



Effect of Aerobic Exercise on Depression and Insomnia in Post Menopausal Women

Hala M. Emar¹, Marwa A. Mohamed^{1*}, Engy M. El-Nahas¹
and Hossam E. Hussien²

¹Departement of Physical Therapy for Obstetrics and Gynecology, Cairo University, Egypt.

²Departement of Obstetrics and Gynecology, El- Azhar University, Egypt.

Authors' contributions

This work was carried out in collaboration between all authors. Author HME designed the study, performed the statistical analysis. Author MAM wrote the protocol, and wrote the first draft of the manuscript. Author EME managed the analyses of the study. Author HEH managed the literature searches. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

The majority of women during the menopausal period have great hormonal changes that affect both somatic and mental aspects. In modern life, regular exercise has become a necessity and recently is considered as a new alternative method to improve post menopausal symptoms.

Aims: The trial intends to evaluate the effect of aerobic exercises on depression and insomnia in post menopausal Egyptian females.

Place and Duration of Study: Department of Obstetrics and Gynecology, Bap- Al Sharya Hospital, El- Azhar University and the outpatient clinic of the Faculty of Physical Therapy, Cairo University, between July 2012 and October 2012.

Methodology: 20 post menopausal women, their age ranged from 51-63 years and their body mass index was less than 30 kg/m² attached to this study after meeting the study requirements. All participants were assessed before and after the treatment program through self-rating depression scale (SDS) and Modified Davis Sleep measures scale (MDSS), A program of exercise (walking on a treadmill) started for 30 minutes at 60-70% of target heart rate (THR) for 4 weeks 3 times/week, after that the exercise was increased till 40 minutes for the next 4 weeks.

Results: Showed a statistically highly significant decrease ($P < 0.001$) in (SDS) scores and

*Corresponding author: E-mail: dr.marwa2010@gmail.com;

a statistically highly significant increase in Modified Davis Sleep measures scale (MDSS), after the 8 weeks of exercise training.

Conclusion: Regular physical activity appears to be an alternative method to decrease depression and insomnia that occur during post menopausal period.

Keywords: Exercise; menopause; depression; insomnia.

1. INTRODUCTION

Menopause is diagnosed after 12 months of amenorrhoea resulting from the permanent cessation of ovarian function at a mean age of about 51 years. The pre-menopause, a time of changing ovarian function, precedes the final menses by several years. The physiology and clinical manifestations of this transition to menopause are not well understood; however, some symptoms related to menopause begin during pre-menopause. Causal associations of menopause with several symptoms and diseases are proposed [27].

The climacteric is that part of aging process which embraces the transition from the reproductive to the non-reproductive phase of life, menopause marks the end of menstruation but as with the menarche in relation to puberty, it reflects only one manifestation of a series of changes, the age of the physiological menopause varies with race and socioeconomic conditions [25].

The mean age of the menopause in Egypt is 46.7 years, which is low compared to many countries, but this age has been rising recently. The incidence of premenopausal and menopause-associated symptoms in Egyptian women is higher than in the west, probably because of the different 'socio-cultural attitudes' towards menopause in different communities [22].

Mood and sleep disturbances were the most common symptoms in about 75% of women especially near menopause, and there are an increased number of suicides in women during this time period [20].

Depression, irritability, anxiety and nervousness induced by hormonal changes may be worsened by other distressing symptoms such as hot flushes, poor sleep and fatigue, weight gain and increase the amount of central body fat resulting from altered body metabolism, this is also associated with aging and a change in lifestyle, morning Joint pain and stiffness of the hands, knees, hips, shoulders and lower back are also common distressing issues [7].

Depression post menopause is likely due to fluctuating and declining estrogen levels in part. Steroid hormones, such as estrogen, act in the CNS by means of various mechanisms. For instance, they stimulate the synthesis of neurotransmitters, the expression of receptors, and influence membrane permeability [28].

Regulation of serotonin and norepinephrine may change as estrogen levels fluctuate and thus contribute to depression. Because estrogen facilitates the actions of serotonin and norepinephrine, a decline in estrogen concentrations may, in turn, decrease levels of these hormones, Changes in estrogen levels, perhaps due to mechanisms involving these neurotransmitters, may be related to psychological symptoms in the menopausal transition of some women [26].

Sleep is an essential restorative physiologic phenomenon, and impaired sleep can have significant negative impact on health, sleep disorders have been linked to impaired cognition, poor job performance, motor vehicle accidents, and increased health care use also sleep disorders are common in adults, especially in the elderly, they include insomnia, excessive daytime sleepiness, obstructive sleep apnea syndrome, and restless legs syndrome. Because of their impact on quality of life, primary care physicians should be aware of these common sleep disorders [1].

Insomnia occurs in 40-50% of women during the menopausal transition, and problems with sleep may or may not be connected to mood disorders. Women with insomnia are more likely than others to report problems such as anxiety, stress, tension, and depressive symptoms [16].

Complaints of insomnia are common among pre menopausal and postmenopausal women. Hormonal and physiological changes; as well as lifestyle factors contribute to the high prevalence of sleep problems, recognizing and appropriately treating sleep disorders represent an opportunity not only for improving the quality of life of women, but also an opportunity to prevent the development of mood and medical disorders later in life [12].

The Royal College of Obstetricians and Gynecologists in the UK and the North American Menopause Society, 2002 have recommended that women be advised to consider aerobic exercise as a treatment for vasomotor menopausal symptoms suggests that aerobic exercise can improve psychological health and quality of life in vasomotor symptomatic women, in addition, several studies of middle-aged/menopausal-aged women have found that aerobic exercise can invoke significant improvements in several common menopause-related symptoms such as mood, health-related quality of life and insomnia [14].

Many women experience mood changes at menopause. Some of these symptoms are caused by chronic sleep deprivation due to night flushes and respond best to estrogen; others are related to levels of brain chemicals and respond favorably to exercise [5].

Exercise is extremely important through a woman's lifetime and particularly as she gets older. Regular exercise benefits the heart and bones, regulate weight, contribute to a sense of overall well-being and improve mood. If woman is physically inactive, she is far more prone to coronary heart disease, obesity, high blood pressure, diabetes and psychological diseases [11].

Regular exercise has been highly promoted and recognized as the best non-pharmacological treatment for postmenopausal problems. It may also increase total sleep time and decrease the latency of sleep onset [3], mixed high-intensity exercise program effectively compensates for negative changes related to the menopausal transition [15].

Exercise increases the brain's aminergic synaptic transmission i.e. the monoamines such as serotonin and dopamine, have an improved transmission rate when exercise occurs. Just how exercise reduces symptoms of depression and anxiety isn't fully understood. Researchers believe that exercise prompts changes in both mind and body [24].

There is no one type of exercise that is more effective than another. Studies have shown that aerobic activity, strength or flexibility training all proves effective in treating depression, because the focus not on the cardiovascular exercise and the physiological effects but more the physical activity itself and the effects it produces on the mind [21].

2. MATERIALS AND METHODS

Twenty volunteer post menopausal women participated into this study. They were selected from the Gynecological Outpatient Clinic at Bap- Al Sharya Hospital, El- Azhar University, seeking for help at their climacteric period, they all physically examined to be sure that they hadn't any physical problems that interfere with the program of exercises. They all were nonsmoker and at the same socioeconomic standard. Also, they had no history of renal, liver or endocrinal disorders, or cardiac affection. Then every participant in this study signed a consent form after a demonstration about the aim and the procedure would be done in this study. Their mean age was (56.9±5.75) years, mean weight was (72.28±3.16) kilograms (Kg), mean height was (157.9±4.33) centimeters (cm) and their BMI were not exceeding 30 Kg/m². None of participants were on hormonal replacement therapy (HRT) and/or antidepressant drugs before starting this study by 3 months and/or during this study period.

At the beginning of this study, all the women were given Zung self-rating depression questionnaire [30], as in Fig. 1.

Name: Age:..... y. Date: / /

	None or a little of the time(1)	Some of the time(2)	Good part of the time(3)	Most or all of the time(4)
1-I feel downhearted, blue and sad				
2-I feel best in the morning.				
3-I have crying spells or feel like crying.				
4-I have trouble sleeping through the night.				
5-I eat as much as I used to.				
6-I enjoy looking at, talking to and being with attractive women.				
7- I notice that I am losing weight.				
8-I have trouble with constipation.				
9-My heart beats faster than usual.				
10-I get tired with no reason.				
11-My mind is as clear as it used to be.				
12-I find it easy to do the things I used to.				
13 -I am restless and can't keep still.				
14-I feel hopeful about the future.				
15-I am more irritable than usual.				
16-I find it easy to make decisions.				
17-I feel that I am useful and needed.				
18-My life is pretty full.				
19-I feel that other people would be better off if I was dead.				
20-I still enjoy doing the things I used to do.				

Fig. 1. Zung self rating depression scale

Formula for converting raw scores to self-rating depression scale (SDS) index.

$$\text{Index} = \frac{\text{Raw score total} \times 100}{\text{Maximum score of 80}}$$

Below 50	Within normal range.
50-59	Minimal to mild depression
60-69	Moderate to marked depression
70 and over	Severe to extreme depression

Also Modified Davis Sleep measures scale (MDSS) [Davis] was given to the participants, as in Fig. 2.

A. On the average, how many hours did you sleep each night during the past 4 weeks?
 Write in number hours of sleep per nightHours

B-How often during the past 4 weeks did you...

	All of the time (1)	Most of the time (2)	Some of the time (3)	A little of the time (4)	None of the time (5)
1	Feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)?				
2	Get enough sleep to feel rested upon waking in the morning?				
3	Awaken short of breath or with a headache?				
4	Feel drowsy or sleepy during the day?				
5	Have trouble falling asleep?				
6	Awaken during your sleep time and have trouble falling asleep again?				
7	Have trouble staying awake during the day?				
8	Snore during your sleep?				
9	Take naps (5 minutes or longer) during the day?				
10	Get the amount of sleep you needed?				

Fig. 2. Modified Davis Sleep Measures scale (MDSS)

And also, added paper contained questions about: history of oophrectomy or hysterectomy to recognize their menopausal state, and their occupation, marital status and chronic diseases.

The treadmill training program was lasted for 30 minutes begins as walking with no resistance on the treadmill as warm up stage for 5 minutes, 20 minutes of walking with

resistance till reach 60- 70 % of target heart rate (THR) as active stage, then another 5 minutes cooling down stage as walking without resistance. "The THR= [(maximal heart rate - resting heart rate)] + resting heart rate". Maximum heart rate was detected according to Borg scale for rating perceived exertion. This time was in the first 4 weeks of the study, then the time of active stage was increased up to 30 in the next 4 weeks so, the total time of exercise was 40 minutes, the treatment sessions were repeated 3 times/week for 2 months.

3. STATISTICAL ANALYSIS

The data were analyzed statistically by using descriptive statistics including the mean, percent and the standard deviation and dependant samples t-test was used for the comparison between the results. The level of significance, P-value was selected at 5% ($P = .05$), P -value > 0.05 indicates non significant results; while P -value < 0.05 indicates significant results and P -value < 0.001 indicates highly significant results.

4. RESULTS

On the current study, only 5 cases were diabetic (type II) and controlled by hypoglycemic agents, also there were 6 cases mild hypertension and controlled with antihypertensive drugs. SDS scores before aerobic training was ranged between 50-59 with a mean value of (56.05 ± 2.50), while after the aerobic exercises the SDS score was ranged from 40-52 with a mean value of (45.65 ± 3.52). The statistical difference between before and after the exercise showed a statistically high significant decrease ($P < 0.001$) and the percentage of change was 18.45% as shown in Table 1.

Table 1. The mean values of Zung self-rating depression scale (SDS) before and after aerobic training

	Mean	S.D	t-test	P value	Percentage of change
Pre training	56.05	± 2.50	17.61	< 0.001	
Post training	45.65	± 3.52			18.45

MDSS (Hours of sleep each night) scores before aerobic training was ranged between 2-6 with a mean value of (4.5 ± 1.27), while after the aerobic exercises the scores ranged from 4-7 with a mean value of (5.8 ± 1.09), the statistical difference between before and after the exercise showed a statistically high significant increase ($P < 0.001$) and the percentage of change was 29.04% as shown in Table 2.

Table 2. The mean values of MDSS (Hours of sleep each night) before and after aerobic training

	Mean	S.D	t-test	P value	Percentage of change
Pre training	4.5	± 1.27	10.3	< 0.001	29.04
Post training	5.8	± 1.09			

MDSS (quality and quantity evaluation) scores before aerobic training was ranged between 20-28 with a mean value of (23.45 ± 2.04), while after the aerobic exercises the scores was ranged from 22-30 with a mean value of (26.15 ± 1.89). The statistical difference between

before and after the exercise showed a statistically high significant increase ($P < 0.001$) and the percentage of change was 8.9% as shown in Table 3.

Table 3. The mean values of MDSS (quality and quantity evaluation) before and after aerobic training

	Mean	S.D	t-test	P-value	Percentage of change
Pre training	23.45	±2.04	4.24	< 0.001	8.9
Post training	26.15	±1.89			

5. DISCUSSION

It is widely believed that physical activity and exercise help depressed patients and promote quicker and better relief from depression. They are also thought to help antidepressants and psychotherapy work better, many find walking, for example, to be of great help. Exercise produces higher levels of chemicals in the brain, notably dopamine, serotonin, and norepinephrine. In general this leads to improvements in mood and sleep disturbance, which is effective in countering depression [4].

Therapeutic exercise programs have become an obligatory component in the modern treatment of many internal and orthopedic conditions. In the field of psychiatry, the interaction of physical fitness and mental well-being has been increasingly recognized. In the meanwhile, solid evidence has emerged that regular exercise is associated with therapeutic effects in psychiatric patients suffering from depressive and other psychiatric disorders [2].

The results of this study showed a statistically highly significant decrease ($P < 0.001$) in Zung self rating depression (SDS) scale and statistically highly significant increase ($P < 0.001$) in (MDSS) when comparing mean values between before and after the aerobic training program which was extended for 8 weeks in 3 nonconsecutive times/week. However, lack of control group may be a limitation of this study.

The intensity of exercise was applied in this study ranged from 60-70% of THR as a moderate intensity. This supported by Hassmen et al. [10] who concluded that moderate exercise is more effective than strenuous. Because in strenuous exercise when someone pushes him/herself beyond a certain point of acceptable exercising, the exercise will work against the original goal to decrease depression.

People who practice regular physical activity are less susceptible to depression and chronic physical disorders than sedentary individuals. Walking is the most popular physical activity among adults. Many researchers suggest that at least 30 minutes of exercise a day for at least 3-5 days a week significantly improves symptoms of depression. However, smaller amounts of activity as 10-15 minutes at a time have been shown to improve in the short time. So, small bouts of exercise may be a great way to get started if it's initially too difficult to do more [19].

The results of this study were in agreement with Gutiérrez et al. [9], who stated that a controlled program of physical exercise for postmenopausal women alleviates symptoms of anxiety and depression, and its inclusion in primary healthcare programs should be considered.

Moilanen et al. [18], stated that night sweats, mood swings, and irritability were significantly reduced after a program of aerobic training for 50 minutes four times weekly for 24 weeks. Exercise training induced significant improvement in subjective sleep quality in postmenopausal women, with even a low dose of exercise resulting in greatly reduced odds of having significant sleep disturbance [6].

These were explained with McCrae et al. [17], as sleep difficulties in older postmenopausal women may be influenced by the emergence of coexisting medical conditions and the presence of other hormonal, physiologic, and even psychosocial factors, estrogen regulates the synthesis and release of neurotransmitters and neuromodulators that affect many brain functions including mood, behavior, cognition and sleep .

Sleep disturbances during menopause have been associated with estrogen deficiency elevated LH levels during late menopause produce poor sleep quality through a thermoregulatory mechanism, resulting in high core body temperatures. However, in the Medical Research Council National Survey of Health, women who were transitioning into menopause were more likely to report severe sleep difficulty compared with women who were premenopausal [13].

This confirmed with that of Youngstedt [29] who said that sleep serves an energy conservation function, a body tissue restitution function, or a temperature down-regulation function have all predicted a uniquely potent effect of exercise on sleep because no other stimulus elicits greater depletion of energy stores, tissue breakdown, or elevation of body temperature, respectively. Exercise offers a potentially attractive alternative or adjuvant treatment for insomnia, as it consider a healthy, safe, inexpensive, and simple means of improving sleep.

The result of this study was in agreement with Buman and King [3] as they stated that physical exercise is one such alternative that is inexpensive and affects numerous health systems simultaneously. The current literature indicates that moderate amounts of exercise, which can be obtained through a variety of means such as brisk walking and resistance training, are sufficient to improve sleep quality.

Charlinton [5] stated that many women experience mood changes at menopause. Some of these symptoms are caused by chronic sleep deprivation due to night flushes and others are related to levels of brain chemicals and respond favorably to exercise.

Contradicting results are still found in studies of the effect of exercise on sleep. Among the substances that have been described as sleep modulators, cytokines produced during the recovery period after an acute exercise session are very important. Various studies have verified that physical exercise may alter the plasma concentration of the many pro-inflammatory cytokines that may in turn modulate sleep. A number of factors seem to mediate this effect of exercise, including duration, intensity, and form of exercise, in addition to temperature and metabolic alterations [23].

6. CONCLUSION

In conclusion, regular physical activity appears to be an alternative method to decrease depression and insomnia that occur during post menopausal period. So, women could pass through this period in safe. The study was approved by ethical committee of Faculty of Physical Therapy, Cairo University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Alattar M, John J, Madeline C, Murp A , Philip S. Sleep Problems in Primary Care: A North Carolina Family Practice Research Network. *The Journal of the American Board of Family Medicine*. 2007;20(4):365-74.
2. Broocks A, Aherndt U, Sommer M. physical training in the treatment of depressive disorders. *Psychiatr Prax*. 2007;34(3):s300-4.
3. Buman M, King A. Exercise as a treatment to enhance sleep. *American Journal of Lifestyle Medicine*. 2010;4(6):500-14.
4. Castren E. is mood chemistry?. *Nat Rev Neurosci*. 2005;6(3):241-6.
5. Charlington L. Exercise and women's health. 1st ed. Nova publisher Inc; 2008.
6. Christopher E, Xuemei S, Martica H, Shawn Y, Steven N. Dose–response effects of exercise training on the subjective sleep quality of postmenopausal women: exploratory analyses of a randomised controlled trial. *BMJ Open*. 2012;2:e001044.
7. Curtis M, overholt S, Hopkins M. glass office gynecology. 6th ed. Lippincott Williams; 2005.
8. Davis J, Babette S, Steve N, Robert R. A scale for the estimation of sleep problems in clinical research. *Journal of Clinical Epidemiology*. 1988;41(4):313–21
9. Gutiérrez C, Luque G, Medina G, Castillo M. Influence of exercise on mood in postmenopausal women. *Journal of Clinical Nursing*. 2012;21 (7-8):923-928.
10. Hassmen p, koivula n, uutela a. physical exercise and psychological well-being: a population study in finland. *prev.med*. 2000;30(1):17-25.
11. Jeannette E. Osteoporosis: Part II. Nonpharmacologic and Pharmacologic Treatment. *Am Fam Physician*. 2001;63(1):1121-8.
12. Joan L, Shannon N. Sleep Disturbance in Menopause. *Journal of Women's Health & Gender-Based Medicine*. 2000;9(2):109-18.
13. Kalleinen N, Päivi P, Himanen S, Paula A, Atte J. Sleep and the menopause: do postmenopausal women experience worse sleep than premenopausal women?. *Menopause Int*. 2008;14(1):97-104.
14. Kantola P. Dealing with Menopausal Sleep Disturbances. *Medicine Clinics*. 2008;3(1):121-31.
15. Kemmler W, Stengel S, Weineck J, Lauber D, Kalender W, Engelke K. Exercise effects on menopausal risk factors of early postmenopausal women: 3-yr Erlangen fitness osteoporosis prevention study results. *Med Sci Sports Exerc*. 2005;37(2):194-203.
16. Lu, Tseng F, Lin L, Luh W, Shu B. Factors Related to Depression During Menopause: A Study in Southern. Taiwan *Journal of Nursing Research*. 2009;17(2):128-35.
17. McCrae S, Rowe A, Tierney G, Dautovich D, Definis L, McNamara P. Sleep complaints, subjective and objective sleep patterns, health, psychological adjustment, and daytime functioning in community-dwelling older adults. *J Gerontol B Psychol Sci Soc Sci*. 2005;60(4):182-9.
18. Moilanen J, Mikkola T, Raitanen J. Effect of aerobic training on menopausal symptoms-a randomized controlled trial. *Menopause*. 2012; published online Feb 13.
19. Paluska S, Schwenk t. Physical activity and mental health: current concepts. *Sports Med*. 2000;29(3):167-80.

20. Parry L. Optimal management of perimenopausal depression. *Int J Womens Health*. 2010;2(1):143–51.
21. Rot M, Collins K, Fitterling H. Physical exercise and depression. *Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine*. 2009;76(2):204–14.
22. Sallam H, Galal A, Rashed A. Menopause in Egypt: past and present perspectives 2006. *Climacteric journal*. 2006;9(6):421-9.
23. Santos R, Tufik S, De Mello T. Exercise, sleep and cytokines: Is there a relation?. *Sleep Medicine Reviews*. 2007;11(3):231–9.
24. Sunao U, Kohei S, Yuko M, Chie K. Exercise Effects on Sleep Physiology. *Front Neurol*. 2012;3:48.
25. Symonds E, Symonds M. *Essential obstetrics and gynecology*. 4th ed. Churchill Livingstone; 2004.
26. Watson S, Rebecca A, Cunningham K, Jeng Y. Estrogens of multiple classes and their role in mental health disease mechanisms. *International Journal of Women's Health*. 2010;2(1):153–66.
27. Weismiller G. Women's Health Menopause. *Primary Care: Clinics in Office Practice*, 2009;36(1):199-226.
28. Wise D, Felker A, Stephen M. Tailoring Treatment of Depression for Women across the Reproductive Lifecycle: The Importance of Pregnancy, Vasomotor Symptoms, and Other Estrogen-Related Events in Psychopharmacology. *CNS Spectr*. 2008;13(8):647-62.
29. Youngstedt D. Effects of exercise on sleep. *Clinics in sports medicine*. 2005;24(2):355-65.
30. Zung W, Richards C, Short M. Self-rating depression scale in an outpatient clinic: further validation of the SDS. *Arch Gen Psychiatry*. 1965;13(6):508-15.

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