

EFFECT OF PILATES EXERCISE ON PAIN INTENSITY AND FUNCTIONAL LIMITATION AMONG YOUNG WOMEN WITH PRIMARY DYSMENORRHEA

IRAM ANWAR¹, Shivangi Pathania²

¹MPT (Sports Physiotherapy) Student, Chandigarh University, Email ID: irammir300@gmail.com

²Assistant Professor, Department of Physiotherapy, Chandigarh University, Mohali, Punjab

ABSTRACT

Primary dysmenorrhea refers to pain during menstruation in the absence of a pelvic disorder and can impact daily activities and quality of life. As an approach to pain and symptom management, exercise-based care seems to be beneficial because of its low cost, ease of access, and potential for functional recovery. Despite the fact that primary dysmenorrhea can improve with 8 to 12 weeks of progressive Pilates, the remaining literature is inconclusive. The lack of rigor in the trials is evident due to poor blinding methods, lack of standard outcome measures, and incomplete follow-up.

This paper aims to contribute to the body of knowledge regarding the impact of Pilates exercise on the level of pain experienced and functional limitations among women with primary dysmenorrhea. We used a PICO framework, the PRISMA 2020 flow diagram for systematic reviews, and PEDro-style evidence appraisal. According to the current literature, functional limitations and pain level can be positively impacted with progressive Pilates. Health-related quality of life and sleep quality can also be improved with a progressive Pilates regimen.

KEYWORDS: primary dysmenorrhea; Pilates exercise; pain intensity; functional limitation; young women; PEDro; PRISMA

INTRODUCTION

Primary dysmenorrhea is a common pain disorder among adolescents and young adult women. The condition likely stems from the increased release of prostaglandins beyond normal uterine contractility ranges resulting in ischemic pain in the uterus. Fatigue, nausea, headache, back pain, changes in mood, and decreased participation in academic/socio/physical activities may occur and can persist for the duration of the menstrual cycle. The condition is of great concern as many young women have been reported to normalize pain from their menstrual cycle and consequently delay seeking medical help. Non-steroidal anti-inflammatory medications and hormonal therapies are the standard options for managing primary dysmenorrhea but may be unacceptable and/or unsuitable for some women. Therefore, safe and effective options free of pharmacological intervention such as exercise, physiotherapy, and lifestyle management become very important.

Pilates is a training system that focuses on pelvic placement and breathing, spinal and pelvic flexibility with core strengthening. Given that pain in primary dysmenorrhea is pelvic and lumbar in nature, Pilates may be a reasonable option. Pilates is also safe since low level options for key aspects of the intervention may be designed to stimulate and promote gradual progression of movement, thereby increasing comfort. Additionally, Pilates system promotes body awareness for participants to identify tension.

Recent studies on the effectiveness of pilates in managing pain and improving physical function have shown positive results. However, being small and having significantly limited design features, the studies mentioned have provided preliminary evidence and the effectiveness of alternative exercises should definitely not be dismissed. This paper employs an evidence-based framework. A research question is formed using PICO. Next, evidence is outlined via a PRISMA diagram. The studies are summarized in accordance with the PEDro scale and the value of Pilates for the function and pain is interpreted.

2. Research Question, Aim and Objectives

The principal question directs attention toward the use of Pilates exercise as a means of pain management among young women with primary dysmenorrhea and the impact of Pilates on reducing the pain and functional limitation within this population above that of no exercise, usual care, wait-list control, or exercise interventions. This question is important to consider as the population of interest requires practical and accessible interventions that do not require costly exercise equipment.

The primary focus is to understand how Pilates exercise impacts pain and limits daily activities for young women with primary dysmenorrhea. The goals are to provide an overview of the recent literature, discuss the possible mechanisms, and evaluate the quality of research from a PEDro perspective, as well as to provide a functional Pilates guide for upcoming studies. The hypothesis states that the use of a supervised and structured Pilates program is bound to be more effective in reducing menstrual-related pain and improving the functionality of young women with primary dysmenorrhea when

compared to the control group, who are placed on no exercise interventions or routine care. Improvements in flexibility, control of the lumbopelvic and lumbar area, as well as relaxation and improved sleep may partially rationalize the improvement in functionality.

Table 1: PICO Framework for the Proposed Research Paper

PICO element	Operational definition	Suggested measurement	Manuscript interpretation
Population	Young women or adolescent girls with primary dysmenorrhea, without diagnosed pelvic pathology.	Age, menstrual history, dysmenorrhea diagnosis, baseline pain score, medication use and exclusion of secondary causes.	The population should remain clearly limited to primary dysmenorrhea because endometriosis, fibroids and pelvic inflammatory disease require different management.
Intervention	Structured mat Pilates exercise programme emphasizing breathing, pelvic placement, trunk control, flexibility and progressive strengthening.	Frequency, duration, session length, adherence, exercise progression and adverse events.	The intervention should be reproducible and safe. A clear exercise manual strengthens the scientific value of the study.
Comparison	Wait-list control, usual care, no exercise, health education, yoga, gym-ball exercise, aerobic exercise or chair aerobics.	Comparator type, co-interventions, analgesic use and attendance.	Active comparators help evaluate relative effectiveness, while usual-care controls help estimate the absolute treatment effect.
Outcomes	Primary outcome: pain intensity. Secondary outcomes: functional limitation, menstrual distress, sleep quality, quality of life and absenteeism.	VAS/NPRS, Menstrual Symptom Questionnaire, Moos Menstrual Distress Questionnaire, SF-36, EQ-5D-5L, PSQI and attendance records.	Pain reduction is important, but functional improvement is the key clinical outcome for students and young working women.

Interpretation: The PICO framework maintains a clinical focus for this paper. It connects young women with primary dysmenorrhea with a reproducible Pilates intervention, appropriate comparisons, and measurable outcomes, primarily pain intensity and functional limitation.

3. METHODOLOGY

A structured literature-based method was employed. The research question was articulated in PICO framework and recent studies (2019-2026) were screened using PRISMA 2020-style logic and selected Pilates or relevant exercise trials were evaluated using a PEDro-style method. This method combines evidence selection and narrative interpretation. This method does not claim to be a registered systematic review, instead it aims to render the manuscript clear, methodical and appropriate for an academic audience. The alignment of this method assists in linking the research question with the results and the discussion as well as with recommendations. The literature search targeted in peer-reviewed publications related to primary dysmenorrhea and Pilates and therapeutic, yoga-based, aerobic and dysmenorrhea-related functional limitations and menstrual pain. The databases searched were PubMed, Google Scholar, Scopus, Web of Science, Science Direct, PEDro and sites of various journals. The main search phrases were primary dysmenorrhea AND Pilates, dysmenorrhea AND exercise therapy, and menstrual pain AND physiotherapy.

The studies included in this review targeted adolescent and/or young women with primary dysmenorrhea and included Pilates and/or structured exercise interventions. The types of studies included were randomized and/or controlled research, systematic reviews and relevant methodological papers. Research on secondary dysmenorrhea, non-peer-reviewed literature, and studies older than 2019 and unrelated research to the topic were excluded. The primary outcome analyzed was the level of pain, which was most commonly measured using the VAS or NPRS. The secondary outcomes of interest included menstrual distress, functional limitation, activity restriction, absenteeism, sleep quality, and quality of life. The PEDro was used because it is a scale that is appropriate for physiotherapy trials and the scores presented in this review are the authors' ratings of descriptive verbatim citations and not official database scores.

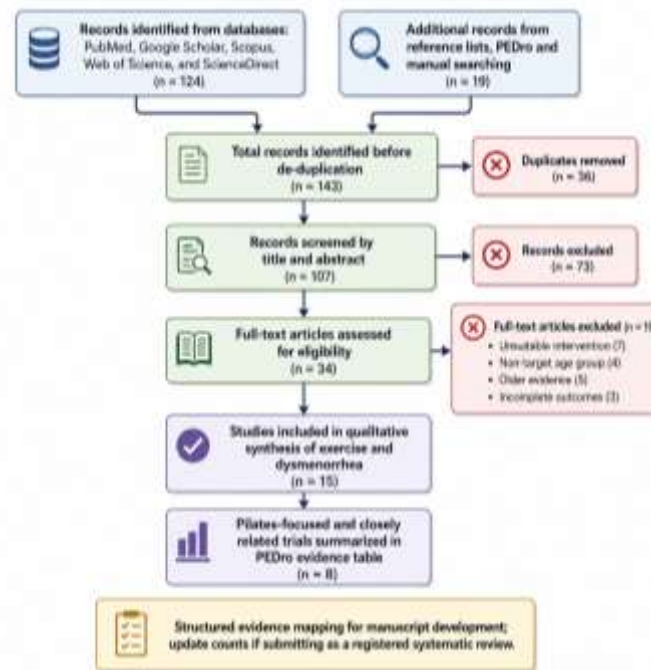


Figure 1: PRISMA 2020- Style Flow Diagram for Evidence Selection

4. RESULTS

Recently there has been evidence to suggest that structured exercise helps primary dysmenorrhea, and Pilates may be a beneficial option. Within Pilates studies participants reported lower levels of pain and menstrual symptoms after completing an 8-to-12-week Pilates programme. One such study implemented a 12-week programme, and reported Pilates participants had lower levels of pain compared to the wait-list control and also reported improvements in function and lowered levels of stress and better sleep. Improvements occurring during this time is highly relevant and may help women during their menstrual cycle and the disruptions caused in their daily life. This may justify the use of Pilates in student health and physiotherapy where group exercise may safely be implemented and is low cost. These results are supported by exercise reviews. Dysmenorrhea pain was shown to be relieved by aerobic exercise, resistance training, core, mind-body and relaxation-based programs. Effects did vary with dose and intensity of the intervention. Irregular and short exercise programmes were shown to be less beneficial than programmes of at least 8 weeks duration. Considering the focus of this study, pain is relevant, but of limited use on its own to measure the impact of dysmenorrhea. Young women may be suffering fatigue, poor attention and sleep disturbance, and also poor or limited movement, while also regularly attending classes. Pilates has been shown in research to reduce pain and symptoms, and has positive effects on quality of life, and therefore should be included as an option during rehabilitation.

Table 2: Recent Evidence and PEDro-Style Appraisal

Study	Design and sample	Intervention / comparison	Main outcomes	Key findings	PEDro-style score
Song & Kim (2023)	Randomized controlled trial; 30 young women with primary dysmenorrhea.	Pilates twice weekly for 12 weeks versus wait-list control.	Pain, menstrual symptoms, physical function, sleep quality and stress.	Pilates significantly reduced pain and symptoms and improved function, sleep and stress.	7/10; good, with usual exercise-trial limitations in blinding.
El Nahas et al. (2024)	Randomized controlled trial; 60 adolescent girls aged 12-16 years.	Pilates versus yoga for 30 minutes, 3 days/week, for 3 months.	VAS and Verbal Multidimensional Scoring system.	Both groups improved; yoga showed stronger change in some pain outcomes, while Pilates remained clinically useful.	6/10; moderate, active comparison and limited blinding.

Kirthika et al. (2024)	Comparative interventional study in young women with primary dysmenorrhea.	Pilates versus gym-ball exercise for 12 weeks.	VAS and Moos Menstrual Distress Questionnaire.	Both interventions improved pain and menstrual distress; longer controlled studies were recommended.	5/10; fair, limited details on allocation concealment and assessor blinding.
Bhatt et al. (2024)	Pilot comparative study; 24 females with primary dysmenorrhea.	Pilates versus chair aerobics, 4 days/week for 8 weeks.	NPRS, Menstrual Symptom Questionnaire and SF-36.	Both interventions improved pain, symptoms and quality of life; chair aerobics showed larger post-intervention differences.	5/10; fair for pilot evidence, limited sample and blinding.
Juzer et al. (2025)	Pilot intervention among school students with primary dysmenorrhea.	Pilates, yoga and control groups over 3 months.	VAS, absenteeism, EQ-5D-5L and PSQI.	Pilates and yoga improved pain, sleep and quality-of-life indicators compared with control.	5/10; fair, small sample and limited randomization detail.
Kannan et al. (2019)	Randomized controlled trial; 70 women with primary dysmenorrhea.	Treadmill-based aerobic training plus home exercise versus control.	Pain, quality of life, daily functioning and sleep.	Exercise reduced pain and improved functioning, with benefits maintained at longer follow-up.	7/10; good, with stronger follow-up than many exercise trials.
Kirmizigil & Demiralp (2020)	Randomized controlled trial in women with primary dysmenorrhea.	Functional exercises versus control.	Pain and sleep quality.	Functional exercise improved pain and sleep quality.	7/10; good, although participant and therapist blinding remained difficult.
Heidarimoghadam et al. (2019)	Randomized controlled trial applying FITT exercise principles.	Exercise based on frequency, intensity, time and type principles.	Pain severity and duration.	Structured exercise reduced severity and duration of dysmenorrhea.	6/10; moderate, useful for dose planning.

Interpretation: This table shows really helpful Pilates support when contextualized with non-Pilates specific research. Most studies have limitations like small samples, partial blinding and lengthy follow-ups. For future studies, I recommend concealed assignments, blinding the assessors, and most importantly long-term follow-ups.

4.1 Effect on Pain Intensity

The most common measurement of outcome for dysmenorrhea is pain intensity. Most Pilates studies show a reduction in pain intensity after sessions. Song and Kim showed a reduction after 12 weeks while Bhatt and colleagues showed a reduction of NPRS in the Pilates group. While the studies show evidence of varying effects, the direction of evidence suggests that Pilates is a viable option of non-pharmacologic intervention. Interpretive analysis should remain prudent. Young women need improvement that is meaningful and impactful in day to day living, and not just statistically significant. Following studies should show multiple pain scores across multiple menstrual cycles both before and after the intervention in order to lessen the effects of natural month to month variations.

4.2 Effect on Functional Limitation

Functional limitation encompasses a range of activities including limited participation in work, household activities, walking, sitting, and exercising including limited social participation. Pilates may aid in functional improvement by providing trunk control, pelvic alignment, flexibility, and reduced muscle guarding. This, in turn, reduces muscle guarding and may aid in boosting confidence when exercising during that time of the month.

There are also positive changes in physical function (especially with the ability to perform activities of daily living), improved sleep, reduced stress, and improved quality of life, all of which support the idea that Pilates offers something special beyond pain management. The next studies on this topic should include more objective measures of function, such as the SF-36 and EQ-5D-5L, the Menstrual Symptom Questionnaire, the Moos Menstrual Distress Questionnaire, and absentee/activity diaries. Function matters most of all, because the success of any intervention is only meaningful in that it allows young women to study, sleep, move, and participate with less of the debilitating effects of menstruation.

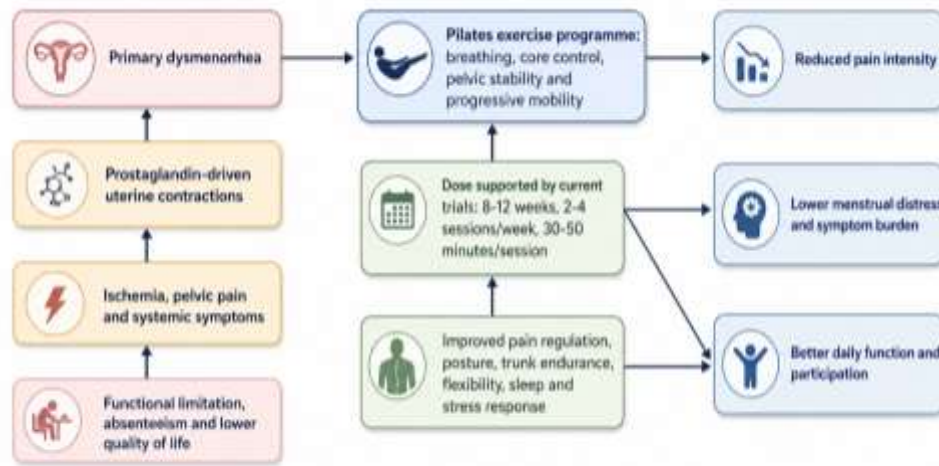


Figure 2: Biological and Functional Pathways Linking Pilates to Dysmenorrhea Outcomes

Interpretation: Pilates may improve dysmenorrhea outcomes through combined musculoskeletal, neurophysiological and psychosocial pathways, which is consistent with modern pain rehabilitation.

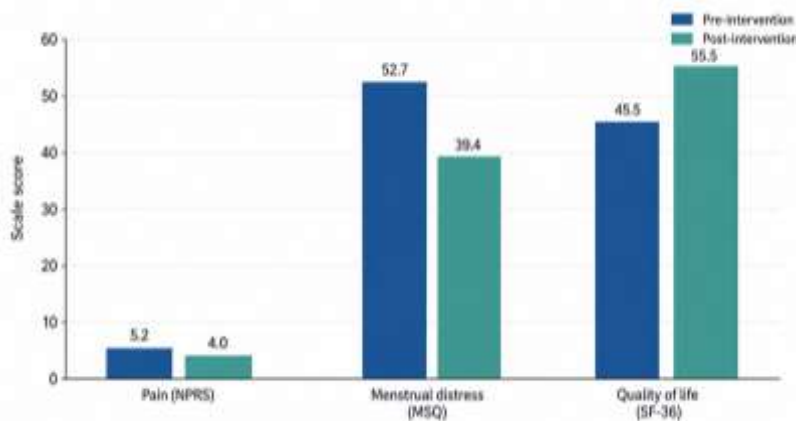


Figure 3: Pilates Outcome Changes Reported in a 2024 Pilot Trial

Interpretation: Although the pilot results indicate improvements in pain, symptoms associated with menstruation, and quality of life after undertaking Pilates, further conclusive research must be conducted through larger randomized trials.

4.3 Practical Intervention Characteristics

The Pilates dose must find a balanced intensity between efficacy and comfort. Most studies suggest sessions for 8 to 12 weeks, 2 to 4 times a week, each session having a duration of 30 to 50 minutes. An example of a safe session is breathing, pelvic tilts, cat-camel mobility, shoulder bridge, leg circles, gentle abdominals activation, hip mobility, and cool down stretching.

The program must be responsive to symptoms. The initial days of the menstrual period is usually painful for many, therefore, breathing, mobility, and relaxation exercises are better altered to replace high-load core activities. On non-pain days, flexibly and gradually increased core strengthening exercises are encouraged. Reported attendance, home practice, missed sessions, and dropout timing should be documented.



Figure-4 Practical Pilates Dose Proposed for Young Women with Primary Dysmenorrhea

Interpretation: The proposed dose converts recent evidence into a practical programme that can be adjusted according to pain severity, fitness level and menstrual phase.

5. DISCUSSION

The available data indicates that Pilates can be a useful adjunct treatment for primary dysmenorrhea. It should not be considered a replacement for traditional medical treatment when secondary dysmenorrhea is suspected, or in the case of severe or progressive pain. Pilates offers the combined benefits of decreased pain, improved ease of movement, improved sleep, reduced stress, and enhanced daily functional ability. There are multiple potential mechanisms for this effect. Pilates has the potential to improve core and hip stability, pelvic symmetry, breathing as well as spinal flexibility and control. Breathing control and movement instruction could potentially help to decrease nervous system arousal and help in the control and modulation of pain. The regular practice of Pilates may help to promote confidence in one's ability to control the situation and pain. It could also help decrease avoidance behavior of physical activities that are thought to be harmful when performed during one's menstrual cycle.

Pilates can be performed in a variety of settings on a mat and has the flexibility of being incorporated with a variety of props with minor adjustments. It can be seen as a "middle of the road" type of exercise that can be done during a woman's menstrual cycle. The flexibility and adaptability of Pilates appears to be the best of its advantages. It is at least as effective as other forms of exercise, such as resistance exercise, yoga, chair aerobics, and aerobic exercise. Pilates can be considered one of the many techniques used in a comprehensive exercise therapy regimen. With this type of exercise therapy Pilates can be considered if the other forms of exercise are preferred by the individual or are culturally acceptable exercise, are done within pain limits that are considered to be harmful, and if the exercise therapy can be done without a supervisor. The current evidence for the use of Pilates is of moderate quality and somewhat inconclusive. Exercise therapy, by its very nature, is difficult to adequately blind the user, so, complete insurance is difficult at best. Pilates can be done within pain limits and post a goal that can be maintained after a supervisor has been responsible for the exercise. Pilates can be done in a variety of settings on a mat and has the flexibility of being incorporated with a variety of props with minor adjustments. It can be seen as a "middle of the road" type of exercise.

Outcome selection is crucial. Both VAS and NPRS assess pain severity, yet there are essential measures for assessment—functional outcomes and quality of life. Recording analgesic usage is essential. This is because pain scores may become influenced by medication, creating ambiguity as to whether exercise has independent effects. Primary dysmenorrhea should be differentiated from secondary dysmenorrhea wherein there exists progressive severe pain, abnormal bleeding, dyspareunia, chronic pelvic pain, fever, or suspected pelvic pathology. These scenarios require a comprehensive clinical assessment. Both research validity and the safety of study participants depend on accurate screening.

An ideal future trial would fall under Q1-level and be of a parallel-group randomized design wherein one group would be receiving Pilates interventions versus the usual care or health education, and possibly another active exercise comparator. This future trial would also include a sample-size calculation, blind randomization to allocate participants, blinding of outcome assessors, registration of the study protocol, and monitoring of adverse effects throughout the study, as well as three to six months of follow-up. A manualized approach for the Pilates intervention would be implemented in order to document the exact intervention as it is to be repeated for the purpose of maintaining scientific integrity and to increase the likelihood of practical applicability of the intervention in exercise therapy. The results from this study are beneficial to the design and delivery of physiotherapy services throughout college, community, and community-based programs. Pilates based classes for small group interventions, led by physiotherapists, are especially relevant and should be implemented on campuses as convenience. Additionally, education materials should be designed to inform safe exercise, alarming responses, as well as the presentation of dysmenorrhea versus clinical menstrual pains.

6. Proposed Pilates Programme for Future Research

A Pilates program that is designed to be implemented and studied might look like this. It might have a duration of 12 weeks, involve three 40-minute sessions a week. Each session might have 5 minutes of breathing and pelvic mobility, 5 minutes of relaxation breathing with symptom reflection, 25 minutes of mat Pilates, and 5 minutes of flexibility. Progression is to be slow. Weeks 1 and 2 might be breathing and mobility with no pain. Weeks 3 to 6 might be focused

on strengthening. Weeks 7 to 10 might work on coordination and trunk control. Weeks 11 and 12 might focus on the practice of self-management. Exercise should remain at a moderate level and not cause sharp pain in the pelvic region. Pain is to be measured on a 10 centimeter VAS or 0-10 NPRS while on the first two days flow of the menstrual cycle. Functional limitation is to be measured using validated assessment tools with performance and attendance logs as evidence. Baseline and post-intervention assessments should measure and compare where groups have the most relevant clinical impact at the most recent follow-up assessment.

7. Limitations of the Current Evidence

The evidence has significant gaps. There is less Pilates-related research compared to general exercise literature, and research with longer follow-up times is scarce. Blinding is often missing, intervention descriptions can be vague, and control of analgesic use, confounding stress, activities, and menstrual cycle is sometimes lacking. There is a lot of detail in the comparative group and a large Pilates group activity, and yoga, chair aerobics, or gym-ball exercise activity and how future trials can be conducted. When designing future trials, a standardized outcome measure set should be agreed upon, and adherence and intervention manuals should be reported clearly to increase the comparability and reproducibility of the interventions.

8. Future Research Recommendations

Future studies should evaluate Pilates in sufficiently powered randomized controlled trials. The best design would compare traditional Pilates with usual care and, when feasible, another active exercise intervention. Stratifying the samples by baseline Pain Severity (PS) would help identify if mildly, moderately, or severely dysmenorrheic individuals achieve different levels of response.

A comprehensive intervention manual will be needed, which should include instructions for every exercise including starting posture and specific instructions for the pattern, number of reps, progression rules, contraindications, and adjustments for days when pain is experienced. The degree to which the therapist is trained should also be included, given that the quality of the instruction is likely to impact safety, adherence, and outcomes. A comprehensive manual will also support monitoring fidelity to the manual, as it will enable the researchers to determine if each session was delivered as planned. This justifies the manual's position to enhance the internal validity of the intervention and makes future replication or meta-analysis more likely to succeed. Mechanism-focused investigations should evaluate dysmenorrhea in relation to Pilates and consider constructs such as lumbopelvic control, muscle tension, sleep, and confidence to move. Flexibility and core endurance assessments and qualitative interviews may provide insight into the impacts of Pilates on dysmenorrhea.

Implementation research is warranted in schools, colleges, hostels, community clinics, and online platforms. Time, privacy issues, menstrual-related stigma, and the ability to exercise during pain may be barriers to implementation. Group classes, and hybrid, mobile, and online interventions should be evaluated for adherence. Digital interventions may be the best method to reach clients who are unable to attend in-person sessions, but online interventions should include safety and screening guidance. As menstruation remains a sensitive subject in many contexts, the safety and privacy of participants should be prioritized in all interventions.

9. CONCLUSION

Primary dysmenorrhea is a condition that is marked by painful menstrual experiences. The pain can be so severe that it causes women to be incapacitated, often enough that they are unable to go about their daily activities. The pain from dysmenorrhea can be especially hard to manage. It is said that physical exercise can help alleviate the pain. Of the various exercises that can be performed, Pilates has been said to have a meaningful impact, as it is said to be feasible for most, especially when it comes to young girls, and it is considered a promising way to help alleviate the symptoms caused by primary dysmenorrhea. The evidence suggests that over the course of 8-12 weeks, modeling Pilates classes delivered about 2-4 days/week for 30-50 minutes each session, can relieve pain and symptoms associated with the menstrual cycle, in addition to helping improve daily activities (function) and sleep. This also has a positive impact on the quality of life for those suffering. The conclusion should be balanced. Though Pilates promises great benefits, and has shown positive evidence, the current studies have a lot of limitations, such as a small cohort, poor blinding and a shorter period of observation. Therefore, Pilates should be prescribed as an adjunct exercise method.

REFERENCES

1. Armour, M., Ee, C. C., Naidoo, D., Ayati, Z., Chalmers, K. J., Steel, K. A., & de Manincor, M. J. (2019). Exercise for dysmenorrhoea. *Cochrane Database of Systematic Reviews*, 2019(9), CD004142. <https://doi.org/10.1002/14651858.CD004142.pub4>
2. Bhatt, J. P., Trivedi, S., & Mankad, D. (2024). Effect of Pilates versus chair aerobics exercises on pain and quality of life in females with primary dysmenorrhea: A pilot study. *International Journal of Health Sciences and Research*, 14(1), 65-71. <https://doi.org/10.52403/ijhsr.20240109>
3. Burnett, M. (2025). Guideline No. 169: Primary dysmenorrhea consensus guideline. *Journal of Obstetrics and Gynaecology Canada*, 47(5), 102840. <https://doi.org/10.1016/j.jogc.2025.102840>
4. Cai, J., Liu, M., Jing, Y., Yin, Z., Kong, N., & Guo, C. (2025). Effectiveness of aerobic exercise in alleviating primary dysmenorrhea among adolescents and young women: A systematic review and meta-analysis. *Acta Obstetrica et Gynecologica Scandinavica*, 104(5), 815-828. <https://doi.org/10.1111/aogs.15042>

5. Carroquino-Garcia, P., Jiménez-Rejano, J. J., Medrano-Sanchez, E., de la Casa-Almeida, M., Díaz-Mohedo, E., & Suarez-Serrano, C. (2019). Therapeutic exercise in the treatment of primary dysmenorrhea: A systematic review and meta-analysis. *Physical Therapy*, 99(10), 1371-1380. <https://doi.org/10.1093/ptj/pzz101>
6. El Nahas, E. M., Tammam Atia, D., Hassan, M. H., Abd El-Hakim, A. A. E.-M., & Sae'd Mahmoud, S. M. (2024). Effect of Pilates versus yoga on primary dysmenorrhea in adolescent girls: A randomized clinical trial. *SPORT TK-EuroAmerican Journal of Sport Sciences*, 13, 5. <https://doi.org/10.6018/sportk.605701>
7. Fernández-Martínez, E., Onieva-Zafra, M. D., & Parra-Fernández, M. L. (2019). Lifestyle and prevalence of dysmenorrhea among Spanish female university students. *International Journal of Environmental Research and Public Health*, 16(5), 713. <https://doi.org/10.3390/ijerph16050713>
8. Ferries-Rowe, E., Corey, E., & Archer, J. S. (2020). Primary dysmenorrhea: Diagnosis and therapy. *Obstetrics & Gynecology*, 136(5), 1047-1058. <https://doi.org/10.1097/AOG.0000000000004096>
9. Guimarães, I., & Póvoa, A. M. (2020). Primary dysmenorrhea: Assessment and treatment. *Revista Brasileira de Ginecologia e Obstetrícia*, 42(8), 501-507. <https://doi.org/10.1055/s-0040-1712131>
10. Heidarimoghadam, R., Abdolmaleki, E., Kazemi, F., Masoumi, S. Z., Khodakarami, B., & Mohammadi, Y. (2019). The effect of exercise plan based on frequency, intensity, time and type principle on primary dysmenorrhea. *Journal of Research in Health Sciences*, 19(3), e00456.
11. Itani, R., Soubra, L., Karout, S., Rahme, D., Karout, L., & Khojah, H. M. J. (2022). Primary dysmenorrhea: Pathophysiology, diagnosis, and treatment updates. *Korean Journal of Family Medicine*, 43(2), 101-108. <https://doi.org/10.4082/kjfm.21.0103>
12. Juser, I., Ramalingam, V., Ramalingam, K., & Aravind, P. (2025). Effects of Pilates and yoga on pain intensity, absenteeism, quality of life, and sleep quality among primary dysmenorrhea school students. *Indian Journal of Community Medicine*, 50(Suppl. 3), S497-S502. https://doi.org/10.4103/ijcm.ijcm_555_24
13. Kannan, P., Chapple, C. M., Miller, D., Claydon-Mueller, L., & Baxter, G. D. (2019). Effectiveness of a treadmill-based aerobic exercise intervention on pain, daily functioning, and quality of life in women with primary dysmenorrhea: A randomized controlled trial. *Contemporary Clinical Trials*, 81, 80-86. <https://doi.org/10.1016/j.cct.2019.05.004>
14. Kim, S. D. (2019). Yoga for menstrual pain in primary dysmenorrhea: A meta-analysis of randomized controlled trials. *Complementary Therapies in Clinical Practice*, 36, 94-99. <https://doi.org/10.1016/j.ctcp.2019.06.006>
15. Kirmizigil, B., & Demiralp, C. (2020). Effectiveness of functional exercises on pain and sleep quality in patients with primary dysmenorrhea: A randomized clinical trial. *Archives of Gynecology and Obstetrics*, 302(1), 153-163. <https://doi.org/10.1007/s00404-020-05579-2>
16. Kirsch, E., Rahman, S., Kerolus, K., Hasan, R., Kowalska, D. B., Desai, A., & Bergese, S. D. (2024). Primary dysmenorrhea: A narrative review of therapeutic options. *Journal of Pain Research*, 17, 2657-2666. <https://doi.org/10.2147/JPR.S459584>
17. Kirthika, S. V., Sudhakar, S., Mohan Kumar, G., Ramachandran, S., Deepthi, R. N. V., & Senthil Selvam, P. (2024). Efficacy of Pilates versus gym ball exercise in alleviating pain and improving quality of life in primary dysmenorrhea. *Cureus*, 16(4), e59184. <https://doi.org/10.7759/cureus.59184>
18. Moseley, A. M., Elkins, M. R., Van der Wees, P. J., & Pinheiro, M. B. (2020). Using research to guide practice: The Physiotherapy Evidence Database (PEDro). *Brazilian Journal of Physical Therapy*, 24(5), 384-391. <https://doi.org/10.1016/j.bjpt.2019.11.002>
19. Paci, M., Bianchini, C., & Baccini, M. (2022). Reliability of the PEDro scale: Comparison between trials published in predatory and non-predatory journals. *Archives of Physiotherapy*, 12(1), 10. <https://doi.org/10.1186/s40945-022-00133-6>
20. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
21. Rigal, P., Bonnet, S., Vieira, Á., Carvalhais, A., & Lopes, S. (2025). Therapeutic physical exercise for dysmenorrhea: A scoping review. *Journal of Functional Morphology and Kinesiology*, 10(1), 10. <https://doi.org/10.3390/jfmk10010010>
22. Song, B.-H., & Kim, J. (2023). The effect of Pilates exercise on primary dysmenorrhea in women. *Healthcare*, 11(14), 2076. <https://doi.org/10.3390/healthcare11142076>
23. Tsai, I.-C., Hsu, C.-W., Chang, C.-H., Lei, W.-T., Tseng, P.-T., & Chang, K.-V. (2024). Comparative effects of non-pharmacological interventions on menstrual pain intensity in primary dysmenorrhea: A systematic review and network meta-analysis. *Sports Medicine - Open*, 10, 63. <https://doi.org/10.1186/s40798-024-00718-4>
24. Xiang, Y., Yang, X., Chen, Y., Zhang, Y., & Zhang, H. (2025). Effect of therapeutic exercise on pain intensity in patients with primary dysmenorrhea: A systematic review and meta-analysis. *Frontiers in Medicine*, 12, 1540557. <https://doi.org/10.3389/fmed.2025.1540557>
25. Zheng, Q., Huang, G., Cao, W., & Zhao, Y. (2024). The efficacy of exercise in patients with primary dysmenorrhea: A systematic review and network meta-analysis. *BMC Women's Health*, 24, Article 545. <https://doi.org/10.1186/s12905-024-03453-w>