

# Effect of Aerobic Exercises on Mood Swings in Perimenopausal Women

Dalia M. Kamel\*, Hala M. Hanfy\* and Ahmed El-Halwagy\*\*, Amal Abdel Wahab\*\*\*

Department for Obstetrics and Gynecology, Faculty of Physical Therapy, Cairo University.

Department for Obstetrics and Gynecology, Faculty of Medicine, Cairo University.

Department for Clinical and Chemical Pathology, Faculty of Medicine, Cairo University.

## ABSTRACT

**Background:** The majority of women during the transition period to menopause have the greatest estrogen shift that affecting both somatic and mental aspects. In the modern life regular exercise has become an obligatory and recently is considered as a new alternative method to improve the mood. **Aim of the study:** It was a trial to evaluate the effect of aerobic exercises on mood changes or swings during perimenopausal period. **Methods:** 20 perimenopausal women attached to this study after scoring from 50-59 on self rating depression scale (SDS) scores then a blood samples were drawn from them to estimate the plasma cortisol level. 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, then the time of exercise was increased till 40 minutes for the next 4 weeks. Re-assessment for SDS scores and plasma cortisol level were done at the end of 8 weeks of exercise. **Results:** Showed a statistically highly significant decrease ( $P < 0.001$ ) in both SDS scores and plasma cortisol level after the 8 weeks of exercise training. **Conclusion:** Regular physical activity appears to be an alternative method to improve the mood swings that occur during perimenopausal period.

**Key words:** Exercise, Menopause, Mood swings, Cortisol.

## INTRODUCTION

After the age 40, most women begin to have changes in hormone levels that eventually lead to menopause. Although hormonal shifts can cause a number of symptoms, the main concern is the changes in mood<sup>16</sup>.

Menopause is the last menstrual period and the climacteric is the period of time around the menopause when ovarian function gradually ceases<sup>11</sup>. The majority of women, their process of menopause occurs between the ages of 45 to 54 years, it is usually said to have occurred after 6 months of amenorrhea. Only one percent of women will undergo the menopause before the age of forty<sup>25</sup>.

However, several studies shown no association between menopause and increased depressive symptoms<sup>11,15</sup>. Less clear is the

association between depression and the perimenopause, the time before cessation of menses that is characterized by increased occurrence of symptoms such as hot flushes and night sweats that may lead to insomnia and depressed mood. Two studies suggested modest increases in depressive symptoms at perimenopause<sup>12,13</sup>.

Depression is typically defined as a state of lower self esteem, with associated feelings of hopelessness and helplessness. Some of the main features of depression include expression of hopelessness or despair, a change (usually decreased) in physical activities such as eating, sleeping, or intercourse, continual questioning of self esteem, a real or an imagined feeling of failure, and inability to concentrate on reading, writing, or conversing<sup>7</sup>.

There are numerous methods to treat depression. The two most common treatments

are antidepressant medications and counseling. Although antidepressants have been proven effective but counseling is prescribed as an additional method, the principle behind that to help the individual to identify and cope with her emotions<sup>11</sup>. Other alternative methods that have become acceptable treatments for depression include herbal medicines, dietary supplements, electroconvulsive therapy (ECT), and exercises<sup>19</sup>.

Chronic stress can make the woman clinically depressed. Stress- either physical or emotional stress- produces a cascade of different hormonal changes in the body. These hormones act in a feedback called the hypothalamic-pituitary-adrenal (HPA) axis. Stress prompts the release of cortisol releasing factor (CRF) from the hypothalamus. CRF alerts the pituitary gland to secrete adrenocorticotrophin hormone (ACTH)<sup>14</sup>.

Then, ACTH tells the adrenals to produce more cortisol. Like adrenalin, cortisol is an essential stress hormone without which we would not survive. However, too much of it can be damaging, especially to the heart, brain, muscles and internal organs<sup>3</sup>.

Changed patterns of serum cortisol levels have been observed in connection with abnormal ACTH levels, clinical depression, psychological stress, and such physiological stressors as hypoglycemia, illness, fever, trauma, surgery, fear, pain, physical exertion or extremes of temperature. There is also significant individual variation, although a given person tends to have consistent rhythm<sup>4</sup>.

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<sup>25</sup>. Just how exercise reduces symptoms of depression and anxiety isn't fully understood. Researchers believe that exercise prompts changes in both mind and body<sup>24</sup>.

Some evidence suggests that exercise positively affects the level of certain mood through enhancing neurotransmitters in the brain. It is also boost feel good endorphins, release tension in the muscles, help better sleep and reduce levels of cortisol (the stress hormone)<sup>23</sup>. Exercise also increases body temperature, which may have calming effects. All of these changes in the mind and body can improve such symptoms as sadness, anxiety, irritability, stress, fatigue, anger, self doubt and hopelessness<sup>14,18</sup>.

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<sup>17</sup>.

It is important to note whatever exercise is prescribed, it must be one that is not difficult to fulfill and appealing to the patient. If either of these factors are not met, it is more likely that the patient will not be able to benefit from exercise because these factors would serving as an impedance to any benefits the physical routine may offer<sup>15</sup>.

The purpose of this study is to demonstrate the importance of exercise in reducing mood swings or minimal depression in premenopausal women.

## SUBJECTS, MATERIALS AND METHODS

Off 100 perimenopausal women who were at the Gynecological Out patient Clinic at El Kasr El Aini University Hospital, seeking for help at their climacteric period. Only 20 perimenopausal women met our requirements in this study.

The twenty perimenopausal women who were met the requirements (scoring ranged from 50-59 points in the SDS questionnaire) and physically examined to be sure that they hadn't any physical problems that interfere with the program of exercises. 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 ages were ranged from 45-54 ( $47 \pm 2.5$ ) and their weight were ranged from 75-85 ( $79 \pm 3.6$ ) and their heights ranged from 158-170 ( $165 \pm 6.2$ ). 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 and their BMI were not exceeding  $30 \text{ Kg/m}^2$ ).

At the beginning of this study, all the 100 women were given Zung self rating depression questionnaire<sup>7</sup>, as in figure (1) and an added paper contained questions about: frequency of the period in the last 12 months, history of oophrectomy or hysterectomy to recognize their menopausal state and classified either close to menopause (perimenopause) or begun menopause. Then asked about five climacteric symptoms including hot flushes, night sweating, insomnia (trouble sleeping), recent memory loss and mood swings. Also, asking about her occupation, marital status and chronic diseases such as cardiac diseases, hypertension, diabetes.....etc.

### Zung self rating depression scale<sup>7</sup>.

Name:..... Age:..... date:.....

	none or a little of the time	some of the time	good part of the time	most or all of the time
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.				

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

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

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

A venous blood sample was drawn from each participant before and after the end of 8 weeks (3 times/week) of exercise program at 10 Am o'clock after 12 hours of fasting to overcome the circadian rhythm of cortisol. Blood samples collected in clean tubes containing few milligrams of EDTA then centrifuged to separate serum and stored at -50° in tight tubes. All collected samples were analyzed by using ELISA (an automated chemiluminescence system ACS: 180 by competitive immunoassay) which based on the principle of competition between a labeled (cortisol enzyme conjugate) and unlabeled steroids (cortisol) for binding to cortisol specific monoclonal antibodies, coated on the wells of a microtiter plate.

The exercise 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<sup>6</sup>. 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.

### Data Analysis

All the collected data before and after the programme of exercise including Zung self rating scale and plasma cortisol level was analyzed using descriptive statistics and student t-test to compare between pre and post experimental values at the level of significance  $P < 0.05^{21}$ .

## RESULTS

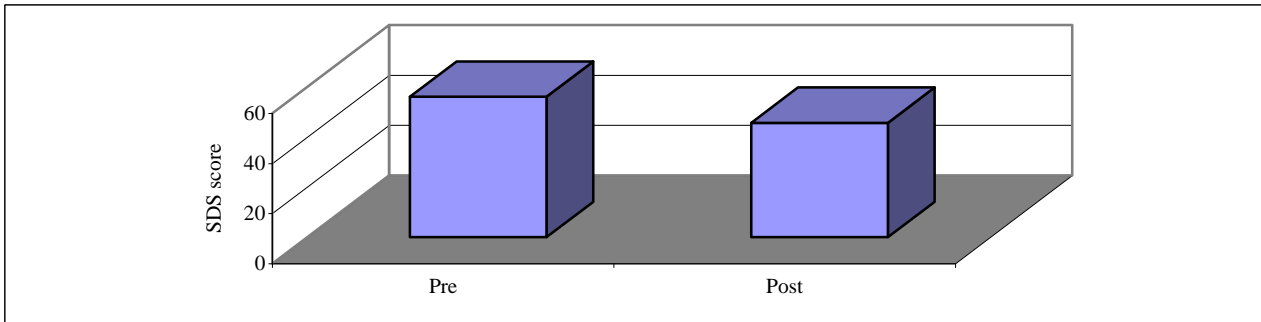
Among the twenty women in this current study 15 women (75%) were close to menopause, while 5 women (25%) were begun menopause. On Zung self rating depression scale (SDS), at the beginning of this study, 4 women (20%) scored 59 points which is the upper limit of mild depression on this scale and when reviewing their answers about the five climacteric symptoms, they had at least 4 out of 5 symptoms. While, the other 16 women (80%) had at least two of climacteric symptoms and their scoring on SDS were ranged between 50-58. By the end of the study, the climacteric symptoms disappeared in 8 cases (40%) another 8 cases had only one symptom with decreased intensity, while the 4 cases who had severe symptoms at the beginning improved into 2 out of 5 symptoms at the end. Only 4 cases were diabetic (type II) and controlled by hypoglycemic agents, also there were 2 cases have mild hypertension and controlled with antihypertensive drugs.

SDS scores before aerobic training was ranged between 50-59 with a mean value of (56.05±2.60), while after the aerobic exercises the SDS scores was ranged from 40-52 with a mean value of (45.65±3.54). The statistical

difference between before and after the exercise showed a statistically highly significant decrease (P<0.001) and the percentage of change was 18.55% as in fig.1 and table (1).

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

	Zung self rating depression scale				
	Mean	S.D	t-test	P value	Percentage of change
Pre training	56.05	± 2.60	17.61	< 0.001	18.55
Post training	45.65	± 3.54			



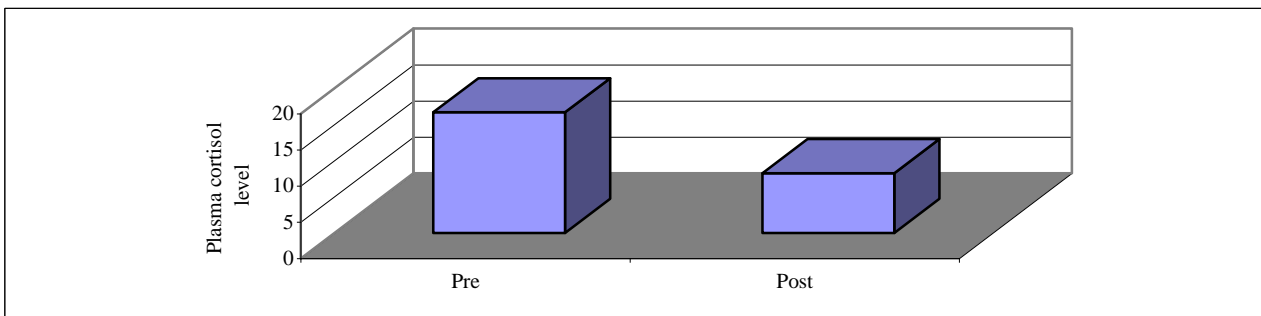
**Fig. (1): The mean values of Zung self rating depression scale (SDS scores) pre and post aerobic training.**

Before aerobic training, plasma cortisol level was ranged between 8.5-25 mg/dl with a mean value of (16.67±3.85), while after the aerobic exercises it was ranged between 5-12.5 mg/dl with a mean value of (8.25±2.53).

When comparing the mean values of cortisol level before and after the aerobic training for 8 weeks, there was a highly significant decrease (P<0.001) and the percentage of change was 50.5%, in fig (2) and table (2).

**Table (2): The mean of plasma cortisol level before and after the aerobic training.**

	Plasma cortisol level (mg/dl)				
	Mean	S.D	t-test	P value	Percentage of change
Pre training	16.67	± 3.85	14.56	< 0.001	50.5%
Post training	8.25	± 2.53			



**Fig. (2): The mean values of plasma cortisol level pre and post aerobic training.**

## 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, which is effective in countering depression<sup>2</sup>.

Therapeutic exercise programs have become an obligatory component in the modern treatment of many internal and orthopedic conditions<sup>8</sup>. 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<sup>1</sup>.

The results of this study showed a statistically highly significant decrease ( $P < 0.001$ ) in both plasma cortisol level and Zung self rating depression (SDS) scale when comparing mean values between before and after the aerobic training program which was extended for 8 weeks in 3 non consecutive times/week.

The highly significant decrease in both plasma cortisol level and SDS scores and hence improving in the subjects' mood can be explained as following, cortisol shuts down functions the body doesn't need in a fight-or-flight situation. It changes the body's immune system responses and starts to shut down the digestive and reproductive systems and certain growth processes<sup>13</sup>. Cortisol also impacts the regions of the brain that control mood,

motivation and fear. One theory is that the hormone may reduce serotonin, and low levels of this vital neurotransmitter are associated with depression<sup>14</sup>.

Furthermore explanation as there are three basic theories involved with the connection between exercise and depression, the first being the distraction hypothesis or the diversion from the painful stimuli leads to an improved state after the exercising<sup>19</sup>. The second is the self efficiency theory, it is thought that when a depressed person becomes motivated enough to perform exercise her self esteem is raised and in turn depression lessened. Lastly is the mastery hypothesis, which suggested that if one is able to use exercise as a mean to gain control and a feeling of mastery, depression may decrease<sup>22</sup>.

Another explanation advocated by O'Connell et al., 1989<sup>18</sup> and Nicoloff & schwenk, 1995<sup>17</sup>, based on that exercise increases the brain's aminergic (serotonin & dopamine) synaptic transmission which directly affecting the one's mood during exercising.

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., 2000<sup>10</sup> who concluded that moderate exercise is more effective than strenuous. As, 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.

In contrast, Scully et al. (1998)<sup>24</sup>, have a theory that any type of exercise and any level of intensity i.e. acute and chronic exercise can produce beneficial affects with 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<sup>5</sup>. Many researchs suggest that at least 30 minutes of exercise a day for at least 3-5 days a week is 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<sup>19</sup>.

In the current study, it was found that 75% of cases were close to menopause i.e in perimenopausal period and 25% of cases begun menopause and this supported as women in this menopausal transition stage experience the greatest decline in estrogen, whereas women who have completed menopause adapted low and stable levels of endogenous estrogen and are no longer experiencing drastic shifts in estrogen levels. So, it would expect women taking HRT to have lower levels of depressive symptoms<sup>23</sup>.

Hayden et al., 2001<sup>11</sup>, found in a survey study that women who underwent regular physical activity had lower depressive symptoms than other participants. Also, other research indicated that exercisers, significantly more positive moods, lower somatic symptoms and memory concentration difficulties than sedentary women regardless of menopausal state<sup>24</sup>.

Exercise increases the production and catabolism of cortisol, our program continued for 8 weeks to over come the transit fluctuation in cortisol level. The level rises transiently during exercise of both moderate and severe intensity, and falls rapidly to the basal level or below within a few hours of completion of the exercise. There is a rise of similar proportions in both fit and unfit individuals when exercising to exhaustion. For a given amount of exercise, there is a greater rise in the unfit. The magnitude of the rise in

cortisol declines as training continues and subjects improve their fitness<sup>20</sup>.

In the present study, climacteric symptoms disappeared in 8 cases (40%), another 8 cases (40%) had only one symptom with decreased intensity, while the 4 cases who had severe symptoms at the beginning of the study improved into 2 out of 5 symptoms at the end. This can be explained as the exercise may alleviate depressive symptoms indirectly by preventing hot flushes and the other climacteric symptoms.

The previous result was in agreement with many studies which concluded that exercises' moods, memory-concentration and lower somatic symptom are significantly more positive than sedentary women<sup>24</sup>. Also, revealed that moderate to severe hot flushes and sweats were only half as common among the physically active postmenopausal women (22%) than in the sedentary women (44%)<sup>9</sup>.

In conclusion, regular physical activity appears to be an alternative method to improve the mood swings that occur during perimenopausal period so women could pass through this period in safe.

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### الملخص العربي

#### تأثير التمرينات الهوائية على اعتلال المزاج لدى السيدات في فترة ما قبل انقطاع الدورة الشهرية

انقطاع الدورة الشهرية لدى النساء والمعروف بسن اليأس تسبقه فترة من الوقت تتراوح ما بين 2-5 سنوات والتي تتعرض فيها السيدة لتقلبات كثيرة في مستوى هرمون الأستروجين والذي له تأثير كبير على أجهزة الجسم المختلفة والمزاج النفسي لدى السيدات . ومن الواضح في هذه الأيام ضرورة ممارسة الرياضة لما لها من فوائد كثيرة وتعتبر كبديل للعلاج التقليدي في حالات تقلبات المزاج . ومن هنا كان هدف هذه الدراسة لتقييم تأثير التمرينات العلاجية على تقلبات المزاج لدى السيدات في فترة ما قبل انقطاع الدورة الشهرية . انضمت للدراسة 20 سيدة واللاتي سجلن ما بين 50-59 نقطة والتي توازي اكتئاب أو اعتلال مزاجي طفيف على استبيان Zung لتقييم الحالة المزاجية والاكتئاب . كذلك تم قياس نسبة هرمون الكورتيزول في الدم بعدها تم إخضاع كل المشتركات لبرنامج من التمرينات العلاجية تتراوح شدتها ما بين 60-70 % من نبض القلب المستهدف علي جهاز التريدميل لمدة 8 أسابيع ، ثلاث مرات أسبوعيا ثم تم القياس بالاستبيان و نسبة الكورتيزول في الدم مرة أخرى . وقد أظهرت النتائج انخفاض ذو دلالة إحصائية عالية في القياسات السابق ذكرها بالمقارنة عند بدء الدراسة ومن هنا ننصح كل السيدات في سن ما قبل انقطاع الدورة بممارسة رياضة المشي بانتظام لما لها من تأثير ايجابي علي الحالة المزاجية والتي تتأثر بشدة في تلك الفترة .