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Effects of an Eight-week Elastic Training and Foeniculum Vulgare Consumption on Premenstrual Syndrome in Adolescent Girls: a Randomised Clinical Trial

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Abstract

Background: Premenstrual syndrome (PMS) is one of the most prevalent adverse physical, behavioral, and psychological changes in women during the luteal phase of the menstrual cycle. It reduces fertility and quality of social life. The current study was conducted to evaluate the effects of an eight-week elastic training and Foeniculum Vulgare consumption on PMS in adolescent girls.
Methods: In this experimental study, we selected 40 inactive subjects diagnosed with PMS in Shiraz, Iran in October 2020. They were randomly divided into four groups: elastic training, fennel, elastic training and fennel, and control. Elastic training was performed three sessions (45 minutes) per week for eight weeks. Fennel was consumed as oral drops of phenylene 2% daily, 30 drops every 12 hours for two months. The subjects were assessed using a premenstrual symptom screening questionnaire in pre- and post-test phases. In order to analyze the data, we utilized analysis of variance (ANOVA), analysis of covariance (ANCOVA), paired t-test, and Tukey's post hoc tests; $P<0.05$ was considered to be significant. This study was registered in Iranian Clinical Trial Registration Center with the code of IRCT20201116049412N.
Results: The results showed that after elastic training and fennel consumption, mood (8.00±1.25 vs 16.50±2.32) and physical (6.17±1.08 vs 15.50±1.92) symptoms of PMS reduced compared to those in the control group ($P <0.05$). The combined use of elastic training and fennel consumption had the greatest effect on physical (3.14±0.72 vs 15.50±1.92, $P<0.001$) and behavioral (5.23±1.53 vs 16.50±2.32, $P<0.001$) symptoms reduction in adolescent girls.
Conclusion: It could be recommended to use elastic training along with fennel consumption in order to reduce the physical and mood symptoms of adolescent girls with PMS.

***Keywords*:** Adolescent, Foeniculum, Premenstrual syndrome

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1. Introduction

Premenstrual syndrome (PMS) is believed to be one of the most general problems in women of reproductive age, which reduces fertility and quality of their life (1, 2, 3). More than 150 symptoms have been assigned to this syndrome. These symptoms are divided into three categories: physical, mood, and behavioral. Common physical symptoms include bloating, pain, breasts soreness, limbs edema, fatigue. Crying, depression, anxiety, and change in sexual orientation are considered as mood symptoms of the disease. Moreover, behavioral symptoms include alcoholism, isolationism, academic letdown, reduced socio-occupational efficiency and crime (1, 2). Several studies have reported the prevalence of this syndrome to be 20-50% in Western countries and 74% in Iran (2, 3, 4).

Several biological theories have been proposed for this disease; however, the exact causes still remain unknown. Some of the most important hypotheses are genetic and psychological factors, endocrine disorders, hormonal imbalances, and ovarian infections on top of deficiency of carbohydrates, fatty acids, vitamins, and essential minerals (1, 5, 6). Therefore, due to the

ambiguity of the pathophysiology of this syndrome, no absolute treatments have been found for it and various methods have been suggested for its treatment (7). These include surgery, medication, and non-pharmacological or alternative therapies (3). In this regard, exercise therapy and phytotherapy (herbal medicine) have attracted a great deal of scientific attention owing to being cost-effective, simple, and available (3, 7).

Physical activity is one of the most effective treatment protocols for this disorder because development in endorphins secretion, reducing the cortisol, and the effect on leptin balances result in the balance of brain chemical secretion, reduction in problems, such as anxiety and depression, increase in pain tolerance threshold, and finally improvement in the symptoms of PMS (5, 8, 9, 10). Elastic training is one of the methods of exercise therapy, which has recently come to the attention of researchers and is widely used. This method is a new routine in plyometric exercises in which stretching bands are used. This kind of exercises contribute to the improvement in the strength, power, and joints flexibility and result into a reduction in the likelihood of injury (11). In addition, certain studies have shown that elastic training increases muscle mass and upper and lower limbs strength. At the same time, it reduces visceral and the whole-body fat (11-13) and improves speed and body and cardiovascular fitness in middle-aged women (14, 15). The research by Go´ mez-Toma´s and co-workers indicated the positive effect of elastic training on the reduction of blood lipid compounds and factors affecting cardiovascular disease in postmenopausal women (16).

Over the recent years, herbal medicine has also been used to treat PMS because it is simple, inexpensive, and with fewer side effects than chemical drugs. Thus, today, the use of this treatment method has become very common. Fennel (scientific name: Foeniculum Vulgare) is a flowering plant species in the carrot family. It is a hardy perennial herb with yellow flowers and feathery leaves that are traditionally used as a decoction in the treatment of menstrual disorders, specifically PMS (17, 18, 19). Yilmaz-Akyuz and Aydin-Kartal reported that diet and aerobic exercise reduce the intensity of PMS symptoms and dysmenorrhea in female students with this disorder (5). Omidali and colleagues indicated the severity of PMS symptoms reduction via pilates training and consumption of Foeniculum Vulgare in inactive girls (20). Furthermore, Delaram and co-workers examined the effect of fennel and Echinophora-platyloba herbal on the symptoms of PMS and found which factors decreased similarly the severity of the symptoms (21). On the other hand, the effect of fennel essence on contractions inhibition, due to oxytocin and prostaglandin in guinea pig ileal, showed that the essence can reduce the intensity and frequency of contractions (18).

Based on what has been said to date, several treatments has been found to ameliorate or eliminate PMS symptoms. There has recently been a tendency to use non-pharmacological drugs since herbal medicine or aerobic and anaerobic exercise have been shown to positively affect premenstrual syndromes; they have fewer side effects compared to medical drugs or other methods, which makes them more popular.

Additionally, the result of previous works have suggested herbal medicine (like fennel extract) along with exercise (such as pilates or regular aerobic exercise) as a favorable therapeutic approach that seems to be more efficient in reducing PMS symptoms compared to their application individually (5, 20, 22). To the best of our knowledge, the effects of fennel along with elastic training on PMS have not been investigated yet. The objective of this study was to compare the effects of eight weeks of elastic training and Foeniculum Vulgare consumption against premenstrual syndrome in non-athletic adolescent girls.

2. Methods

The present research was an applied and experimental study performed through pre-test/post-test and comparison of the cases with the control group. The statistical population of this study consisted of high school female students in the city of Shiraz, Iran, in October 2020. The statistical samples of the research were choosen by cheking among students aged 15 to 20 years with premenstrual syndrome symptoms. The exclusion criteria included the presence of chronic diseases, pelvic inflammatory disease history, taking certain medications, and having stressors. The inclusion criteria comprised non-athletic students with premenstrual syndrome symptoms, who agreed to participate in the study and were able to perform the exercises.

250 students were surveyed online employing the Persian version of the Syndrome Symptoms Screening

(PSST) Questionnaire (21, 23) during the COVID-19 pandemic. Among the students with premenstrual syndrome symptoms and those who agreed to participate, 40 subjects were selected as the study samples. The sample size was calculated using El-Lithy's and Borm's studies (24, 25), 10 participants in each group and 40 in total (N=40) were estimated. The sample size was calculated with this formula: N= (1 – r2) n, (in which r = 0.86 (r: the correlation between baseline and outcome variablesY0 and Y1 in sample, respectively), n = 2 (Z1_α/2 + Z1_β)2S2/(mB _ mA)2 + 1: (Which in that: mB = mA = 1 (mB , mA : the number of receptors after and before the intervention in sample, respectively), α = 0.05, 1- ß = 0.8, Z 1- α/2 = 1.96, Z 1- ß = 0.845, S2 = 2.44914 (S2: the sample variance of pilot studies), and consequently: N = 10.0357612 ≈ 10 (sample size in each group)."

A detailed history of the individuals was also obtained in terms of the characteristics of the menstrual cycle; for example, the amount and duration of menstrual bleeding, the menstruations interval, the presence of dysmenorrhea and age of onset of dysmenorrhea, family history of PMS, and the use or non-use of medication to reduce the symptoms. In the next step, the severity of their symptoms was assessed for two monthly cycles and before applying any experimental treatments through the use of a questionnaire. Finally, the severity of these symptoms at the end of each cycle was identified. Moreover, written consent was obtained from the subjects following giving them the necessary explanations.

Random number table was utilized in this study for tasks such as selecting random samples in groups (random allocation). Therefore, 40 subjects were randomly divided into four groups, namely elastic training (n=10), Foeniculum Vulgare (n=10), elastic training with Foeniculum Vulgare (n=10), and control (n=10, without intervention) via random number table. The process of this study is exhibited in Figure 1. The subjects were explained the side effects of interventions and were asked to visit a doctor or project consultant if they noticed any health problems.

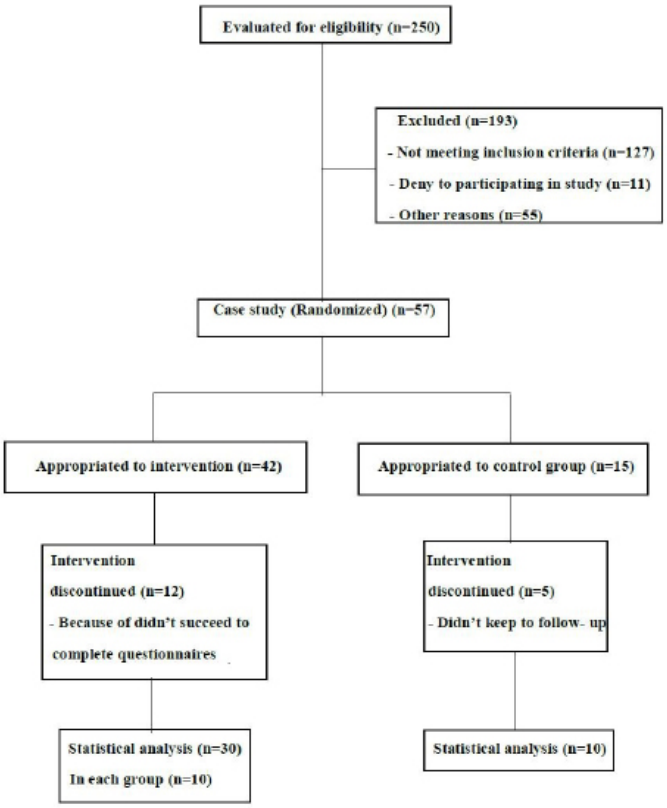

Figure 1: The figure shows CONSORT flowchart of the study.

The questionnaires were redistributed and completed based on the condition and characteristics of the subjects after eight weeks of groups' treatment. Checklist of PMS complaints was completed by the subjects (expressed with I do not have, mild, moderate and severe) at the beginning of each month. A decrease in one score compared to that prior to the intervention was considered as improvement and otherwise, as no improvement. The PMS status was also calculated at the end of the first and second months and compared to the PMS status before the intervention. The protocol of this study was approved by the Iranian Clinical Trial Registration Center with the following number: IRCT20201116049412N).

The Premenstrual Symptoms Screening Tool-PSST

This questionnaire is known as a standard tool for diagnosing the syndrome severity, whose validity and reliability have been confirmed in several studies ($\alpha \geq 0.9$, CVR= 0.7 and CVI= 0.8) (23, 26). The above questionnaire has 19 questions and consists of two parts assessing mood and physical symptoms. The first part includes 14 questions about mood (mental), behavioral, and physical symptoms and the second part evaluates the impact of symptoms on life with five questions. For each question, four criteria were marked as "asymptomatic, mild, moderate, and severe" in which scores of zero to 3 were considered for them. Total score from the questionnaire (the severity of symptoms) was categorized into three groups of mild (0–19), moderate (20 – 38), and severe (39 – 57) (23).

Demographic Characteristics

Primarily, age, height, and weight of the participants were measured prior to the intervention and body mass index (BMI (kg/m2)) was then calculated based on the ratio of body weight (kg) to height squared (m2). The analysis of variance (ANOVA) was used to evaluate the differences between the groups in before the intervention. The significance level was considered to be less than alpha 0.05.

Elastic Training Protocol

Elastic exercises were performed three sessions (45 minutes) a week for eight weeks on a researcher-made power machine. The main exercises included double-leg jump up, double-pulse jump squat, side jump, and single-leg jump up. The training protocol in each session comprised a 10-minute warm-up (joging, stretching, and mobility), 30 minutes of elastic band strength training (main protocol using yellow band color), and 5 minutes of cool-down (stretching).

Accordingly, each exercise session took about 45 minutes (27, 28). Each session consisted of three to four sets with six to eight repetitions per set. The exercises were also accomplished circulary with a 2-min rest after each cycle outdoors (30 seconds to 1 min rest between sets) and at the beginning of each training session, preparations were provided, including posture, breathing control, and the accurate method of performing. The control group was inactive and did not accomplish any exercise during the study period.

Foeniculum Vulgare Consumption

Foeniculum Vulgare consumption in the form of phenylene oral drops -2% (15.5 mg of anethole per ml) was administered 30 drops every 12 hours, daily, for 2 months (17, 20, 21, 29). Fennel extract was produced from the Bareej pharmaceutical company (BPC). The control group did not receive any fennel.

Statistical Analysis

The obtained data were analyzed utilizing SPSS software (version 23, SPSS Inc., Chicago, IL, with license from the University of Valencia). The Shapiro-Wilk and Levene's tests were used to examine the distribution normality and variance homogeneity of the data, respectively. Subsequently, analysis of variance (ANOVA), analysis of covariance (ANCOVA), paired t-test, and Tukey's post hoc tests were applied for assessing the differences in between- and within- group changes. A P value of less than 0.05 was considered to be the significance level throughout this research ($P<0.05$).

Ethics Statement

The informed consent was signed by all the participants before the bigining of their contribution in this research. This project was approved by the Local Ethic and Graduate Committee of Shiraz University (No: 991/85/23111) and also Ethic Committee of School

of Rehabilitation Science in Shiraz University of Medical Sciences (No: IR.SUMS.REHAB.REC.1399.037). The clinical trial code is IRCT20201116049412N1.

3. Results

The statistical samples of the research were choosen by cheking among students aged 15 to 20 years with premenstrual syndrome symptoms. The exclusion criteria included the presence of chronic diseases, pelvic inflammatory disease history, taking certain medications, and having stressors. The inclusion criteria comprised non-athletic students with premenstrual syndrome symptoms, who agreed to participate in the study and were able to perform the exercises.

Table 1 represents the demographic characteristics of the participants. Our subjects were between the age of 15 to 20 years old (average: 16.61±1.07). The comparison among the four experimenal groups using analysis of variace showed no significant differences among the groups before the intervention in terms of BMI (P=0.20), age (P=0.37), age at menarche (P=0.139), age at dysmenorrhea onset (P=0.070), and duration of menstruation (P=0.062). In addition, menstrual cycle intervals and family history of PMS were similar among the groups and none of the students had a family illness. Thus, these variables were homogeneous in all the groups.

For assessing the effects of elastic training and Foeniculum Vulgare on premenstrual syndrome symptoms, we used paired t-test and ANCOVA in order to determine the significant differences within and between the treatment groups. Therefore, the results of t-test in Tables 2 and 3 demonstrate that a significant decrease ocurred in mood-behavioral (P=0.0001), and physical (P=0.0001) symptoms of PMS after applying fennel and elastic training separately or their combination (P=0.0001) in the treatment groups. However, there were not any significant changes in the control group concerning psychological (P=0.138) and physical (P=0.237) PMS symptoms.

According to Tables 2 and 3, the results of ANCOVA indicated the significant effects of experimental groups on PMS symptoms (including mood-behavioral and physical syndromes) after pre-intervention adjustment as covariate. These results implied significant differences between the mean scores of mood- behavioral PMS symptoms in fennel, the elastic training, and the fennel and elastic training (F= 382.616, P= 0.0001, $\eta 2 = 0.970$) groups with the control in the post-intervention. In addition, these findings revealed other significant differences between the mean scores of physical PMS symptoms in the fennel, the elastic training, the fennel and elastic training (F= 466.420, P= 0.0001, $\eta 2 = 0.976$) groups with the control in the post-intervention. Thus, all the experimental groups, except for the control, showed a significant reduction in the severity of mood-behavioral and physical PMS symptoms in this study. However, these data demonstrated that the simultaneous use of exercise and Foeniculum Vulgare was more beneficial than using each one separately.

In other words, the mean scores of PMS symptoms

Table 1: Comparison of demographic characteristics of the experimental and control groups

Groups	Control	Fennel	Exercise	Exercise and Fennel	P*
Variations			**(Mean±SD)**		
Age (year)	16.40 ± 1.12	16.50 ± 1.21	16.71 ± 0.91	17.11 ± 1.04	0.37
Height (Cm)	160.13 ± 2.17	159.41 ± 7.03	157.2 ± 4.03	160.53 ± 6.28	0.06
Weight (Kg)	53.43 ± 6.74	52.37 ± 7.48	54.50 ± 9.31	55.18 ± 4.21	0.09
BMI (kg/m2)	20.84 ± 1.73	20.61 ± 2.21	22.05 ± 5.41	21.41 ± 2.23	0.20
age at menarche (year)	13.5 ± 1.20	14.2 ± 1.37	14.00 ± 1.43	14.16 ± 1.32	0.139
age at dysmenorrhea onset (year)	14.27 ± 1.13	15.30 ± 1.36	15.22 ± 1.42	15.5 ± 1.48	0.070
duration of menstruation (day)	6.5 ± 1.78	6.25 ± 1.24	6.15 ± 1.50	6.78 ± 1.62	0.062

BMI: Body mass index, SD: Standard deviation, Significant: *P<0.05

Table 2: Camparison of the mean scores of mood-behavioral symptoms in experimental and control groups

Variable	Groups	Pre-test (Mean±SD)	Post-test (Mean±SD)	Within group t	Within group P*	Between subject effect F	Between subject effect P*	Between subject effect Eta square (η^2)
Mood-behavioral symptoms	Control	17.41±3.42	16.50±2.32[a]	1.627	0.138			
	Fennel	17.35±4.15	9.00±1.37[b]	13.587	*0.0001			
	Exercise	15.20±2.45	8.00±1.25[b]	17.638	*0.0001			
	Exercise and Fennel	18.25±4.46	5.23±1.53[c]	25.109	*0.0001			
ANOVA		0.127	*0.0001					
ANCOVA								
Pre-test						4.881	0.034*	0.122
Group						382.616	0.0001*	0.970

a, b, c, d Significant differences between post-test groups, SD: Standard deviation, Significant: *P<0.05

(including mood-behavioral and physical syndromes) were campared among the four experimenal groups using analysis of variace and Tukey's post hoc test before and after the intervention (Tables 2 and 3). These results represented no signifant differences among the groups prior to the intervention in terms of mood-behavioral (P=0.127) and physical (P=0.423) syndromes. Meanwhile, following the intervention, the severity of mood-behavioral (P=0.0001) and physical changes (P=0.0001) of PMS symptoms were statistically significant and reduced among the experimental groups. In addition, the result of the camparison between the means demonstrated that the treatment with elastic training, Foeniculum Vulgare, and exercise with fenel groups was significantly effective whereas in the control group, no changes were observed. However, exercise with fenel group showed the most positive effects on decreasing the severity of PMS symptoms compared to the other groups.

4. Discussion

The present research indicated that an eight-week elastic training along with Foeniculum Vulgare consumption in non-athlete adolescent girls resulted in the reduced the severity of PMS symptoms, including mood-behavioral and physical syndromes. However, the subjects were homogeneous in terms of BMI, age, age at menarche, age at dysmenorrhea onset, and duration of menstruation, which could affect PMS symptoms.

The results showed positive effects of the simultaneous use of both elastic training and Foeniculum Vulgare on pain reduction, which can be justified in part due to a possible mechanism for pain relief. This Foeniculum Vulgare effect may be related to its antispasmodic properties, owing to the presence of a substance called anethole with a dopamine-like structure in fennel, which reduces the severity of pain by binding to dopamine receptors. Studies have also shown that

Table 3: Camparison of the mean scores of physical symptoms in experimental and control groups

Variable	Groups	Pre-test (Mean±SD)	Post-test (Mean±SD)	Within group t	Within group P*	Between subject effect F	Between subject effect P*	Between subject effect Eta square (η^2)
physical symptoms	Control	16.05±2.35	15.50±1.92[a]	1.168	0.237			
	Fennel	12.15±2.49	6.17±1.08[b]	12.108	0.0001*			
	Exercise	13.50±3.02	7.14±1.25[c]	10.135	0.0001*			
	Exercise and Fennel	14.00±3.73	3.14±0.72[d]	20.544	0.0001*			
ANOVA		0.423	0.0001*					
ANCOVA								
Pre-test						1.099	0.032*	0.03
Group						466.420	0.0001*	0.976

a, b, c, d Significant differences between post-test groups, SD: Standard deviation, Significant: *P<0.05

fennel essence can inhibit uterine contractions caused by oxytocin and prostaglandins and ultimately reduce pain. On the other hand, new research has shown that fennel essence has an antispasmodic effect by inhibiting contractions induced by acetylcholine and histamine (17, 18, 29). Moreover, physical activity facilitates the venous blood return through continuous muscle contractions and prevents from prostaglandins and other substances accumulating in the pelvis and reduces lumbar and abdominal pain by increasing the displacement of them in the body. Therefore, elastic training associated with endurance, muscle strength, and power improvement reduces spasm, results into an increase in prostaglandin displacement, reduces fat, and finally reduces muscle pain in the upper body areas, specifically the abdomen and lumbar, by controlling the body's muscle contractions (30). Research has also illustrated that strenuous exercise, hypoxia, and acidosis stimulate the production of pain-reducing factor, beta-endorphins, confirming the beneficial effects of elastic training on reducing pain and anxiety, and this concering offer another mechanism for its effects (5, 8, 9, 31). In addition, elastic training prevents sympathetic nerve activity, increases heart rate and blood pressure, increases uterine contractions and pain by reducing stress (14, 32).

Various factors are involved in the development of physical symptoms of the syndrome, such as increased plasma aldosterone and renin levels followed by reabsorption sodium and edema, decreased estrogen and progesterone levels, and impaired secretion of neurotransmitters, especially serotonin and gamma aminobutyric. In this regard, increasing plasma aldosterone levels induces reabsorption sodium followed by edema and physical symptoms. So, it is possible that elastic training reduces serum aldosterone levels, reabsorption of water, sodium, and edema by reducing renin and increasing estrogen and progesterone secretion levels; this eventually improves the physical symptoms of the syndrome (30, 33). Numerous studies have shown that resistance or endurance exercise reduces the physical symptoms of the syndrome (5, 6, 8, 20, 31). Therefore, the results of this study are in agreement with previous findings on reducing pain and the physical symptoms of PMS.

Additionally, based on the results of this study, fennel extract positively affected physical and psychological symptoms, yet its effect on physical symptoms is more significant than mood-behavioral symptoms. These findings confirmed the previous research data regarding medicinal plants, like fennel, on PMS symptoms (17, 19, 20, 21, 29, 34). Our findings also indicated that elastic training reduced mood-behavioral symptoms. Consistent with the result of the present study, a great deal of research has reported the positive effects of physical activity and exercise on psychological PMS symptoms (6, 8, 20, 31, 34, 35). It was demonstrated that the rate of reduction of estrogen hormone is lower than progestrone hormone at the end of luteal phase. Thus, the increase in estrogen, decrease in progesterone (imbalance in estrogen and progestron levels), and magnesium deficiency induced emotional-psychological changes and psychological symptoms. It seems that one of the effective mechanisms of exercise is reducing body fat mass. This variation causes a decline in estrogen levels and the increase in the secretion of progesterone, which contributes to an improvement in the psychological symptoms and obviation insomnia via a hormonal balance. Certain papers have also showed that depression can produce mood changes via brain beta-endorphin reduction and increase in the secretion of adrenal cortisol hormone. In addition, in another mechanism based on the inverse relationship between endorphin levels and depression, exercise reduces the severity of depressive symptoms and mental health problems by increasing endorphin production (5, 6, 8, 9, 32).

Based on the research by Pearce and colleagues exercise may be an effective healing for PMS, yet somethings it should be investigated (31). The results of Virk and co-workers showed that 8 weeks of regular moderate aerobic exercises, such as walking, jogging, running, stretching of quadriceps, and hamstrings can improve psychological symptoms and total signs of PMS (8). The findings of Çitil and colleagues indicated that the pilates exercises considerably reduced the syndrome and had an important function in the treatment of PMS symptoms after three months (6). In addition, Vancini and co-workers proved that eight weeks of pilates and walking significantly improved mood disorders (life quality, depression, and anxiety) in fat/obese individuals (35). Rayes and colleagues also reported that pilates exercises were much better than aerobic training in fat/obese individuals for eight weeks because it could improve many characteristics of overweight subjects, such as body composition, general strength, flexibility, and cardiorespiratory fitness (36). However, some previous works reported that the correlation among the

three factors of being overweight, obesity, and BMI with PMS symptoms were significant and positive (37). Accordingly, these literatures confirm our results and show that pilates training is a useful physical activity method for PMS.

In our study, the positive effect of elastic training alone and in combination with Foeniculum Vulgare was observed on reducing the severity of mood-behavioral symptoms following eight weeks. The outcomes of the present research revealed that elastic training had more significant effects than fennel consumption, but a combination of exercise with herbal remedies could be more effective in reducing PMS. These findings were confirmed in previous study (5, 20, 34). In proving this subject, the results of research by Yilmaz-Akyuz and Aydin-Kartal demonstrated that diet and aerobic exercise reduced the intensity of PMS symptoms and dysmenorrhea in female students with this disorder (5). The finding of study done by Pazoki and colleauges proved that fennel extracts and regular aerobic exercise decreased the intensity of premenstrual syndrome in non-active young girls after 8 weeks, but the using of fennel along with exercise seemed to be more effective on improvement of anxiety, depression and PMS symptoms compared with using them alone (34). Also, Omidali reported the severity reduction of PMS symptoms via pilates training individually or together with Foeniculum Vulgare consumption in inactive girls after 8 weeks intervention but indicated a combination of pilates training and fennel extract were more effective on reducing PMS (20). On the other hand, our data showed that the simultaneous use of exercise and Foeniculum Vulgare had the greatest effect on reducing the severity of physical and mood-behavioral symptoms of the syndrome in non-athlete adolescent girls after eight weeks. These results are consistent with several studies (6, 8, 17, 18, 20, 21, 34).

Therefore, it seems that elastic exercise alone or along with fennel consumption could be applied as a favorable therapeutic approach for non-athletic adolescent girls with PMS.The limitations of this study were physical and psychological conditions in the pre-test, dissimilar motivation, and unwillingness to exercise. In addition, there are a few studies performed for evaluation of the effects of elastic training alone or the simultaneous effects of exercise and herbal medicine (especially fennel) on premenstrual syndrome. Therefore, it is suggested that ellastic training and Foeniculum Vulgare be replaced with other types of exercises (for example, endurance and aerobics) or other types of herbal and chemical medicines. The effects of these treatments on PMS symptoms should be evaluated and compared in different periods of time.

5. Conclusions

Eight weeks of elastic training and fennel extract together or separately decreased the severity of PMS symptoms in adolescent girls. Therefore, it seems that the use of elastic exercise due to cheapness, safety, easy access, improved performance, reduced injury, happiness and pleasure, as well as the consumption of fennel with fewer side effects and as a natural alternative to chemical drugs with exercise is a better way to improve patients' symptoms. In addition, it was found that consuming exercise with fennel has the most positive effect on reducing the severity of the symptoms, so it can be replaced with conventional methods in the treatment of complications such as analgesics, anti-anxiety and depression. Consequently, women suffering from PMS can be encouraged to apply them as a favorable therapeutic approach. Further studies with more subjects, longer time of therapy, and other factors such as other types of exercises (e.g. endurance and aerobics) or other types of herbal and chemical medicines could be suggested for further clarification.

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Ethical Approval

The Ethics Review Board of Shiraz University of Medical Sciences approved the present study under the following number: IR.SUMS.REHAB. REC.1399.037. Also, the informed consent was signed by all the participants before the bigining of their contribution in this research.

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Conflicts of interest: None to declare

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