

## Effect of pilates exercise versus yoga on primary dysmenorrhea in adolescent girls

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### ABSTRACT

The aim of this study was to investigate the effect of Pilates exercise versus yoga on primary dysmenorrhea in adolescent girls. The study was designed as a randomized controlled trial and was conducted with adolescent girls at an experimental school in Cairo. Sixty adolescent girls, aged 12 to 16 years, who were all diagnosed with primary dysmenorrhea, participated in this study. They were randomly assigned to one of two groups: Group (A) (Pilates exercise) with 30 participants, and Group (B) (Yoga exercise) with 30 participants. Participants were assessed before and after the treatment period. Group (A) performed Pilates exercises for 30 minutes, three days per week, for three months, while Group (B) engaged in yoga exercises for 30 minutes, three days per week, for three months. The Visual Analog Scale (VAS) was used to rate the intensity of pain, and the Verbal Multidimensional Scoring System (VMS) was used to assess the severity of menstrual symptoms. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The study revealed a statistically significant improvement in VAS and VMS measures following Pilates exercise in Group A ( $p < 0.05$ ). Similarly, a statistically significant improvement in VAS and VMS measures was observed following yoga exercise in Group B ( $p < 0.05$ ). Both Pilates and yoga exercises demonstrated

a significant impact on managing primary dysmenorrhea. The findings indicate that these mind-body interventions are effective in alleviating the severity of menstrual pain and related symptoms.

## **KEYWORDS**

Pilates Exercises; Yoga Exercise; Primary Dysmenorrhea; Adolescent Girls

## **1. INTRODUCTION**

Primary dysmenorrhea (PD) is painful menstruation in the absence of any underlying pelvic disorder. It is characterized by the endometrium's excessive production of prostaglandins, which leads to uterine hypercontractility, uterine muscle ischemia, hypoxia, and discomfort. The condition is a common contributor to pelvic pain in females in their reproductive years and is the most prevalent gynecological ailment. Restrictions on everyday activities and psychological stress, a leading cause of school and work absences, significantly affect the quality of life (Guimarães & Póvoa, 2020). Pain in the lower abdomen that can also spread to the lumbar region or inner thighs, along with other symptoms such as headache, nausea, and diarrhea, are all signs of PD (Itani et al., 2022).

Exercises are beneficial for treating primary dysmenorrhea in a variety of ways, including reducing stress, alleviating menstruation symptoms by boosting local metabolism, increasing local blood flow at the pelvic level, and enhancing endorphin production. Therapeutic exercises for primary dysmenorrhea shorten the duration of menstruation and lessen the intensity of associated pain (Fallah & Mirfeizi, 2018). Exercise and physical activity of mild to moderate intensity help reduce dysmenorrhea symptoms. Exercises cause the release of endorphins, which raise a participant's pain threshold and elevate their mood. They decrease the consumption of drugs and the duration of menstrual pain. Even better, they encourage constructive thinking and divert unwanted thoughts (Koushkie Jahromi et al., 2008).

Pilates exercise are based on the body's ability to perform a series of progressive movements. They are a type of body-mind training that emphasizes regulated movement, good posture, and a regular breathing rhythm (Araújo et al., 2012). To maintain physiological body curves, Pilates is a dynamic method that focuses on working strength, flexibility, and stretching. The abdominal region serves as the technique's primary strength center and is continuously engaged throughout all Pilates exercises (Shakeri et al., 2013).

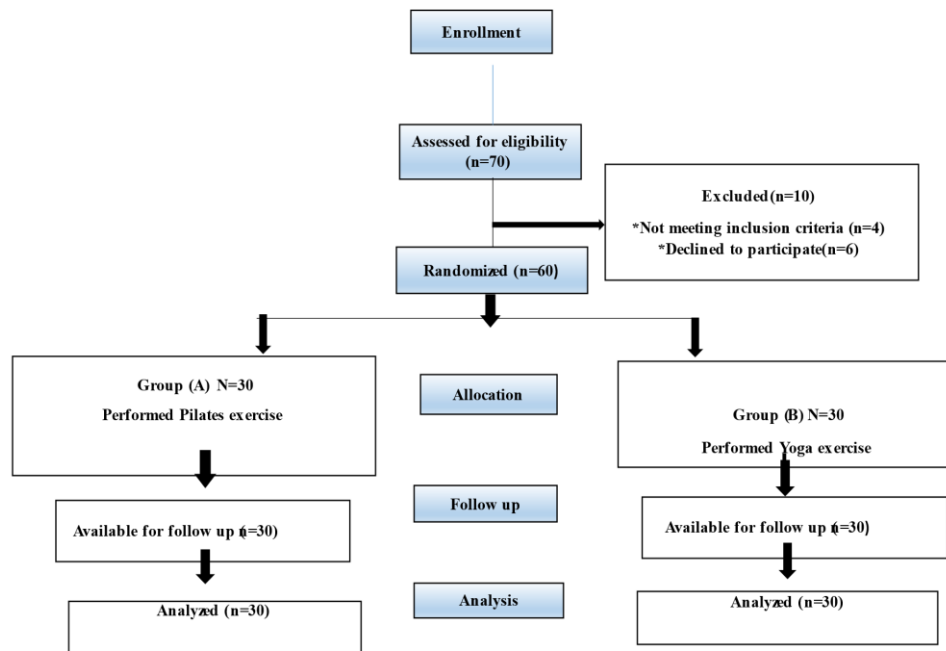
It has been observed that certain yoga poses can alleviate menstrual pain (McGovern & Cheung, 2018). Yoga frequently combines physical positions, breathing exercises, and relaxation techniques to increase physical fitness and reduce stress. Consequently, frequent yoga practice can aid in reducing anxiety. Patients who suffer from migraines, high cholesterol, hypertension, asthma, backaches, diabetes, and menopause have all benefited from using yoga as a supplemental therapy (Kiecolt-Glaser et al., 2010). Therefore, this study aims to investigate the effect of Pilates exercise versus yoga on primary dysmenorrhea in adolescent girls.

## **2. METHODS**

### **2.1. Study design and participants**

The study was designed as a randomized controlled trial and was conducted on adolescent girls at an experimental school in Cairo. Sixty adolescent girls between the ages of 12-16 years participated in this study, all diagnosed with primary dysmenorrhea. They were excluded from this study if they had cardiac diseases, irregular menstrual cycles, or previous abdominal or back operations such as pelvic fractures and umbilical or inguinal hernias. The outcome measures used were the Visual Analogue Scale (VAS) and the Verbal Multidimensional Scoring System for Assessment of Dysmenorrhea Severity (VMS). Parental consent was obtained from each participant. The study has been approved by the Research Ethics Committee of the Faculty of Physical Therapy, Cairo University (No. P.T.REC/012/004225).

An independent person randomized participants to group (A) (Pilates exercise) (n = 30) or group (B) (Yoga exercise) (n = 30) using sealed envelopes with numbers generated by a random number generator. To ensure that both groups had an equal number of participants, randomization was restricted to permuted blocks. There was no dropout after the random selection (Figure 1).



**Figure 1.** Flow Chart of the participants during the trial

## 2.2. Interventions

Both interventions started after the 4th day of menstruation and were administered for 30 minutes, three days a week, for three months. Group (A) performed Pilates exercises, while Group (B) performed yoga exercises.

## 2.3. Procedures

### 2.3.1. Pilates exercise (Group A)

The Pilates exercises were performed as follows:

- **Single Leg Stretch:** Each participant was instructed to inhale while bending her right knee and pulling her right leg toward her chest while lying supine. Then, she was to place her right hand around the outside of her right ankle and her left hand around the outside of her right knee. She would then change legs while keeping the left leg extended and toes pointed.
- **Double Leg Stretch:** From a supine lying position, each participant was instructed to breathe in while stretching out her body, reaching her arms behind her ears and extending her legs. Then, she would exhale while pulling her knees toward her chest and re-holding her knees with her arms.

- **Leg Floats:** From a crook lying position, each participant was instructed to inhale while moving her leg to the 90-90 position and exhale while straightening her leg.
- **Bridging:** From a crook lying position, each participant was instructed to gradually raise her hip off the floor until only her forearms and heels were in contact with the surface. Then, she was to raise one leg straight.
- **The Roll Up:** From a supine lying position, each participant was instructed to inhale while curling her head up and bringing her chin toward her chest, rolling up off the mat with the spine in a "C" shape and her legs straightened. She would then exhale as she started to roll backward, carefully reversing the movement.
- **Pelvic Curl:** From a crook lying position, each participant was asked to exhale as she lifted her pelvis off the floor. She was then asked to breathe in while holding the position and out while unrolling the spine and returning to the starting position.
- **Plank:** Each participant was instructed to lie on her elbows while supporting the weight of her body with both her forearms and toes.

All Pilates exercises were performed 10 times. Participants took a break whenever it was convenient for them.

### **2.3.2. Yoga exercise (Group B)**

In Group B, each participant received a video with explanations demonstrating the movements and breathing techniques. The video, created specifically for this study, guided the participants through the following yoga poses:

- **Cobra Pose (Bhujangasana):** The participant lay on her abdomen with legs together and palms down under the shoulders, forehead on the floor. Inhaling while bringing the head up, she lifted the hands while raising the chest off the floor, keeping the abdomen pressed to the floor. After holding the position for at least ten seconds, she exhaled while slowly returning to the starting position. This pose was repeated five times.
- **Cat Pose (Marjaryasana):** Starting in a quadruped position with hands directly under the shoulders and knees directly under the hips, the participant kept her back fully extended. She took a deep breath while gently squeezing the abdominal muscles backward toward the spine, tucking the tailbone down and under, contracting the buttocks, curving the spine upward, and curling the head inward. This pose was held for at least ten seconds and repeated five times.

- **Fish Pose (Matsyasana):** The participant lay on her back with her legs straight and feet together, with palms down and under her thighs. Pressing down on the elbows while inhaling, she arched her back so the top of her head rested on the floor, ensuring the weight was on the elbows. While in this position, she breathed deeply and kept her legs and lower torso relaxed. This pose was held for one minute.
- **Diamond Pose (Vajrasana):** The participant knelt with knees close together and sat back between her calves, keeping her back straight. She stretched her arms out forward with palms covering the knees. This posture was maintained for 2 minutes initially.
- **Knees to Chest Pose (Apanasana):** The participant lay on her back and gently pulled her knees toward her chest. She breathed in while releasing the knees slightly away from the chest. This pose was held for at least ten seconds and repeated five times.

The entire exercise session lasted 30 minutes, with a 30-second break between each pose.

## 2.4. Outcome measures

The degree of pain severity (the primary outcome) was determined by using Visual Analogue Scale (VAS) and severity of menstrual symptoms (the secondary outcome) was determined by using verbal multidimensional scoring system (VMS). Each outcome was measured before as well as after treatment on the day of peak menstrual pain.

### 2.4.1. Visual Analogue Scale (VAS)

The Visual Analogue Scale (VAS) is a 10-centimeter line with two ends, one signifying no pain and the other representing the worst possible pain. Participants were provided with this line and instructed to place a mark on it based on their current pain level (Rijkenberg et al., 2015).

### 2.4.2. Verbal Multidimensional Scoring System (VMS)

The VMS grading system, which assigns scores from 0 to 3, was categorized into mild, moderate, and severe based on the extent of activity limitations and pain experienced. The categories assessed include the need for analgesics, systemic symptoms, and ability to work (Unsal et al., 2010).

All participants received a summary of the questionnaire's purpose and instructions before completing it for three menstrual cycles (24-36 hours before the start of menstruation). The results were recorded both before and after the therapy was administered.

## 2.5. Data Analysis

The results were presented as mean  $\pm$  standard deviation (SD) for data that were normally distributed. The unpaired t-test was used to compare different variables between the two groups, while the paired t-test was used to compare variables before and after treatment within the same group. A p-value of less than 0.05 was considered significant. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS).

## 3. RESULTS

The independent t-test revealed no significant differences ( $p > 0.05$ ) in the mean values of age, body mass index, or pain duration between the two groups, as shown in Table 1.

**Table 1.** Demographic data for both groups (A & B)

Characteristics	Group A	Group B	t-value	p-value
Age (years)	13.83 $\pm$ 1.23	13.9 $\pm$ 1.24	0.2086	0.835 <sup>NS</sup>
MBI (kg/cm <sup>2</sup> )	21.3 $\pm$ 2.8	21.8 $\pm$ 3.3	0.6703	0.505 <sup>NS</sup>
Pain duration (days)	2.87 $\pm$ 0.68	2.97 $\pm$ 0.67	0.5737	0.568 <sup>NS</sup>

For both groups, the mean  $\pm$  SD of VAS values in the pre- and post-treatment are shown in Table 2. Post-treatment, there was a statistically significant decrease in pain intensity in both groups, as indicated by the paired t-test ( $p < 0.05$ ). However, the comparison of pain intensity between the groups after treatment revealed no statistically significant difference ( $p > 0.05$ ), according to the unpaired t-test.

**Table 2.** Results of VAS values in both groups pre- and post-treatment

VAS	Group (A) (n=30)	Group (B) (n=30)	t-value	p-value
Pre-treatment	6.0 $\pm$ 0.91	5.87 $\pm$ 1.01	0.538	0.593 <sup>NS</sup>
Post-treatment	3.37 $\pm$ 0.61	3.27 $\pm$ 0.69	0.592	0.556 <sup>NS</sup>
t- value	18.857	28.58		
p-value	0.0001 <sup>HS</sup>	0.0001 <sup>HS</sup>		
Percentage of improvement	43.83%	44.29%		

For both groups, the mean  $\pm$  SD of VMS values in the pre- and post-treatment are shown in Table 3. Post-treatment, there was a statistically significant decline in the severity of menstrual symptoms in both groups, as indicated by the paired t-test ( $p < 0.05$ ). However, the comparison of

severity between the groups after treatment revealed no statistically significant difference ( $p > 0.05$ ), according to the unpaired t-test.

**Table 3.** Results of VMS values in both groups pre- and post-treatment

<b>VMS</b>	<b>Group (A) (n=30)</b>	<b>Group (B) (n=30)</b>	<b>t-value</b>	<b>p-value</b>
<b>Pre-treatment</b>	2.07 ± 0.69	1.93 ± 0.69	0.747	0.458 <sup>NS</sup>
<b>Post-treatment</b>	1.00 ± 0.64	0.87 ± 0.63	0.812	0.420 <sup>NS</sup>
<b>t-value</b>	23.028	23.028		
<b>p-value</b>	0.0001 <sup>HS</sup>	0.0001 <sup>HS</sup>		
<b>Percentage of improvement</b>	51.69%	54.92%		

#### 4. DISCUSSION

The purpose of this study was to compare the effectiveness of Pilates vs Yoga for managing primary dysmenorrhea in adolescent girls. Primary dysmenorrhea (PD) is one of the most common complaints among young women. It involves painful menstruation in the absence of any disease in the pelvis. PD can have an impact on a person's daily life and social interactions in addition to their physical health (Midilli et al., 2015).

Adolescents with PD often feel excruciating pain, which has a negative impact on their mood. Because of this, young people with PD often miss work or school because they are in pain, which can have a significant negative social and economic impact (López-Liria et al., 2021). Previous research also indicated that 12% of teenage girls and young women (ages 14-20) missed school or work each month due to dysmenorrhea, while 24% of those respondents self-administered pain medication each month without seeing a doctor to determine the reason of their pain (Zannoni et al., 2014).

This current study showed a statistically significant improvement in VAS as well as VMS measures following Pilates exercise in group A ( $p < 0.05$ ) with an improvement percentage of 43.83% and 51.69%, respectively.

The results of the current study are consistent with previous research that found reductions in menstrual pain severity after participants completed Pilates exercise program specifically designed to alleviate this symptom (Khadiga et al., 2019). Women suffering from primary dysmenorrhea may experience symptom relief and an overall improvement in quality of life with regular Pilates instruction (Oswal et al., 2017).



Pilates exercises involve smooth, precise movements that are coupled with mental focus and breathing. These movements promote new, more ergonomic movement patterns and provide measurable psychological benefits by reducing stress levels (Sari, 2020).

Additionally, Pilates has been shown to boost endorphin levels in the blood, which act as natural sedatives and lead to feelings of calm and relaxation. Therefore, Pilates activities can enhance quality of life and reduce both the severity and duration of pain associated with primary dysmenorrhea (Salehi et al., 2012).

The current study also revealed a statistically significant improvement in VAS and VMS measures following Yoga exercise in group B ( $p < 0.05$ ), with improvement percentages of 44.29% and 54.92%, respectively. Yoga is increasingly used to treat gynecological issues, and regular yoga practice has been shown to reduce menstrual pain (Yang & Kim, 2016; Rakhshae, 2011).

Yoga-based exercises, which enhance awareness of pelvic floor muscles, are believed to yield positive results within just 4 weeks. Based on these findings, it is possible to assert that mind-body interventions positively impact both pain and body awareness (Cramer et al., 2018). Previous studies have also shown statistically significant improvements in physical function, vitality, mental health, social functionality, and pain among women with PD who engaged in a 12-week yoga practice and had no history of sports (Yonglitthipagon et al., 2017).

Yoga therapy has been demonstrated to be beneficial in reducing period cramps and monthly discomfort, with significant improvements across all outcome measures (Azima et al., 2015). The intervention aims to enhance general health, reduce stress, increase flexibility and muscle strength, and alleviate physical symptoms such as chronic pain, with yoga playing a crucial role (Carlson et al., 2004).

According to the findings, neither Pilates nor yoga exercises were significantly superior to each other in terms of reducing dysmenorrhea symptoms. However, overall measurements within each group showed significant improvement after either treatment. This indicates that both treatments are equally effective in alleviating the symptoms associated with dysmenorrhea.

## **5. CONCLUSIONS**

Both Pilates and yoga exercises have been shown to have a significant impact on managing primary dysmenorrhea. The findings of this study indicate that these mind-body interventions are effective in alleviating the severity of menstrual pain and related symptoms. While neither Pilates nor

yoga was found to be significantly superior to the other, both are effective in mitigating the symptoms of dysmenorrhea and improving the overall well-being of individuals affected by this condition.

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#### **AUTHOR CONTRIBUTIONS**

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

#### **CONFLICTS OF INTEREST**

The authors declare no conflict of interest.

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