fatigue (5). Fatigue has a negative impact on quality of life of postmenopausal women. It can be an overwhelming experience impacting the physical, emotional and social aspects of them. It can prevent them from carrying out their usual activities of daily living (6). Menopause-related fatigue is often compounded by symptoms, mainly vasomotor symptoms which are experienced by up to 80% of women and include hot flashes and night sweats that

can disrupt postmenopausal women sleep (7). Several psychotropic pharmaceuticals may be prescribed to rapidly and successfully improve the vasomotor symptoms that contribute to sleeplessness and fatigue. These include selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs), both of which are commonly used as antidepressants, but have potential side effects as associated with appetite, constipation and nausea (8).

Hormone replacement therapy (HRT), (estrogens and progestogens) used to treat symptoms associated with postmenopausal women (9), but with long run use it promotes endometrial thickening and can increase the risk of cancer as well as having several side effects as headache, upset stomach, stomach cramps or bloating, diarrhea, appetite and weight changes, black patches on the skin, acne, swelling of hands and legs due to fluid retention (10). Regular exercise of postmenopausal women has benefits of increased cardio-respiratory fitness, increased muscle strength and endurance, reduced body fatigue, improved morale, and increased ability to perform daily tasks with greater force. Thus, the main objective of regular exercises is prevention of physical deterioration and optimizing functional capacity to improve overall postmenopausal women's quality of life (11). Pilates is a system of exercises using special apparatus designed to improve physical strength, flexibility, dynamic postural balance, enhance mental awareness as well as improves quality of life in postmenopausal women (12). In Egyptian population postmenopausal fatigue didn't have much interest, thus the aim of the present study is to assess the effect of a set of Pilates exercises on the general physical and mental fatigue of the postmenopausal women.

## Materials and Methods

### 2.1 Study Design

It was a randomized controlled trial. Ethical approval was obtained by the Research Ethics Committee of the Faculty of Physical Therapy, Cairo university (No: P.T.REC/012/003239).

### 2.2 Participants

Fifty-two postmenopausal women suffered from fatigue participate in this study were selected from outpatient clinic of El Kasr EL-Aini hospital, faculty of Medicine, Cairo, Egypt. All of them were post menopause at least for one year, their age was between 50-55 years old and their body mass index (BMI) didn't exceed 30 Kg/m<sup>2</sup>. The exclusion criteria were uncontrolled hypertension, thyroid gland disorders, history of syncope or arrhythmia induced by physical exercise, any mental, neurological, vestibular, cardiovascular disorders or metabolic disease, visual or hearing impairment did not allow possibility of intervention, any hormonal replacement therapy (HRT) or any drug known to affect their physical activity, auto immune disease and other problems that make it impossible to perform physical exercises were excluded from the study. Group (A) (study group) included 26 post menopausal women who received Pilates exercises 3 sessions per week for 8 weeks, medical standard care for fatigue and a pamphlet of advices to deal with fatigue, while group (B) (control group) received medical standard care for fatigue as well as a pamphlet of advices to deal with fatigue. All females were instructed with a full explanation of the study protocol with signing a consent form before participating in the study, they were randomly and equally distributed into two groups (A) & (B).

### 2.3 Measurement Procedures

#### 2.3.1 Weight-Height Scale

It was used to measure the weight and height for each postmenopausal woman in both groups (A and B) before the treatment program to assure that all

postmenopausal women BMI did not exceed 30 kg/ m<sup>2</sup>.

#### 2.3.2 Fatigue Assessment Scale (FAS)

The FAS proven to be a valid questionnaire to assess fatigue for postmenopausal women, it is quick, easy and not time consuming (13). The FAS is a 10-item general fatigue questionnaire to assess postmenopausal fatigue, , five questions reflected physical fatigue and 5 questions (questions 3 and 6-9) reflected mental fatigue, an answer to every question had to be given on the Likert scale as never, sometimes, regularly, often or always. The total FAS score calculated by summing the scores on all questions (recoded scores for questions 4 and 10), the total score ranged from 10 to 50, a total FAS score < 22 indicated no fatigue, while a score ≥ 22 indicated fatigue (14). It was done on all post-menopausal women in both groups (A and B) before starting the study and after the end of the treatment (8 weeks).

#### 2.3.3 Interluken-6 Test (IL-6)

5 ml blood sample was drawn to assess level of IL-6 for each postmenopausal woman in both groups (A and B) before starting the study and after the end of the treatment (8 weeks). The blood analysis took place at the central Labs of El Kaser El Aini University Hospital. Its normal range is 0-16.4 pg/ml, values higher than 16.4 indicated fatigue (16).

### 2.4 Treatment Procedures

#### 2.4.1 Pilates Exercises

All females in group (A) received Pilates exercises consisted of a set of 10 movements: bridging, the saw, roll up, one leg circle (both ways), single straight leg stretch, single leg kick, side kick up and down, side kick circle, spine stretch forward and curling (17). participants were instructed to perform 30 min per session, 3 sessions per week, for 8 weeks. At the beginning warm up 7–10 min as a walk brisk, 30min for the main program, with 3–5 repetitions of each 10 movements at the start, 10-sec rest per repetition, 2 sets,

with a 60 sec rest between sets and a 5–7 min for the cool-down in form of stretching. Adding two more repetitions for each movement every week until the end of the intervention (18). The rating of perceived exertion (RPE) was used to gradually increase the program intensity; the modified RPE scale has a range from 0 to 10 (with 0 being no exertion and 10 being maximum effort). This scale corresponds more with a feeling of breathlessness (19). If any woman complained from the following: chest pain, breathing difficulties, excessive sweat, feeling dizzy, numbness or tingling, the exercises session was stopped immediately.

#### **2.4.2 Medical Standard Care for Fatigue**

All females in group (A and B) received the medical standard care for fatigue which instructed for them in shape of dietary supplements and vitamins.

#### **2.4.3 Advices**

Each postmenopausal woman in both groups (A and B) received a pamphlet with life style advices to fight fatigue included drink a plenty of water , get rid of caffeine, make sure to have breakfast, don't skip meals , eat a healthy diet, increase the amount of fruit, vegetables, wholegrain foods, low fat dairy products and lean meats, reduce the amount of high fat, high sugar and high salt foods; don't eat so much, Instead of eating three big meals per day, try eating six mini-meals to spread the kilojoule intake more evenly, eat iron rich foods and avoid sleeping pills.

#### **2.5 Statistical Analysis**

Statistical analysis was conducted using IBM SPSS Statistics. The current test involved two independent variables The first one was the (Tested Group); between subject factors which had two levels (group A received Pilates exercises 3 sessions per week for 8 weeks, medical standard care for fatigue and a pamphlet of advices to deal with fatigue, while group (B) (control group) received medical

standard care for fatigue as well as a pamphlet of advices to deal with fatigue). The second one was the (measuring periods); within subject factor which had two levels (Pre-treatment, Post-treatment). In addition, this test involved two tested dependent variables (FAS, and IL-6). Prior to final analysis, data were screened for normality assumption, homogeneity of variance, and presence of extreme scores. This exploration was done as a pre-requisite for parametric calculations of the analysis of difference. FAS, and IL-6 were normally distributed, as assessed by Shapiro-Wilk's test ( $P > 0.05$ ). There was homogeneity of variances, as assessed by Levene's ( $P > 0.05$ ) for almost dependent variables. There was a linear relationship between the dependent variables, as assessed by scatterplot, and no evidence of multicollinearity, as assessed by Pearson correlation ( $|r| < 0.9$ ). There were no univariate outliers in the data, as assessed by inspection of a boxplot, and no multivariate outliers in the data, as assessed by Mahalanobis distance, accordingly, 2x2 Mixed MANOVA test was used to compare the tested variables of interest at different measuring periods at both groups. With the initial alpha level set at 0.05.

## **RESULTS**

#### **General Characteristics:**

The current study was conducted on 52 participants. They were assigned randomly into two groups of twenty-six patients each. As indicated by the independent t test, there were no significant differences ( $p > 0.05$ ) in the mean values of age, body mass, height, BMI and last menstruation between both tested groups (A&B) as shown in Table 1.

**Table 1: Physical characteristics of participants in both groups (A & B)**

Items	Group (A)	Group (B)	Comparison		S
	Mean $\pm$ SD	Mean $\pm$ SD	t-value	P-value	
Age (Years)	52.4 $\pm$ 1.8	53.23 $\pm$ 1.6	-0.18	0.428	NS
Body Mass (kg)	74.42 $\pm$ 3.7	75.46 $\pm$ 4.12	0	0.5	NS
Height (cm)	165.2 $\pm$ 5.06	164 $\pm$ 4.07	-0.14	0.444	NS
BMI(Kg/m <sup>2</sup> )	27.3 $\pm$ 1.89	28 $\pm$ 1.11	0.17	0.43	NS
Last Mens. (Years)	3.96 $\pm$ 1.1	4.23 $\pm$ 1.2	-0.83	0.204	NS

\*SD: standard deviation, P: Probability, S: Significance, NS: non-significant.

### 3.1 Overall Effect

Statistical analysis using 2x2 mixed design MANOVA, Table 2, indicated that there were significant effects of the tested group on the all tested dependent variables; FAS, and IL-6 (F=12.29, P=0.00001\*).

**Table 2: 2x2 mixed design MANOVA****Table 2: 2x2 mixed design MANOVA**

Source of Variation	F-value	P-value
Groups	12.29	0.00001*

#### 3.1.1 FAS:

##### 3.1.1.1 Within groups:

As presented in Table 3 within group's comparison the mean  $\pm$  SD values of fatigue assessment scale (FAS) in the "pre" and "post" treatment were 29.31 $\pm$ 3.33 and 15.8  $\pm$ 2.26 respectively in the group (A). There was significant reduction of FAS at post treatment in compare to pre-treatment (P-value < .00001\*). While, the mean  $\pm$  SD values of FAS in the "pre" and "post" treatment were 30.58  $\pm$ 2.436 and 29.7 $\pm$ 7

respectively for group (B). There was no significant reduction of FAS at post treatment in compare to pre-treatment (P-value =0.273).

##### 3.1.1.2 Between groups:

Considering the effect of the tested group on FAS, the "pre" treatment between both groups showed no significant differences with (P=0.062). While, there was significant difference of the mean values of the "post" treatment between both groups with (p< .00001\*)

and this significant reduction in favour to group A.

**Table 3: Mean ±SD and P-values of FAS pre and post- treatment at both groups**

FAS	Pre treatment	Post treatment	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	29.31±3.33	15.8 ±2.26	13.51	-46	<.00001*
Group B	30.58 ±2.436	29.7±7	0.88	-2.9	0.273
MD	-1.27	-13.9			
p- value	0.062	<.00001*			

\*Significant level is set at alpha level <0.05

SD: standard deviation

MD: Mean difference

P-value: Probability value

### 3.1.2 IL-6:

#### 3.1.2.1 Within groups:

As presented in Table 4, within group's comparison the mean ± SD values of IL-6 in the "pre" and "post" treatment were **62.73±31** and **10.58 ±4.99** respectively in the group (A). That there was significant reduction of IL-6 at post treatment in compare to pre-treatment (P-value <**0.00001\***). While, the mean ± SD values of IL-6 in the "pre" and "post" treatment were **54.19 ±28** and **53.61±28.32**

respectively the group (B). There was no significant difference of IL-6 at post treatment in compare to pre-treatment (P-value =**0.470761**).

#### 3.1.2.2 Between groups:

Considering the effect of the tested group on IL-6, mean values of the "pre" treatment between both groups showed no significant differences with (P=**0.149557**). There was a significant difference of the mean values of the "post" treatment between both groups with (p<**0.00001\***).

**Table 4: Mean  $\pm$ SD and p values of Peak torque of knee flexors pre and post- treatment at both groups**

IL-6	Pre treatment	Post treatment	MD	% of change	p- value
	Mean $\pm$ SD	Mean $\pm$ SD			
Group A	62.73 $\pm$ 31	10.58 $\pm$ 4.99	52.15	-83	<0.00001*
Group B	54.19 $\pm$ 28	53.61 $\pm$ 28.32	0.58	-1	0.470761
MD	8.54	-43.03			
p- value	0.149557	< .00001*			

\*Significant level is set at alpha level <0.05

SD: standard deviation

MD: Mean difference

P-value: probability value

## Discussion

The present study is one of the few studies that investigated the effect of Pilates exercises on the severity of postmenopausal fatigue. In our study, we found that Pilates exercises were able to reduce postmenopausal fatigue. The exercises were shown to reduce general, physical and mental fatigue. In fact, in each of these subsets, major improvements were associated with the practice of Pilates exercises. The results revealed that, there was a significant decrease in FAS, and IL-6 test values post treatment in group (A) (study group) compared with that pre treatment values, while there was no significant difference between pre and post treatment values in FAS, and IL-6 test in group (B) (control group).

The result of the current study come in agree with (20) who demonstrated

The effect of Pilates exercises on the fatigue, sleep quality in addition to the anxiety and depression among postmenopausal women. The results showed significant improvement in the Spanish women (21), as well as Indian women (22).

Studies on Pilates exercises have indicated both mental and physical effects

on health (23). Findings of a study conducted by Eyigor et al showed that Pilates exercises were a healthy and effective method for improving the functional capacity, flexibility, fatigue, depression and quality of life of breast cancer patients (24). Therefore, the ability of physical exercise to successfully and significantly decrease postmenopausal women fatigue is evident in past studies. The agreement of our findings with that of previous studies clearly indicates the strong effect exercise has on reducing fatigue. That's why more attention should be paid to make an effective intervention for reducing fatigue. In conclusion, the results of this study showed that Pilates exercises are an effective, healthy and feasible method for reducing postmenopausal fatigue.

## References

1. Davis, R, et al. "Menopause", Nat. Rev. Dis. Primers." 2015: 1, 15004.
2. Faubion SS, Kuhle CL, Shuter LT, Rocca WA. "Longterm health consequences of premature or early menopause and considerations for management. Climacteric." 2015: 18(4):483–91.

3. Mansikkamäki K, Raitanen J, Malila N, Sarkeala T, Männistö S, Fredman J, et al. "Physical activity and menopause-related quality of life-a population-based cross-sectional study." 2015: 80(1):69–74.
4. RR., Freedman. "Postmenopausal physiological changes. *Curr Top Behav Neurosci.*" 2014: 21:245–256.
5. Freeman, W., D. Sammel, H. Lin, and Z. and Gracia, R. Liu. "Duration of menopausal hot flushes and associated risk factors, ." 2011: 117(1): 1095–1104.
6. Anderson D., Seib C., Rasmussen L., "Can physical activity prevent physical and cognitive decline in postmenopausal women? A systematic review of the literature." 2014.
7. Santoro N, Epperson CN, Mathews SB. "Menopausal Symptoms and Their Management. *Endocrinology and metabolism clinics of North America.*" 2015.
8. Dutta R, Dcruze L, Anuradha R, Rao S, Rashmi MR. "Population based study on the menopausal symptoms in a rural area of Tamil Nadu." *India. J Clin Diagn Res*, 2012: 4:597–601.
9. Manson JE., Fertil Steril. "Current recommendations: What is the clinician to do?" 2014: 101(13):916-921.
10. Deleruyelle, LJ. "Menopausal Symptom Relief and Side Effects Experienced by Women Using Compounded Bioidentical Hormone Replacement Therapy and Synthetic Conjugated Equine Estrogen and/or Progestin Hormone Replacement Therapy." *International Journal of Pharmaceutical Compounding*, 2017: 21 (1): 6–16.
11. Holviala, J., et al. "Effects of strength, endurance and combined training on muscle strength, walking speed and dynamic balance in aging men, *Eur J Appl Physiol.*" 2012: 112(1): 1335–1347.
12. Byrnes K, Wu PJ, Whillier S. "Is Pilates an effective rehabilitation tool? A systematic review." *Journal of Bodywork and Movement Therapies*, 2018: 22(1):192-202.
13. Drent M, Lower EE, De Vries. "J. Sarcoidosis-associated fatigue." *Eur Respir J*, 2012: 40: 255–263.
14. Sterling K, Gallop K, Swinburn P, Flood E, French A, Al Sawah S, et al. "Sterling K, Gallop K, Swinburn P, Flood E, French A, Al Sawah S, et al." 2014: 23(2):124–32.
15. Mollayeva, T, P Thurairajah, K Burton, S Mollayeva, CM Shapiro, and A Colantonio. "The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis." 2015: 25: 52–73.
16. Dmitrieva, O. S., Shilovskiy, I. P., Khaitov, M. R. & Grivennikov, S. I. "Interleukin 1 and 6 as main mediators of inflammation and cancer. *Biochemistry.*" 2016: 81 (14): 80-90.
17. Campos de Oliveira L, Gonçalves de Oliveira R, Pires-Oliveira DA. "Effects of Pilates on muscle strength, postural balance and quality of life of older adults: a randomized, controlled, clinical trial." *J Phys Ther Sci*, 2015: 27:871–876.
18. Küçük F, Livanelioglu. "Impact of the clinical Pilates exercises and verbal education on exercise beliefs and psychosocial factors in healthy women." *J Phys Ther Sci*, 2015: 27(3):3437–3443.
19. Rattray B, Argus C, Martin K, Northey J, Driller M. "Is it time to turn our attention toward central mechanisms for post-exertional recovery strategies and performance?" 2015: 98(2): 6-79.
20. Bais, A., Mishra, S. A., Darda, P. P. and Phansopkar, P. "Impact of 6 Weeks Pilates Training on Menopause Specific Symptoms and Quality of Life in Menopausal Women: A Case Report." *Journal of Pharmaceutical Research International*, 2021: 83-89.
21. Aibar-Almazán A, Hita-Contreras F, Cruz-Díaz D, de la Torre-Cruz M,



- Jiménez-García JD, Martínez-Amat Aibar-Almazán A, Hita-Contreras F, Cruz-Díaz D, de la Torre-Cruz M, Jiménez-García JD, Martínez-Amat. "Effects of Pilates training on sleep quality, anxiety, depression and fatigue in post menopausal women." 2019: 124:62-67.
22. Shradha Santosh Shah, Sandhya Wasnik. "Effect of Pilates exercise on the level of fatigue, cognition and knee proprioception in the elderly population of 60-80 years." *Int J Physiother Res*, 2021: 9(2):3774-3777.
23. LM., Bernardo. "The effectiveness of Pilates training in healthy adults: An appraisal of the research literature." *J Bodyw Mov Ther*, 2007: 11:106–10.
24. Eyigor S, Karapolat H, Yesil H, Uslu R, Durmaz B. "Effects of pilates exercises on functional capacity, flexibility, fatigue, depression and quality of life in female breast cancer patients: a randomized controlled study." *Eur J Phys Rehabil Med*, 2010: 46:481–7.