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Effects of a Health Training Course on Premenstrual Syndrome Symptoms

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ABSTRACT: Physical activity is one of the most suitable strategies for treating premenstrual syndrome (PMS) to reduce pressure and create a balance in the chemical secretions of the brain. The general purpose of this research was to study the effects of Pilate's exercises on PMS. This semi-empirical study was conducted on 50 inactive 20-35 year old women with definitive diagnosis of PMS. The subjects were randomly divided into the experimental and control groups. Training in the experimental group was carried out in three 60-minute sessions per week for 8 weeks under the supervision of a Pilate's instructor. The Wicks' lambda test at the p? 5% significance level was used to analyze the data. Mood, physical, and behavioral symptoms after the 8-week Pilates training decreased in the experimental group. Comparison of the results showed that the reduction in physical symptoms was more pronounced, and that behavioral symptoms ranked second and mood symptoms third in this respect. Pilate's exercises were effective in reducing physical, mood, and behavioral symptoms resulting from PMS.

Keywords: Pilates exercises, Premenstrual syndrome

INTRODUCTION

Premenstrual syndrome (PMS) is a common disorder among women of reproductive age. Close to 40% of women report that they have problems related to their menstrual cycles. Moreover, about 2-10% of women say these symptoms affect their lives and occupations to various degrees [1]. PMS is a combinatorial and cyclical event consisting of bodily, psychological, and/or behavioral changes that occur in the late secretary phase of the menstrual cycle and lead to interpersonal relationship problems or to disruption of normal functions [2]. Khajehei *et al*. carried out a study and estimated that more than 90% of women in their reproductive age experienced some symptoms of PMS [3].

Although the real causes of this syndrome are unknown, the cyclical changes in the levels of ovarian steroids, vitamin and mineral deficiencies, rennin-angiotensin-aldosterone system inhibition, increased prostaglandin and prolactin levels, age, and genetics have been suggested as the probable causes of PMS [4, 5]. Since the cause of this syndrome is unknown, different treatments have been proposed for its treatment [6]. This complication is a cyclical, disabling, and preventable problem that plays a big part in reducing women's efficiency and, hence, it seems that it must be treated [1]. Therefore, various methods including drugs, antidepressants and vitamin B6, surgery (removing the ovaries), and nondrug and alternative therapies (physical activity, massage, behavior therapy) have been suggested for treating PMS. Considering the complications of drug treatments and surgery, nondrug therapies, especially physical activity, have attracted attention from specialists and women [7].

Physical activity is a suitable method for treating PMS, and the best method for all women to reduce pressure and create a balance in the chemical secretions of the brain [7]. It appears that physical activity results in improving PMS symptoms (increased pain tolerance, reduced anxiety, depression, and other problems) through increasing levels of endorphins and by reducing those of adrenal cortisol [6]. Pilate's exercises are one of the motion therapies that have attracted attention from sports specialist and, naturally, are gaining widespread popularity [8].

These exercises are a set of specialized exercises and connect the mind to the body. In this training method, the focus is on the center of the body, which includes the stomach area, the pelvis, and the spine, and the main goal is to increase power, flexibility, stamina, balance, and physical condition. In fact, Pilate's exercises are a suitable method for training mental and physical awareness and for controlling postural movements [9]. Research carried out so far on the effects of this method has shown positive results [10] and hence, physical activity and exercises have found a special therapeutic status as a nondrug treatment, although some studies have not found any relationship between menstrual pain (and PMS) and intensity of exercises [11]. There is some evidence pointing to the effectiveness of factors including extension-like and mental-relaxation exercises [12, 13]. Aerobic exercises also have a fundamental role in reducing stress, anger, depression, pain, and, in general, PMS intensity. Sports such as walking, bicycling, swimming, and jogging, are a suitable method for relieving pressure and for eliminating PMS symptoms [14]. The main emphasis in Pilates, as a newly emerged training that is after mental and physical health, is on the body and awareness of special training requirements [15].

These needs are centered on improving muscle control (muscles of the pelvis, shoulder girdle, and lower organs), increasing balance, assuming proper posture (correct biofeedback), stability of the spinal cord, and the proper way of performing daily movements [15]. Pilates has found great popularity in western societies [16], and has been adopted recently as a rehabilitation method [17]. Considering the high prevalence of PMS among women and girls and its effects on limiting occupational and social performance and interpersonal and familial relationships, this research was conducted to determine the effects of an 8-week Pilates training on clinical symptoms of PMS in inactive 20-35 year old women with the purpose of promoting women's health and capabilities.

METHODOLOGY

This was an applied and semi-empirical study carried out by performing pre- and post-tests and through comparing their results with those of the control. The statistical population consisted of fifty 20-35 year old women living in western Tehran. Criteria for entering the study included age of 20-35, regular menstrual cycles 22-35 days apart, bleeding periods of 3-8 days, and moderate to severe PMS. Exclusion criteria were history of cardiovascular, renal, or hepatic diseases, diabetes, asthma, mental disorders (especially depression), hypothyroidism, urinary tract diseases, women's diseases, smoking, and performing regular and continuous exercises.

After obtaining written consents and explaining the stages of the research to the subjects, they were randomly divided into the two 25-member experimental and control groups. Required information was recorded in questionnaires.

The questionnaires included questions such as demographic features, the age at which menstruation started, the duration of the menstrual cycle, the amount of bleeding, and the regularity of the menstruation cycle. The Premenstrual Symptoms Screening Tool (PSST) Questionnaire was employed to diagnose clinical symptoms. The reliability of the questionnaire (Cronbach's alpha was 0.9) and its content validity and content validity index (0.7 and 0.8, respectively) suggested its validity.

Pilate's exercises were carried out in the presence of an instructor. Each training session consisted of a 10-15 minute special Pilate's warm up, 30 minutes of basic Pilate's exercises including posture exercises, identification of the natural posture, calming down, extension and balance, stamina, respiratory endurance, and strength-training exercises, and 15 minutes of special Pilates cool down. The 8-week training course included three 60-minute weekly sessions. Considering the subjects were inactive women, and given each Pilates exercise consisted of several stages, training started at the elementary level and its level was raised gradually as the subjects made progress.

During the second month of the training, exercises were also done with wooden sticks. However, the control group did not perform any exercises during the training course. At the end of the second month, the questionnaire was filled again as the post-test. Wicks' lambda test was employed to ensure data normality, and SPSS 18 was used to analyze the data at the significance level of $p \leq 5\%$.

FINDINGS

Table 1 shows that there were no significant differences between the participants in the two groups with respect to demographic and physical features, and it also indicates the effects of the Pilates training program on reducing physical, mood, and behavioral symptoms of PMS in the two groups.

The means of mood, physical, and behavioral symptoms in the two groups, as shown in Table 1, were not significantly different before the training, but during and after the training there were significant differences between the groups with respect to the mentioned symptoms ($p \leq 0.01$).

Moreover, the tests demonstrated that, in the Pilates group, the mean percentage reductions in the scores related to physical symptoms were greater compared to those of the behavioral and mood symptoms. Results indicated that the physical and behavioral symptoms were significantly different after the two-month training program ($p \leq 0.01$). At the end of the 8 weeks, the Pilates exercises resulted in general reductions in the physical, behavioral, and mood symptoms of PMS.

Table 1: Describe the characteristics of the two groups of subjects.

Group	**Age** (year)	**Height** (cm)	**Weight** (kg)
Experimental	21.7 ± 4.3	160.1 ± 4.34	59 ± 9.63
Mood symptoms			
Pilates	12.92	10.12	0.001
Control	14.04	14.40	0.001
ρ	0.98	0.001	0.10
Physical symptoms			
Pilates	31.36	25.68	0.001
Control	32.28	32.96	0.001
ρ	0.87	0.001	0.91
Behavioral symptoms			
Pilates	17.88	13.04	0.001
Control	17.32	17.28	0.001
ρ	0.91	0.001	0.94

DISCUSSION

This study showed the positive effects of an eight-week Pilates training program on the physical, behavioral, and mood symptoms of inactive 20-35 year old women. The findings were in agreement with those of many studies performed on the positive effects of Pilate's exercises (as will be discussed below). Results of this research indicated that the mean scores of the two groups on physical, behavioral, and mood symptoms before the training were not significantly different.

However, after the training, the mean scores on physical, behavioral, and mood symptoms decreased significantly. Moreover, in the Pilates group, the percentage reduction in the scores on physical symptoms were greatest compared to the control. Then came the mean reductions in the scores on behavioral symptoms, which was greater in the Pilates group compared to the control. The effects of Pilate's exercises on the mood symptoms of the syndrome showed that the mean intensity of the mood symptoms decreased compared to the period before the training.

Stoddard *et al.* studied 54 women (20 did moderate exercises and 34 were inactive) with respect to the effects of physical activity on PMS and ovarian steroid hormones. Urine samples were taken from these women, and they completed the premenstruation questionnaires. Results indicated that the exercises reduced the general symptoms of PMS including water retention and pain intensity and that, in general, moderate-intensity exercises before the menstruation cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [18].

In our study, we also observed exercises had positive effects on reducing behavioral and mood symptoms. According to research carried out, aerobic exercises reduce levels of rennin and increase levels of estrogen and progesterone (thus decreasing the level of serum aldosterone) and, finally, improve the physical symptoms of PMS. This could probably be the main mechanism for the positive effects of aerobic exercises on PMS symptoms. Appearance of physical symptoms such as edema, weight increase, headache, pain, and breast sensitivity is probably due to increased serum aldosterone and prostaglandin E2, and decreased vitamin B6 and magnesium cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [19]. Considering beta-endorphins decrease in the late luteal stage due to changes in sex hormones, doing aerobic exercises results in increased levels of beta-endorphins cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [20].

Changes in estrogen and progesterone levels in the late luteal stage cause the appearance of physical symptoms cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [21].

Since exercises are an effective factor in increasing estrogen and progesterone levels, they are also probably effective in reducing physical symptoms. Moreover, it seems exercises reduce pain because they cause result secretion of endorphins (that relieve pain). Considering one of the mechanisms causing menstrual pain is the strong contraction of pelvic floor muscles when blood leaves the uterus, increased flexibility of abdominal and pelvic muscles may reduce muscle spasm and contractility, which will reduce pain. Exercises related to muscle flexibility reduce muscle cramps in the long run cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [22]. Therefore, Pilates exercises also, that are a set of muscle contractions, cause muscle strength in the abdominal area on the one hand and help the movement of prostaglandin on the other and, therefore, can reduce upper body muscle pain, especially in the abdomen and waist regions.

On the other hand, the positive effects of Pilate's exercises on physical symptoms can be explained from another point of view. Deep diaphragmic breathing in Pilate's exercises reduces the resting levels of norepinephrine, which can in turn decrease resting heart rate and blood pressure. Therefore, these exercises can be useful for decreasing heart palpitations in women suffering from PMS [23].

Since the level of beta-endorphin decreases in the late luteal stage due to changes in sex hormones, doing aerobic exercises results in increased beta-endorphin levels and increases pain tolerance, and thus improves physical symptoms that appear because of the decrease in beta-endorphin levels cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [24]. Increased rennin-angiotensin activity and decreased levels of estrogen and progesterone are effective factors in the increase in serum aldosterone in the late luteal stage cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [25].

Increased aldosterone levels themselves increase sodium and water reabsorption leading to edema and the appearance of physical symptoms cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [26]. In aerobic activities such as walking, swimming, and bicycling in which the large muscles are used, skeletal muscle oxidative capacity and the amount of oxygen received by the body increasecycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [27]. During exercises, more endorphins, enkephalins, and serotonin are secreted. These hormones reduce the effects of pain and make people feel happy. Moreover, it seems exercises improve mood symptoms through influencing brain endorphins, and that lungs cause mood symptoms through reducing brain endorphins and by increasing adrenal cortisol. Methods of coping with stress such as doing exercises must be used to treat postmenstrual syndrome (PMS). Exercises improve mood symptoms of PMS through increasing brain endorphins and by decreasing adrenal cortisol cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [27].

Since doing aerobic exercises reduces body fat percentage, and because adipose tissue is an important source, besides sex glands, in the production of estrogen in women, this can probably be a reason for reduced affective symptoms in sportswomen cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [27]. Scholars et al. (1998) reported that aerobic exercises reduced the mental symptoms of PMS through increasing relaxation cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [28].

In the late luteal stage, estrogen and progesterone decrease (progesterone more than estrogen), and the high level of estrogen and the low level of progesterone (together with magnesium deficiency) lead to the appearance of mental and mood symptoms. Aerobic activity can raise the levels of estrogen and progesterone, and the increase in progesterone can probably reduce mental symptoms cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [1]. Eyigor *et al.* also showed that 8 weeks of Pilate's exercises improved fatigue, depression, and life quality in 52 women suffering from breast cancer cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [10]. In our research also, behavioral and mood symptoms decreased after 8 weeks of training. Deep diaphragmic breathing in Pilates exercises control mental stress and thus reduce sympathetic nerve stimulation (which is effective in improving many health-related symptoms cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [23].

The positive effects of Pilate's exercises on mental symptoms can be explained from another perspective. Deep diaphragmic breathing during Pilates exercises raise body energy level so that, in addition to active muscles, the respiratory muscles involved also use energy. Moreover, deep diaphragmic breathing provides more oxygen for the active muscles and this increases people's sensitivity to insulin so that they do not require insulin secretion cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [29].

Using this method, fat oxidation increases in the body cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [30], and this will be accompanied by reduced estrogen and increased progesterone levels (which can lead to improved behavioral and mood symptoms cycle reduced the PMS symptoms and the levels of ovarian hormones in the late luteal stage [24].

Since results of this research included the probable effects of Pilates exercises on improving PMS symptoms, and considering the studies that have been conducted on this subject, we can say that this type of exercises may be effective in improving PMS symptoms, especially the physical and psychological symptoms. However, more research much be conducted on this topic to reach definitive conclusions.

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