

## Effect of Pilates Exercises versus Benson Relaxation Technique on Premenstrual Syndrome Symptoms

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### Abstract

**Objectives:** This study was done to identify the effect of Pilates exercises versus Benson relaxation technique on the symptoms of premenstrual syndrome. **Design:** A quasi experimental was utilized. **Subjects:** A purposeive sample of 100 girl students were selected from four academic years in the faculty of nursing at Zagazig University. **Tools:** two tools were used for data collection Tool (I): Basic data structured Interview schedule and tool II Premenstrual Syndrome Scale (PMSS). The high score received from PMS shows that the symptoms were severe. The students in study groups were asked to practice the Pilates exercises and Benson relaxation technique for two months. At the end of the two months, premenstrual syndrome symptoms of experimental groups was diagnosed and the effect of interventions on PMS was evaluated. **Results:** It was observed that after applying both interventions, a statistically significant difference was detected between the means of total score among the two groups in relation to all physiological, psychological and behavioral symptoms  $P < 0.001$ , also the differences between the two groups were statistically significant after applying interventions in relation to severity of PMS in favor of Pilates exercises, where  $p < 0.001$  on 8 weeks. **Conclusion:** it can be concluded that Pilates exercises were more effective in relieving physical, behavioral and psychological symptoms of PMS than Benson relaxation technique. **Recommendation:** it can be recommended that The curricula of basic nursing / midwifery education as well as continuing education could be enriched with , correct , relevant evidence – based information about non-pharmacological management of PMS.

**Keywords:** PMS, Adolescent girls, Benson relaxation technique and Pilates exercise.

### Introduction

Premenstrual syndrome (PMS), is a menstrual disorder which arises with several symptoms and disturbs females' health. The PMS has been identified also as "premenstrual stress". It is characterized by significant distress or compromised functioning, includes behavioral, mood and physical symptoms that occur in the luteal phase of the menstrual cycle and remit with the menstrual flow. More than 40 million females are reported to have PMS symptoms worldwide. Currently, the number of adolescent females suffering from PMS is gradually increasing. The PMS was found among 47.8 % of young women in a meta-analysis including 17 studies done in different countries. PMS is characterized by some bothering physical symptoms and mood changes which cause a marked impairment in females' quality of life. These symptoms include; abdominal bloating, swelling of the extremities, weight gain, breast pain, joint or

muscle pain, sleep disturbances, changes in appetite, as well as depressed mood, anger, irritability, confusion, loss of control, and difficulty in concentrating. PMS is a distressing health problem, most commonly seen in young women aging from 15- 25 years (Abdi et al., 2019; Wolman, 2014; Zhang et al., 2014).

PMS is a term which has been defined since 1930' s. However, its exact cause could not be understood and it was thought that multiple factors have been proposed to cause it. Today, there are two theories which describe the PMS etiology in biological aspects. The first one is the advent lack of progesterone due to the alteration in the estrogen and progesterone balance. The second and latest explanation is based on hypothesis of sensitivity in neural system. Although the actual 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. The main aim in the management of adolescent girls who have PMS is to alleviate the symptoms and to increase social and professional functionality. The most frequently prescribed pharmacotherapies for PMS are selective serotonin reuptake inhibitors, hormones (oestradiol and progesterone) or hormone analogues (GnRH analogues). Considering the adverse effects of drug treatments and surgery, non-drug therapies have attracted attention of specialists and women (Ryu & Kim, 2015; Tolossa & Bekele, 2014).

Many non-pharmacological treatment methods are used to lighten premenstrual symptoms including physical activity, relaxation therapy, nutrition, herbal preparations, cognitive behavioral therapy, as well as social support, adequate rest, regular hot baths and vitamin supplements. These complementary and alternative remedies are reported to have extenuating effects on symptoms. The American College of Obstetrics and Gynecologists recommends regular physical exercise as a drug-free treatment of PMS (Csupor et al., 2019; Saglam & Orsal, 2020).

Physical activity and exercises have favorable effects on all body functions and abilities. Pilates, especially appeal to women across the world, is a flow of exercise which develops physical health (muscle strengthening, endurance, stabilization in core muscles, strengthening in respiratory muscles), psychological health (improved mood, increase in motivation and body awareness) and motor functions (muscle control, dynamic postural control, balance and coordination). Pilates includes the principles of movement of all the body, breath, concentration, centering, precision and harmony (Tolossa & Bekele, 2014).

Research has also proved that PMS is a stress induced psycho-physiological disorder and that stress is the cause of symptoms of PMS. Relaxation techniques and psychotropic therapies have been advocated in most of the recent advances in treatment of PMS. Some simple stress relieving therapies performed on

a regular basis can bring a feeling of peace and calm. Benson relaxation therapy gives rise to a state of calm and relaxation, where the brain waves begin to slow down which will eventually make a person able to rest quietly. This happens when the individual begins to lie down and follow the relaxation instructions that is the stage of muscle relaxation of the head to the legs. Furthermore, in a relaxed state began to close his eyes, at this stage individuals begin to feel relaxed and passively followed the situation so as to suppress the feeling of tension (Ezeh & Ezeh, 2016; Fatmawati et al., 2018).

### Significance of the study

Premenstrual complaints cause a decrease in work productivity and quality of work life, economical losses, and increase in accident potential. It is also an important women's health problem that needs to be addressed in the early stage because of the fact that it adversely affects self-confidence, social relations, school attendance - if they are students - and quality of life of young females. In the studies carried out, PMS rate was high. It also was seen that few studies had investigated the effect of exercise as well as relaxation therapies on severity of PMS (Sahin et al., 2014). Thus, this study can forerunner to the further studies on this subject. From this point of view,

### Aim of work

The study was aimed to compare the effect of Pilates exercises versus Benson relaxation technique on premenstrual syndrome symptoms.

### Research hypothesis:

Adolescent girls who practice Pilates exercises exhibit less premenstrual syndrome symptoms than those who perform Benson relaxation technique.

### Operational definition:

**Pilates Exercises:** comprised of warming up movements for the first 5 min then followed by 30 minutes of basic Pilate's exercises and finally ended by cooling down for the last 5 -7 min. Each session was performed with one to three sets and with 8-12 repetitions per set, and the number of repetitions increased progressively.

**Benson Relaxation Technique:** involved four fundamental components for evoking the relaxation response a quiet environment, a mental device (known as a mantra" in most forms of meditation), a passive attitude, and a comfortable position.

### Plan of the Study

#### Materials

**Research design:** A quasi- experimental research design was used in this study.

**Setting:** The study was conducted at the Faculty of Nursing- Zagazig University (obstetric and gynecologic skill lab)

**Subjects:** A purposeive sample of 100 girl students were selected from four academic years in the faculty of nursing

The sample size estimated based on the use of Epi Info 7 program using the following parameters:

Total Population size: 2674

- Expected frequency: 50%
- Acceptable margin of error: 5%
- Confidence coefficient: 95%
- Minimum sample size: 90 students who fulfilling the following criteria comprised the study subjects.
  - Single
  - Aged from 18-21 years.
  - Suffering from moderate to severe PMS.
  - Free from any other gynecological problems as ovarian cyst or polycystic ovaries.
  - Not currently consume any medication to alleviate premenstrual syndrome.
  - Free from any medical diseases as cardiac or renal disease.
  - Have a history of regular menstrual cycles ranging from 21-35 days and lasting from 3-7 days.
  - Available at the time of data collection and willing to participate in the study.

All female students of the four academic years were surveyed to pinpoint those who

suffer from moderate to severe PMS symptoms. Then according to the results of the survey, a convenient sample of 100 female students were recruited to participate in the study.

The recruited subjects were randomly assigned equally to one of two groups using the simple random sampling technique.

- The study group (1): performed Pilates exercises.
- The study group (2): performed Benson relaxation technique.

**Tools:** two tools were used for data collection

#### Tool (I): Basic data structured Interview schedule.

This tool was developed by the researcher to collect the basic data; it included two parts:

- **Part one:** Socio-demographic characteristics including age, academic year, current residence, family income as well as family size.
- **Part two:** Menstrual history such as age at menarche, cycle duration, cycle interval and regularity of the menstrual cycle.

#### Tool II: The Premenstrual Syndrome Scale (PMSS)

This tool was originally developed by (Padmavathi et al., 2014). It was adopted and used by the researchers. It is a self-reporting scale comprised 40 questions with three sub-scales (Physiological, Psychological and Behavioral symptoms). For each question of the 40 questions the student has to choose one of the responses on a 5 points likert scale: Never (1), rarely (2), sometimes (3), very often (4) and always (5).

The total score ranged from 40 to 200. Subjects' severity of PMS was categorized as follow:

- No symptoms of PMS  $\leq$  40.
- Mild symptoms of PMS from 41 to 80.
- Moderate symptoms of PMS from 81 to 120.
- Severe symptoms of PMS from 121 - 160
- Very severe symptoms of PMS  $\geq$  161

**Method:** The study was executed through the following steps:

- An approval from the Research Ethics Committee, Faculty of Nursing- Zagazig University was obtained.
- Official letter was directed to the faculty of nursing- Zagazig University to take the permission of data collection after an explanation of the study's purpose.
- Tool (I) was developed by the researchers after a theoretical review of literatures. Tool (II) was adopted and translated by the researchers into Arabic language to suit the Egyptian culture.
- Tools were tested for content validity by a jury of 5 experts in the field of obstetrics and gynecology.
- Tool II was tested for content reliability using Cronbach's alpha test. Reliability coefficient was reliable (0.829).
- A pilot study was carried out on 10% of the study sample, (N=10) participants who was (excluded from the main study sample). The purpose of the pilot study is to test the clarity and applicability of the tools and modifications were done.
- The researchers prepared a video show for the subjects of each group in the faculty about how to apply the two types of intervention. Content preparation including presentation (definition, purpose, types of intervention and how it is practiced).
- All study subjects who fulfilled the inclusion criteria were listed by the researchers, and then the researchers contacted and invited them to participate in a session. Then they were given a proper explanation about the study purpose, design, and subject's role.
- Pretest assessment was done for both study groups (1&2) before application of interventions using tools (I and II) within seven days before menstruation.
- For the study group 1: Pilates exercises group:
  - Each activity was demonstrated and re-demonstrated using verbal and visual instructions to facilitate the correct position and movement.
  - The Pilates integrated exercise program comprised of 24 sessions, held three sessions a week for 8 weeks in succession for each subject. The duration of each session was determined in line with recent studies which indicated that programs of longer duration (24 sessions, each lasting 30-45 minutes in average or longer) give better results (Giacomini et al., 2016; Kloubec, 2011).
  - Each session in the Pilates exercises program conducted through three phases (1<sup>st</sup> phase (Warm-up), 2<sup>nd</sup> phase (basic Pilates exercises) and 3<sup>rd</sup> phase (cool-down) in the presence of the researchers.
- 1<sup>st</sup> phase included warming up movements for the first 5 min including head movements, standing roll down and alternate arms.
- 2<sup>nd</sup> phase included 30 minutes of basic Pilate's exercises including single leg lifts, alternate leg lifts , leg circles, single and double leg stretches, , spine stretch forward, and pelvic rocking. Breath control was practiced during all the exercises. These exercises were selected from the original Pilates exercises because they can be carried out easily without equipment.
- 3<sup>rd</sup> phase included cooling down for the last 5 -7 min (movements in sitting and lying down position to return to the initial state)(Giacomini et al., 2016; Kliziene et al., 2017).

For the study group 2: Benson relaxation technique group:

- According to Benson's relaxation method, the students were asked to assume the best position and place where they felt relaxed.
- Researchers interviewed each study subject individually to explain how to do Benson relaxation technique by performing it while student was watching video. Then the student was asked to re-demonstrate it according to the following steps:

- **Step 1:** Each study subject was asked to pick a focus word (such as “one” or “peace”), phrase, movement or image.
- **Step 2:** Each study subject was asked to close her eyes.
- **Step 3:** Each study subject was asked to progressively relax all muscles, beginning with toes and feet and moving up through entire body, shoulders, and face. Spend few minutes with this relaxation exercise.
- **Step 4:** Each study subject was asked to breathe slowly and naturally. As she exhales, repeat silently the focused words or phrases. Or focusing on breathing rhythm.
- It was done twice a day for 20 minutes for 8 weeks 3 sessions per week (Mahmoudi, 2018)
- Evaluation - After the intervention the researchers assessed the premenstrual symptoms severity for both groups (study 1 & study 2) as post-test by using tools (II) this was done twice after 4 weeks (post 1) and repeated after 8 weeks (post 2) from interventions.
- The difference between pre-test and post-test among both groups was calculated to determine which intervention was more effective in reducing the premenstrual symptoms severity.
- Collection of data consumed 3 months starting from October till the end of December 2021.
- Statistical analysis was done by the researchers after collection of data by using Statistical Package for Social Sciences (SPSS version 20) program. Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. Qualitative data were described using number and percent. Shapiro-Wilk test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, and standard deviation. Significance of the obtained results was judged at the 5% level. The used tests were Chi-square test, Fisher’s

Exact, Student t-test, Mann Whitney test And Friedman test.

- Ethical Considerations: For each recruited subject the following issues was considered:
  - 
  - Written informed consent was obtained from the students before data collection and after explanation of the study aim.
  - Privacy of the study participants was asserted.
  - Confidentiality of the collected data was maintained.
  - Every participant was informed that her participation in the study is voluntary and she can withdraw at any time.

## Results

Table (I) presents the that more than three quarters (76% & 82% respectively) of Pilates and Benson groups were 20 to < 24 years old with mean ages ( $20.14 \pm 0.95$  &  $20.36 \pm 0.98$ ) years respectively. Also, slightly more than three fifths of the Pilates group (62%) and approximately half (52%) of Benson group were at their 3<sup>rd</sup> academic year. In addition, the majority of both groups (92%) were urban dwellers. As regards the number of family members, it is noticed that (68% & 60%) of both groups respectively have more than 5 members in the family. Family income was enough from the point of view of the vast majority (92% and 98% respectively) in both groups.

No statistically significant differences were observed between both groups in relation to their socio-demographic data.

Table (II) shows that slightly less than two thirds (64%) of Pilates group and half (50%) of Benson group had their first menstruation at 12 to < 14 years with mean ages ( $12.55 \pm 1.98$  &  $13.18 \pm 1.35$ ) in both groups respectively. The menstrual cycles were regular in about three quarters (74% & 70%) respectively of studied groups. the majority (88%) of Pilates' group participants reported an interval of 21-35 days, compared to about three quarters (74%) of Benson's group. The duration of menstrual bleeding was 3-5 days for three fifths (60%) of both groups .

No statistically significant differences were observed between both groups in relation to their menstrual history.

Table (III) presents, no statistically significant difference between the means of total score of all physiological symptoms of the two groups before applying both interventions ( $p=0.077$ ). While after 4 and 8 weeks of applying both interventions, a statistically significant difference was detected between the means of total score of the two groups in relation to all physiological symptoms ( $P<0.001$ ), where the mean of total score was  $44.0 \pm 11.15$  before applying Pilates compared to  $48.22 \pm 12.39$  before applying Benson,  $36.14 \pm 8.75$  after 4 weeks of applying Pilates compared to  $47.36 \pm 12.03$  after 4 weeks of applying Benson, and  $32.06 \pm 7.41$  after 8 weeks of applying Pilates compared to  $43.98 \pm 11.24$  after 8 weeks of applying Benson.

**Before interventions:** there was no statistically significant differences were observed between the two groups in all physiological symptoms. **After 4 weeks:** statistically significant differences were observed between Pilates and Benson groups in relation to headache, fatigue, pelvic discomfort, abdominal cramps, change in bowel habit as well as, food cravings, skin changes and muscle & joint pain for the favor of Pilates group, while no statistically significant differences were detected between the two groups in relation to breast tenderness, abdominal bloating, weight gain, fainting, palpitations, increased appetite, generalized ache, and nausea & vomiting. **After 8 weeks:** statistically significant differences were observed between the two groups for the favor of Pilates group in all physiological symptoms except weight gain, fainting, palpitations, increased appetite and generalized ache.

Table (IV) shows no statistically significant difference ( $P=0.183$ ) between the means of total score of all psychological symptoms of the two groups before applying both interventions. While after 4 and 8 weeks of applying both interventions a statistically significant differences were observed between the means of total score of all psychological symptoms of the two groups ( $P=0.001$  &  $<0.001$  respectively), where the mean score

was  $35.84 \pm 10.64$  before applying Pilates compared to  $38.72 \pm 10.82$  before applying Benson,  $27.24 \pm 7.03$  after 4 weeks of applying Pilates compared to  $33.02 \pm 9.86$  after applying Benson, and  $22.60 \pm 6.30$  after 8 weeks of applying Pilates compared to  $28.46 \pm 8.99$  after 8 weeks of applying Benson.

**Before interventions:** no statistically significant differences were observed between the two groups in all psychological symptoms. **After 4 weeks:** statistically significant differences were observed between Pilates and Benson groups in relation to anxiety, tension, loss of concentration, easy cry, and sleep changes for the favor of Pilates group, while no statistically significant differences were detected between the two groups in relation to irritability, mood swings, depression, forgetfulness, confusion, aggression, and hopelessness. **After 8 weeks:** statistically significant differences were observed between the two groups for the favor of Pilates group in all psychological symptoms except anxiety, mood swing, sleep changes, aggression and hopelessness.

Table (IV) displays no statistically significant difference ( $p=0.845$ ) between the means of total score of all behavioral symptoms of the two groups before applying both interventions. On the other hand, after 4 and 8 weeks of applying both interventions a statistically significant differences were observed between the means of total score of all behavioral symptoms of the two groups for the favor of Pilates group ( $P=0.016$  &  $<0.003$  respectively), where the mean score was  $35.84 \pm 10.64$  before applying Pilates compared to  $38.72 \pm 10.82$  before applying Benson,  $27.24 \pm 7.03$  after 4 weeks of applying Pilates compared to  $33.02 \pm 9.86$  after applying Benson, and  $22.60 \pm 6.30$  after 8 weeks of applying Pilates compared to  $28.46 \pm 8.99$  after 8 weeks of applying Benson.

**Before interventions:** no statistically significant differences were observed between the two groups in all behavioral symptoms. **After 4 weeks:** statistically significant differences were observed between Pilates and Benson groups in relation to clumsiness, lack of interest in usual activities, irrational thoughts, and being over sensitive for the favor

of Pilates group, while no statistically significant differences were detected between the two groups in relation to social withdrawal, restlessness, lack of self-control, feel guilty, poor judgment, impaired work performance, obsessional thoughts, and compulsive behavior. **After 8 weeks:** statistically significant differences were observed between the two groups for the favor of Pilates group in all behavioral symptoms except social withdrawal, restlessness, lack of self-control, feel guilty poor judgment, and impaired work performance

Table (VI) illustrates the number and percent distribution of the study subjects according to the severity of PMS symptoms. It was noticed that the severity of PMS symptoms before intervention was moderate in slightly less than half (46% and 48%) of Pilates and Benson groups respectively and severe in about one third (34% and 30%) of both groups respectively with no statistically significant difference between the two groups ( $P= 0.358$ ). Meanwhile, 4 weeks after intervention, the

symptoms became mild in 40 % of Pilates group compared to 16% of Benson group, at the same time only 2% of Pilates group reporting severe PMS symptoms compared to 24% of Benson group. Furthermore, 8 weeks after application of Pilates an improvement in PMS symptoms continued, where the symptoms became mild in about three quarters (74%) and moderate in 26% of students with no severe or very severe symptoms were reported, while 8 weeks after application of Benson the symptoms became mild in 26 %, moderate in 56%, and severe in 18% of students with no reported very severe symptoms. Accordingly, the differences between the two groups were statistically significant 4 and 8 weeks after applying interventions where  $p<0.001$ . Although a statistically significant differences were observed before and after application of intervention in each group, Pilates' exercises seemed to be better than Benson's relaxation technique in improving premenstrual symptoms.

**Table (I):** Number and the percent distribution of the studied groups according to their socio-demographic characteristics

Socio-demographic Data	Pilates (n = 50)		Benson (n = 50)		Test of Sig.	P
	No.	%	No.	%		
Age (years)					$\chi^2= 1.314$	0.518
• > 20 yrs	11	22.0	9	18.0		
• 20 to < 24 yrs	38	76.0	41	82.0		
• $\geq 24$ yrs	1	2.0	0	0.0		
Min. – Max.	18.0 – 24.0		19.0 – 23.0		U=	0.304
Mean $\pm$ SD.	20.14 $\pm$ 0.95		20.36 $\pm$ 0.98			
<b>Academic year</b>					$\chi^2= 1.020$	0.313
• Second year	19	38.0	24	48.0		
• Third year	31	62.0	26	52.0		
<b>Residence</b>					$\chi^2= 0.000$	FE p= 1.000
• Rural	4	8.0	4	8.0		
• Urban	46	92.0	46	92.0		
<b>Family income</b>					$\chi^2= 1.895$	FE p= 0.362
• Enough	46	92.0	49	98.0		
• Not enough	4	8.0	1	2.0		

SD: Standard deviation

U: Mann Whitney test

$\chi^2$ : Chi square test FE: Fisher Exact

p: p value for comparing between the studied groups

\*: Statistically significant at  $p \leq 0.05$

**Table (II):** Number and the percent distribution of the studied groups according to their menstrual history

Menstrual history	Pilates (n = 50)		Benson (n = 50)		Test of Sig.	P
	No.	%	No.	%		
<b>Age of menarche</b>					$\chi^2=2.951$	0.229
• 10 to < 12 yrs	6	12.0	5	10.0		
• 12 to < 14 yrs	32	64.0	25	50.0		
• $\geq$ 14 yrs	12	24.0	20	40.0		
Min. – Max.	10.0 – 15.0		10.0 – 16.0		U=1004.50	0.082
Mean $\pm$ SD.	12.55 $\pm$ 1.98		13.18 $\pm$ 1.35			
<b>Menstrual rhythm</b>					$\chi^2=0.198$	0.656
• Regular	37	74.0	35	70.0		
• Irregular	13	26.0	15	30.0		
<b>Menstrual interval</b>					$\chi^2=3.378$	0.185
• Less than 21 days	3	6.0	5	10.0		
• From 21 to 35 days	44	88.0	37	74.0		
• More than 35 days	3	6.0	8	16.0		
<b>Duration of menstruation</b>					$\chi^2=0.360$	0.835
• Less than 3 days	2	4.0	1	2.0		
• 3 – 5 days	30	60.0	30	60.0		
• From 6-7 days	18	36.0	19	38.0		

SD: Standard deviation

U: Mann Whitney test

 $\chi^2$ : Chi square test

p: p value for comparing between the studied groups

\*: Statistically significant at  $p \leq 0.05$ **Table (III):** Mean distribution of the studied groups according to their scores of premenstrual physiological symptoms

Premenstrual physiological symptoms	Before intervention		After 4 weeks		After 8week	
	Pilates group	Benson group	Pilates group	Benson group	Pilates group	Benson group
	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD
• Breast tenderness	1.90 $\pm$ 1.43	2.28 $\pm$ 1.60	1.74 $\pm$ 1.14	2.28 $\pm$ 1.60	1.54 $\pm$ 0.97	2.28 $\pm$ 1.60
U(p)	1082.0(0.195)		1040.0(0.106)		944.0*(0.015*)	
• Abdominal bloating	3.08 $\pm$ 1.69	3.18 $\pm$ 1.64	2.62 $\pm$ 1.35	3.18 $\pm$ 1.64	2.22 $\pm$ 1.25	3.14 $\pm$ 1.63
U(p)	1205.50(0.750)		986.50(0.063)		838.50*(0.003*)	
• Wight gain	2.40 $\pm$ 1.58	2.42 $\pm$ 1.55	2.04 $\pm$ 1.21	2.40 $\pm$ 1.54	1.88 $\pm$ 1.12	2.20 $\pm$ 1.36
U(p)	(0.876)	1228.50	(0.314)	1111.50	1109.0(0.297)	
• Headache	2.72 $\pm$ 1.69	3.26 $\pm$ 1.40	2.0 $\pm$ 1.11	3.16 $\pm$ 1.40	1.68 $\pm$ 0.91	2.70 $\pm$ 1.40
U(p)	(0.095)	1014.50	669.0*( $<0.001^*$ )		721.0*( $<0.001^*$ )	
• Fatigue	3.54 $\pm$ 1.62	4.22 $\pm$ 1.13	2.84 $\pm$ 1.22	4.06 $\pm$ 1.20	2.36 $\pm$ 1.01	3.56 $\pm$ 1.03
U(p)	(0.061)	998.50	572.0( $<0.001^*$ )		512.50*( $<0.001^*$ )	
• Fainting	1.52 $\pm$ 1.05	1.32 $\pm$ 0.59	1.42 $\pm$ 0.93	1.32 $\pm$ 0.59	1.22 $\pm$ 0.62	1.30 $\pm$ 0.54
U(p)	(0.674)	1202.50	(0.968)	1245.50	1113.50(0.176)	
• Palpitation	1.92 $\pm$ 1.26	2.30 $\pm$ 1.47	1.64 $\pm$ 0.92	2.14 $\pm$ 1.36	1.50 $\pm$ 0.76	1.86 $\pm$ 1.20
U(p)	(0.187)	1073.50	1012.50(0.074)		1101.0(0.244)	
• Pelvic discomfort	3.92 $\pm$ 1.51	4.08 $\pm$ 1.31	3.14 $\pm$ 1.21	4.02 $\pm$ 1.30	2.90 $\pm$ 1.13	3.84 $\pm$ 1.30
U(p)	1217.0(0.801)		705.50*( $<0.001^*$ )		692.50*( $<0.001^*$ )	
• Abdominal cramps	4.20 $\pm$ 1.25	4.40 $\pm$ 1.03	3.22 $\pm$ 1.04	4.38 $\pm$ 1.07	2.88 $\pm$ 1.02	4.24 $\pm$ 1.10
U(p)	1151.0(0.431)		471.50*( $<0.001^*$ )		416.0*( $<0.001^*$ )	
• Change in bowel habit	2.76 $\pm$ 1.65	3.30 $\pm$ 1.63	2.34 $\pm$ 1.29	3.30 $\pm$ 1.63	2.12 $\pm$ 1.15	3.14 $\pm$ 1.55
U(p)	1007.0(0.083)		801.0*(0.001*)		768.0*(0.001*)	
• Increase appetite	2.24 $\pm$ 1.35	2.58 $\pm$ 1.50	1.84 $\pm$ 0.96	2.44 $\pm$ 1.46	1.66 $\pm$ 0.87	2.08 $\pm$ 1.21
U(p)	1097.50(0.270)		990.0(0.059)		1032.0(0.105)	
• Generalized ache	3.58 $\pm$ 1.59	3.38 $\pm$ 1.59	2.82 $\pm$ 1.26	3.24 $\pm$ 1.56	2.46 $\pm$ 1.09	2.82 $\pm$ 1.47
U(p)	(0.515)	1159.50	1023.50(0.110)		1074.0(0.212)	
• Food craving (sugar,salt)	2.42 $\pm$ 1.58	2.80 $\pm$ 1.48	2.0 $\pm$ 1.16	2.74 $\pm$ 1.45	1.78 $\pm$ 1.0	2.38 $\pm$ 1.43
U(p)	1055.0(0.164)		(0.009*)	887.50*	971.0*(0.041*)	
• Skin changes	2.46 $\pm$ 1.66	2.90 $\pm$ 1.66	2.04 $\pm$ 1.29	2.90 $\pm$ 1.66	1.92 $\pm$ 1.14	2.90 $\pm$ 1.66



Premenstrual physiological symptoms	Before intervention		After 4 weeks		After 8week	
	Pilates group	Benson group	Pilates group	Benson group	Pilates group	Benson group
	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD
U(p)	1058.0(0.165)		(0.010*) 893.50*		844.0*(0.003*)	
• Nausea / vomiting	2.34±1.52	2.62±1.61	2.0±1.11	2.62±1.61	1.70±0.89	2.48±1.58
U(p)	1133.0(0.399)		1009.0(0.082)		944.50*(0.024*)	
• Muscle joint pain	3.0±1.60	3.18±1.55	2.44±1.23	3.18±1.55	2.24±1.17	3.06±1.56
U(p)	1174.0(0.589)		896.0*(0.012*)		867.0*(0.007*)	
<b>Total physiological score</b>	<b>44.0±11.15</b>	<b>48.22±12.39</b>	<b>36.14±8.75</b>	<b>47.36±12.03</b>	<b>32.06±7.41</b>	<b>43.98±11.24</b>
<b>Test of significance</b>	t=1.790	p=0.077	t=4.661*	p= <0.001*	t=4.661*	p= <0.001*

SD: Standard deviation

U: Mann Whitney test

t: Student t-test

p: p value for comparing between the studied groups

\*: Statistically significant at  $p \leq 0.05$ **Table (IV):** Mean distribution of the studied groups according to their scores of premenstrual Psychological symptoms

premenstrual psychological symptoms	Before intervention		After 4 weeks		After 8week	
	Pilates group	Benson group	Pilates group	Benson group	Pilates group	Benson group
	Mean &SD	Mean &SD	Mean &SD	Mean &SD	Mean &SD	Mean &SD
Irritability	2.40 ± 1.55	2.84 ± 1.46	1.88 ± 1.0	2.30 ± 1.18	1.48 ± 0.74	1.92 ± 1.10
U(p)	1039.0 (0.130)		999.0 (0.069)		994.0*(0.047*)	
Anxiety	3.14 ± 1.58	3.62 ± 1.40	2.30 ± 1.13	2.78 ± 1.18	1.82 ± 0.92	2.18 ± 1.08
U(p)	1040.0 (0.131)		964.0* (0.041*)		1024.50 (0.092)	
Tension	3.38 ± 1.58	3.88 ± 1.12	2.28 ± 1.05	3.04 ± 1.12	1.90 ± 0.91	2.68 ± 1.17
U(p)	1062.0 (0.175)		799.0*(0.001*)		783.0*(0.001*)	
Mood swing	3.90 ± 1.37	3.80 ± 1.21	2.80 ± 1.05	3.10 ± 1.16	2.32 ± 0.87	2.52 ± 1.11
U(p)	1139.0 (0.419)		1087.50 (0.247)		1152.0 (0.480)	
Loss of concentration	3.02 ± 1.55	3.44 ± 1.51	2.36 ± 1.10	3.0 ± 1.34	2.0 ± 0.97	2.74 ± 1.32
U(p)	1058.50 (0.174)		906.0* (0.015*)		847.50* (0.004*)	
Depression	3.58 ± 1.46	3.56 ± 1.58	2.70 ± 1.04	3.12 ± 1.49	2.10 ± 0.89	2.64 ± 1.34
U(p)	1238.50 (0.934)		1036.0 (0.131)		947.0* (0.030*)	
Forgetfulness	2.42 ± 1.36	2.68 ± 1.57	2.04 ± 0.99	2.62 ± 1.51	1.78 ± 0.97	2.40 ± 1.46
U(p)	1150.50 (0.476)		1011.50 (0.088)		982.0* (0.050*)	
Easy cry /easy spell	3.42 ± 1.50	3.70 ± 1.37	2.70 ± 1.22	3.40 ± 1.34	2.32 ± 1.02	3.02 ± 1.32
U(p)	1125.0 (0.369)		880.0* (0.009*)		866.50* (0.007*)	
Sleep changes	3.32 ± 1.39	3.68 ± 1.27	2.40 ± 1.07	2.90 ± 1.15	1.96 ± 0.83	2.12 ± 1.17
U(p)	1068.0 (0.192)		954.0* (0.035*)		1198.0(0.705)	
Confusion	2.88 ± 1.62	3.16 ± 1.45	2.26 ± 1.16	2.76 ± 1.29	1.88 ± 0.90	2.46 ± 1.16
U(p)	1126.50 (0.381)		976.50 (0.052)		900.50* (0.012*)	
Aggression	2.04 ± 1.34	2.06 ± 1.28	1.64 ± 0.90	1.84 ± 1.06	1.46 ± 0.79	1.80 ± 1.01
U(p)	1231.0 (0.888)		1134.0 (0.378)		1020.50 (0.071)	
Hopelessness	2.34 ± 1.49	2.30 ± 1.45	1.88 ± 1.08	2.16 ± 1.25	1.58 ± 0.88	1.98 ± 1.22
U(p)	1243.50 (0.962)		1106.0 (0.288)		1046.50 (0.116)	
Total psychological score	35.84±10.64	38.72±10.82	27.24±7.03	33.02±9.86	22.60±6.30	28.46±8.99
Test of significance	t= 1.342	p= 0.183	t=3.376*	p= 0.001*	t=3.777*	p=<0.001*

SD: Standard deviation

U: Mann Whitney test

t: Student t-test

p: p value for comparing between the studied group

\*: Statistically significant at  $p \leq 0.05$

**Table (V):** Mean distribution of the studied groups according to their scores of premenstrual behavioral symptoms

premenstrual behavioral symptoms	Before intervention		After 4 weeks		After 8week	
	Pilates group	Benson group	Pilates group	Benson group	Pilates group	Benson group
	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD	Mean & SD
• Social withdrawal	2.76 ± 1.52	2.66 ± 1.48	2.16 ± 1.06	2.56 ± 1.43	1.80 ± 0.99	2.18 ± 1.30
<b>U(p)</b>	1205.0 (0.750)		1083.0 (0.233)		1061.50 (0.164)	
• Restlessness	3.04 ± 1.51	3.0 ± 1.43	2.24 ± 1.04	2.46 ± 1.31	1.76 ± 0.85	1.88 ± 1.08
<b>U(p)</b>	1231.0 (0.892)		1169.0 (0.561)		1217.0 (0.804)	
• Lack of self-control	2.46 ± 1.49	2.24 ± 1.46	1.92 ± 1.05	2.02 ± 1.25	1.62 ± 0.81	1.92 ± 1.18
<b>U(p)</b>	1145.50 (0.447)		1236.0(0.918)		(0.304)	1114.50
• Feel guilty	2.30 ± 1.47	2.16 ± 1.48	1.72 ± 0.97	1.98 ± 1.33	1.54 ± 0.81	1.84 ± 1.18
<b>U(p)</b>	1162.50 (0.515)		1185.0 (0.618)		(0.355)	1133.50
• Clumsiness	1.82 ± 1.17	2.08 ± 1.26	1.46 ± 0.73	2.0 ± 1.20	1.34 ± 0.69	1.90 ± 1.16
<b>U(p)</b>	1100.0 (0.259)		956.50* (0.024*)		913.50* (0.007*)	
• Lack of interest in usual activities	2.68 ± 1.53	2.64 ± 1.37	1.98 ± 1.02	2.52 ± 1.31	1.70 ± 0.89	2.24 ± 1.24
<b>U(p)</b>	1243.50(0.963)		969.0* (0.044*)		953.50* (0.029*)	
• Poor judgment	2.32 ± 1.41	1.90 ± 1.28	1.80 ± 0.90	1.72 ± 1.13	1.58 ± 0.76	1.56 ± 0.91
<b>U(p)</b>	1042.0 (0.118)		1103.0 (0.264)		1182.0 (0.590)	
• Impaired work performance	3.0 ± 1.44	2.52 ± 1.37	2.06 ± 0.91	2.10 ± 1.11	1.62 ± 0.75	1.64 ± 0.88
<b>U(p)</b>	1010.50 (0.088)		(0.899)	1232.50	(0.862)	1227.50
• Obsessional thoughts	1.82 ± 1.34	1.98 ± 1.45	1.44 ± 0.81	1.92 ± 1.40	1.30 ± 0.65	1.82 ± 1.22
<b>U(p)</b>	1201.0 (0.691)		1085.0 (0.169)		1005.0* (0.033*)	
• Compulsive behavior	1.48 ± 0.97	1.86 ± 1.43	1.28 ± 0.67	1.80 ± 1.34	1.16 ± 0.47	1.64 ± 1.05
<b>U(p)</b>	1135.0 (0.322)		1056.0(0.082)		978.0* (0.010*)	
• Irrational thoughts	1.70 ± 1.15	2.18 ± 1.52	1.34 ± 0.66	2.02 ± 1.35	1.24 ± 0.52	1.90 ± 1.20
<b>U(p)</b>	1076.0 (0.168)		962.0* (0.016*)		912.0* (0.004*)	
• Being over sensitive	2.52 ± 1.55	3.12 ± 1.61	2.02 ± 1.20	2.84 ± 1.45	1.66 ± 0.87	2.62 ± 1.38
<b>U(p)</b>	994.0 (0.068)		857.50* (0.005*)		760.50* (<0.001*)	
<b>Total Behavioral score</b>	27.90±9.87		21.42±6.31		25.94±11.27	
<b>Test of significance</b>	t= 0.196      p= 0.845		t= 2.475*      0.016*		t= 3.092*      p= 0.003*	

SD: Standard deviation

U: Mann Whitney test

t: Student t-test

p: p value for comparing between the studied groups

\*: Statistically significant at p ≤ 0.05

**Table (VI):** Distribution of the studied groups according to their severity of premenstrual symptoms

Severity of PMS	Before intervention				After 4 weeks				After 8week			
	Pilates group		Benson group		Pilates group		Benson group		Pilates group		Benson group	
	No	%	No	%	No	%	No	%	No	%	No	%
• Mild (40 – 80)	9	18.0	6	12.0	20	40.0	8	16.0	37	74.0	13	26.0
• Moderate (81 – 120)	23	46.0	24	48.0	29	58.0	29	58.0	13	26.0	28	56.0
• Severe (121 – 160)	17	34.0	15	30.0	1	2.0	12	24.0	0	0.0	9	18.0
• Very severe (≥161)	1	2.0	5	10.0	0	0.0	1	2.0	0	0.0	0	0.0
• $\chi^2(p)$	3.253 (0.358)				15.947* (<0.001*)				27.072* (<0.001*)			
• <b>Fr test among Pilates group</b>					65.907*				<0.001*			
• <b>Fr test among Benson group</b>					34.696*				<0.001*			

 $\chi^2$ : Chi square test Fr: Friedman test

\*: Statistically significant at p ≤ 0.05

## Discussion

Premenstrual syndrome (PMS) is a group of symptoms experienced frequently by adolescent girls during the late part of the luteal phase of the menstrual cycle. (Maged et al., 2018; Mahmoudi, 2018; Omidali, 2016). Pilates exercises and Benson relaxation techniques are the recommended interventions to reduce symptoms of PMS. They play an important role in reducing stress, anger, depression, pain and the overall severity. (Saglam & Orsal, 2020). In this context, leading young females to live a comfortable life by decreasing their PMS symptoms is among the competencies of midwives. Therefore, midwives should examine the methods which can decrease the effect of PMS symptoms through research (Çitil & Kaya, 2021). From this point of view, the study was carried out to identify the effect of Pilates exercises and Benson relaxation technique on the symptoms of premenstrual syndrome.

According to the results of the current study it can be noticed that the study groups were matching in almost all of their socio-demographic characteristics as well as their menstrual history (Tables 1 & 2). Generally speaking, the similarity of these variables was useful in limiting extraneous factors, which could interfere with the effect of the intended intervention. It also helped in understanding and securing the reliability and relevance of the forthcoming results of the current study.

The findings of the present study revealed improvements in mean total and subtotal scores of physiological symptoms of premenstrual syndrome among participants who were engaged in 8 weeks Pilates training exercises than those who performed Benson relaxation technique, especially in *breast tenderness, headache, fatigue, fainting, pelvic discomfort, bowel habit, skin changes, nausea & vomiting* (Tables III).

This result is in accordance with a meta-analysis done in **UK**, where it exhibited that Pilates exercises regimen decreased physical symptoms of PMS (SMD = -1.62; 95% CI = -2.41 to -0.83) (Pearce et al., 2020). It matches also with a study done in **Indonesia**, where it revealed that abdominal stretching exercises can reduce physical symptoms of PMS (ROHMAH & Mukhoirotin, 2020). Moreover, It partially agrees with a systematic review performed in

**Turkey**, where it was emphasized that exercise is effective in improving physical symptoms such as pain, constipation, breast sensitivity (Saglam & Orsal, 2020). It also coincides with Rezaei et al. (2019) who reported that Pilates exercises improved the physical symptoms of premenstrual syndrome (Rezaei et al., 2019). Furthermore, it is relatively in line with a study done by Kirthika et al. (2018) in **India**, who emphasized that Pilates training Program implies decrease in the post test mean and a better reduction in the physical symptoms associated with Premenstrual dysphoric disorder (PMDD) (Kirthika et al., 2018). The current findings also match with a study done in **Iran** which indicated that there was a statistically significant difference in the physical symptoms among the Pilates group ( $p=0.003$ ) (Fatemeh et al., 2018). In addition, It is relatively in line with a study conducted in **Egypt**, where it exhibited that there was a highly significant difference between the study and control groups regarding feeling out of control, weak coordination, sleeplessness, confusion, headache, fatigue, pains, breast tenderness, cramps and swellings. There was beneficial effect of swimming exercises on most of the physical symptoms of PMS (Maged et al., 2018). The current study results also relatively compatible with an Iranian study which found that among the physical symptoms of PMS, headache ( $p = 0.001$ ), nausea ( $p = 0.01$ ), constipation ( $p = 0.01$ ), diarrhea ( $p = 0.01$ ), swollen breasts ( $p = 0.001$ ) had a significant reduction in the study group than the control group after intervention. Moreover, the differences between the mean of signs before and after intervention were significant in relation to bloating ( $p = 0.01$ ), Vomiting ( $p = 0.002$ ), hot flashes ( $p = 0.04$ ), increase in appetite ( $p = 0.008$ ) (Dehnavi et al., 2018).

Such an agreement between the results of the present study and the previously mentioned ones is emphasized by some literature which indicated that Pilates exercises increase venous return with repetitive muscle contractions which allow the release of fluid that causes bloating or tenderness. Pilates exercises also cause muscle strength in the abdominal area and help to get rid of prostaglandin which in turn reduce backache, abdominal and pelvic discomfort. Exercise is also known to increase endorphin levels that regulate progesterone and oestrogen synthesis and

encourage the production of endogenous anti-inflammatory chemicals as well as reduces adrenal cortisol for a short time and provides analgesic effect (Saglam & Orsal, 2020). (ROHMAH & Mukhoirotin, 2020)

The results of the present study showed mean total scores and sub total score regarding some of psychological symptoms of PMS was significantly lower among participants who engaged in Pilates training exercises at 4 and 8 weeks than those who performed Benson relaxation technique such as *Irritability, Tension, Loss of concentration, Depression, forgetfulness, Easy cry /easy spell and Confusion* (Table V). This could be attributed to the fact that Pilates exercises increases endorphin levels and reduces estradiol and other steroid hormones. It also reduces cortisol levels that is effective on psychological wellbeing. Physical activity increases the amount of progesterone and balances the levels of estrogen and progesterone, thereby reducing psychological symptoms (Saglam & Orsal, 2020).

This finding is congruent with study conducted by Çitil et.al (2021) who seen that the mean scores in the sub-dimensions of depressive affect, anxiety, irritability, depressive thoughts, changes in, changes in sleep, and the total mean score decreased. Additionally in a meta-analysis conducted by Fleming and Herring (2018) with 8 controlled studies investigating the effect of Pilates on mental health, they identified that Pilates resulted in significant, large, heterogeneous reductions in depressive ( $p=1.27$ , 95%CI: 0.44, 2.09;  $z=3.02$ ,  $p\leq 0.003$ ) and anxiety symptoms ( $p=1.29$ , 95%CI: 0.24, 2.33;  $z=2.40$ ,  $p\leq 0.02$ ). It also coincides with a study done in *Mashhad, Iran*, where it was showed that eight weeks of aerobic exercise training were effective in reducing the number of psychological symptoms of premenstrual syndrome. Four signs of anger outbreak ( $p = 0/01$ ), loneliness ( $p = 0.04$ ) and irritability ( $p = 0.01$ ), Mood swings ( $p = 0.01$ ) (Mohebbi-Dehnavi et al., 2017). The present finding is also in harmony with the results of a study fulfilled in *Iran* showed that the intensity of mood symptoms ( $P=0.0001$ ) reduced significantly among the Pilates exercises group

(Omidali, 2016) . Moreover, it matches with a study in *Cairo , Egypt* where it was reported that aerobic exercise, resulting in improvement of impaired concentration, confusion associated with premenstrual symptoms (El-Lithy et al., 2015). Again the present study findings coincide with two studies implemented in *Iran*, where they revealed an improvement in psychological symptoms of PMS and a decline in the mean score after 4 and 8 weeks of Pilates exercises ( $P\leq 0.05$ ). (Ilka et al., 2015). (VALIANI et al., 2015)

The results of the present study revealed highly significant reduction in mean total scores regarding some of behavioral symptoms of PMS among participants who engaged in Pilates training exercises than those who performed Benson relaxation technique at 8 weeks such as *Clumsiness, Lack of interest in usual activities, Obsessional thoughts, Compulsive behavior, Irrational thoughts as well as Being over sensitive* (Table V). The findings of the present study are consistent with a previous study where it was showed that Pilates exercises reduce the intensity of mood-behavioral symptoms associated with premenstrual syndrome , there was a significant difference in mood-behavioral symptoms in the intervention group ( $p=0.001$ ) (Fatemeh et al., 2018). The results is in line with the study done in *Bazile* where it revealed that lack of interest in social and home activities were more significant in the sedentary group than in the physical exercises group with PMS (Prazeres et al., 2018). It also matches with a previously mentioned study, where it was reported that Pilate's exercises were effective in reducing behavioral symptoms resulting from PMS at 8 week (Ilka et al., 2015)..

On assessing severity of premenstrual symptoms, the results of the study revealed that before intervention slightly more than one third of Pilates exercises and Benson relaxation groups experienced severe premenstrual syndrome, this percent decreased to only 1 % among former group compared to 20 % among the latter group. After 8 weeks, none of Pilates exercises group had severe PMS compared to 18% among Benson group. This was expected due to

likelihood reduction of physical, psychological and behavioral symptoms in Pilate exercise group (Table VI). These findings agree with a previously mentioned study, where it showed a decrease in the PMS scale from a severe level (70%) to a medium-scale (60%) in the first cycle of menstruation and a mild level (60%) in the second cycle among Pilates exercise group (ROHMAH & Mukhoirotin, 2020).

On the contrary, the current finding in disharmony with a study performed in Southern Egypt, where it concluded that No substantial associations between physical activities and premenstrual symptoms (Hassan et al., 2019). The distinction between the finding of this study and the present one may be due to different sample and interventions.

Surprisingly, within Benson relaxation therapy group there was significant reduction in severity of PMS over time (Fr test =34.696 & p <0.001). Regular practice of Benson relaxation therapy is an effective way of achieving balance between sympathetic and parasympathetic system. Physical effects of stress are alleviated by relaxation of body which relaxes mind automatically. This blocking can cut the cycle of anxiety and relieve the symptoms associated with anxiety (Benson et al., 2000). The present finding matches with a study executed in Iran, where it concluded the effectiveness of Benson's relaxation techniques as an alternative medicine for reducing physical and psychological symptoms of PMS (p = 0.001) (Olia et al., 2019). In addition, it matches with a study done in Iran, where it reported that Benson relaxation technique relieved physical symptoms of PMS (Mahmoudi, 2018). The present finding matches with a study implemented in Indonesia, where it showed that Benson relaxation therapy proved to be an efficient therapy to reduce anxiety in premenstrual syndrome (Fatmawati et al., 2018). Furthermore, it is in line with a study conducted in Surabaya, Indonesia, where it found that Benson therapy decreased anxiety level of premenstrual syndrome with significance level p=0,000 (Dewi, 2015).

### Conclusion

Based on the findings of the present study, it can be concluded that Pilates exercises were more effective on relieving physical, behavioral and psychological symptoms of

PMS than Benson relaxation technique. So the study aim and hypothesis were achieved within the framework of the present study.

### Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- 1- The curricula of basic nursing / midwifery education as well as continuing education could be enriched with, correct, relevant evidence – based information about non-pharmacological management of PMS.
- 2- In-service training programs for maternity nurses in gynecologic units- about the utilization of non- pharmacological approaches.
- 3- Further researches are also recommended:
  - a- Studies to find out the effect of other exercises on PMS.
  - b- The effect of Pilates exercise on other menstrual disorders.
  - c- Assessment of young females' satisfaction with the use of non-pharmacological techniques for management of PMS

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