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Exercise Based Intervention for Dysmenorrhea: The Role of Abdominal Stretching and William's Flexion

Weni Guslia Refti[1*], Sefria Indah Primasari[2], Fahrul Irayani[3]
[1,3]Midwifery, University of Indonesia Mandiri, Indonesia
[2]Midwifery, Wahana Husada Bandar Jaya Midwifery Academy, Indonesia
weniguslia0@gmail.com, sefriaindahprimasari@gmail.com, fahrulirayani7@gmail.com

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ABSTRACT

Adolescence is a critical phase of human development characterized by rapid physical, psychological, and cognitive changes. One of the common reproductive health problems experienced by adolescent girls is primary dysmenorrhea, which is menstrual pain caused by excessive uterine contractions and increased prostaglandin levels. This condition can disrupt daily activities, learning concentration, and overall quality of life. This study aimed to analyze the effects of Abdominal Stretching Exercise and William's Flexion Exercise on the intensity of menstrual pain among ninth-grade female students at SMP Dharma Bhakti Waypanji, Kalianda, South Lampung. The study employed a quasi-experimental pre–post test design with two intervention groups. The sample consisted of 48 ninth-grade students with primary dysmenorrhea, selected using total sampling. The first group received Abdominal Stretching Exercise, while the second group received William's Flexion Exercise, each performed for 10–15 minutes per session under supervision to ensure proper execution. Pain intensity was measured before and after the intervention using the Numeric Rating Scale (NRS). Data were analyzed using an Independent t-test with a significance level of $\alpha = 0.05$. The results showed that both interventions significantly reduced menstrual pain. The mean pain score in the Abdominal Stretching group decreased from 2.79 to 2.58 ($p = 0.022$), while the William's Flexion group showed a greater reduction, from 2.79 to 1.54 ($p = 0.000$). The Independent t-test confirmed a significant difference in post-intervention pain scores ($t = 5.802$; $p = 0.000$), with William's Flexion Exercise being more effective. These findings support the physiological theory that strengthening the abdominal and lumbar muscles, improving pelvic circulation, and promoting neuromuscular relaxation contribute to the reduction of uterine contractions and pain perception. In conclusion, William's Flexion Exercise is more effective than Abdominal Stretching Exercise in reducing the intensity of dysmenorrhea. It is recommended that schools and health professionals incorporate this exercise as a routine non-pharmacological method for managing adolescent dysmenorrhea.

ABSTRAK

Remaja merupakan fase kritis perkembangan manusia dengan perubahan fisik, psikologis, dan kognitif yang cepat. Salah satu masalah kesehatan reproduksi yang sering dialami remaja putri adalah dismenore primer, yaitu nyeri menstruasi akibat kontraksi rahim berlebihan dan peningkatan prostaglandin, yang dapat mengganggu aktivitas, konsentrasi belajar, dan kualitas hidup. Penelitian ini bertujuan menganalisis pengaruh *Abdominal Stretching Exercise* dan *William's Flexion Exercise* terhadap intensitas nyeri menstruasi pada siswi kelas IX di SMP Dharma Bhakti Waypanji, Kalianda, Lampung Selatan. Penelitian menggunakan desain kuasi-eksperimental *pre–post test* dengan dua kelompok intervensi. Sampel

terdiri dari 48 siswi dengan dismenore primer, diambil menggunakan *total sampling*. Kelompok pertama menerima *Abdominal Stretching Exercise*, sedangkan kelompok kedua menerima *William's Flexion Exercise*, masing-masing selama 10–15 menit per sesi dengan pengawasan untuk memastikan pelaksanaan yang tepat. Intensitas nyeri diukur sebelum dan sesudah intervensi menggunakan *Numeric Rating Scale* (NRS). Data dianalisis dengan *Independent t-test* pada tingkat signifikansi α = 0,05. Hasil menunjukkan kedua intervensi menurunkan nyeri secara signifikan. Skor nyeri rata-rata kelompok *Abdominal Stretching* menurun dari 2,79 menjadi 2,58 (p = 0,022), sedangkan kelompok *William's Flexion* menurun lebih besar, dari 2,79 menjadi 1,54 (p = 0,000). *Independent t-test* mengonfirmasi perbedaan signifikan pasca-intervensi (t = 5,802; p = 0,000), dengan *William's Flexion Exercise* lebih efektif. Temuan ini mendukung teori fisiologis bahwa penguatan otot abdomen dan lumbar, peningkatan sirkulasi pelvis, serta relaksasi neuromuskular berkontribusi pada pengurangan kontraksi rahim dan persepsi nyeri. Kesimpulannya, *William's Flexion Exercise* lebih efektif dibandingkan *Abdominal Stretching Exercise* dalam menurunkan intensitas dismenore. Disarankan sekolah dan tenaga kesehatan mengintegrasikan latihan ini sebagai metode non-farmakologis rutin untuk manajemen dismenore remaja.

A. INTRODUCTION

Adolescent reproductive health problems remain a major public health concern, particularly menstrual disorders such as dysmenorrhea. Dysmenorrhea is defined as pain during menstruation caused by excessive uterine contractions and increased prostaglandin levels. This condition commonly occurs before or during menstruation and may be accompanied by nausea, vomiting, diarrhea, and fatigue (Saifah, 2021). Among adolescent girls, dysmenorrhea is often classified as primary dysmenorrhea and is not associated with underlying pelvic pathology.

The prevalence of dysmenorrhea among Indonesian adolescents is consistently high. Studies report that more than 60% of adolescent girls experience menstrual pain, with a considerable proportion suffering from moderate to severe pain that interferes with school attendance and learning concentration (Widyaningrum et al., 2022). documented a prevalence of 74.8% among adolescent girls in Aceh Besar. These findings indicate that dysmenorrhea is not only a biological phenomenon but also an educational and psychosocial issue that may compromise academic performance and quality of life (Zuhkrina, Y., & Martina, 2023).

The impact of dysmenorrhea extends beyond physical discomfort. Adolescents with menstrual pain frequently report decreased attention in class, irritability, mood disturbances, and reduced participation in school activities (Saputri, N., Astuti, S. A. P., & Rizky, 2023). Recurrent absenteeism during menstruation has also been reported, suggesting that dysmenorrhea may contribute to cumulative learning loss if not adequately managed. Therefore, effective and accessible pain management strategies are crucial in school-aged populations.

Pharmacological management using nonsteroidal anti-inflammatory drugs (NSAIDs) is widely practiced; however, concerns regarding side effects, inappropriate self-medication, and limited health literacy among adolescents highlight the importance of non-pharmacological alternatives (Oktriyedi, F., Handayani, L., & Piko, 2025). Physical exercise, particularly stretching-based interventions, has been recommended as a safe and low-cost method to

alleviate menstrual pain through improved blood circulation and endorphin release (Marlinda & Purwaningsih, 2023).

Two exercise modalities frequently examined in relation to dysmenorrhea are Abdominal Stretching Exercise and William's Flexion Exercise. Abdominal Stretching Exercise focuses on stretching the abdominal muscles and is typically performed for 10–15 minutes. (Fajrin, 2021) reported a statistically significant reduction in dysmenorrhea intensity among adolescent girls following abdominal stretching, indicating its potential as an effective non-pharmacological intervention. Similarly, William's Flexion Exercise, which emphasizes strengthening abdominal and gluteal muscles while stretching the lower back muscles, has been shown to reduce menstrual pain. Rahman and Hasanah (2024) demonstrated that this exercise significantly decreased pain scores in adolescents with primary dysmenorrhea by improving lumbar flexibility and reducing muscular tension.

Despite evidence supporting the effectiveness of each exercise independently, existing studies predominantly examine these interventions in isolation. There is a notable lack of direct comparative research evaluating which exercise modality provides greater pain reduction or is more practical for adolescent populations in school settings. Furthermore, previous studies often focus on clinical or community samples without specific attention to junior high school students, who may differ in physiological maturity, activity patterns, and adherence to exercise protocols. This limitation restricts the applicability of existing findings to school-based health promotion programs.

Therefore, although both Abdominal Stretching Exercise and William's Flexion Exercise have been proven effective individually, the relative effectiveness between the two interventions remains unclear. The absence of comparative evidence represents an important research gap, particularly in the context of adolescent reproductive health management within educational institutions.

Based on this gap, the present study raises the following research question: Is there a difference in the effectiveness of Abdominal Stretching Exercise and William's Flexion Exercise in reducing dysmenorrhea among ninth-grade adolescent girls at SMP Dharma Bhakti Waypanji, Kalianda, South Lampung?

B. METHODS

This study employed a quasi-experimental design with a pre–post test approach involving two intervention groups. The study was conducted at SMP Dharma Bhakti Waypanji, Kalianda, South Lampung. The target population consisted of ninth-grade female students who experienced primary dysmenorrhea.

The population included all ninth-grade female students who met the inclusion criteria, namely: (1) experiencing primary dysmenorrhea, (2) having regular menstrual cycles, (3) not consuming analgesic drugs during the intervention period, and (4) willing to participate in the study. Exclusion criteria were students diagnosed with secondary dysmenorrhea, musculoskeletal disorders, or other conditions that could interfere with physical exercise. Because the participants were underage, participation in this study required written consent from parents or legal guardians in addition to assent from the students themselves.

A total of 48 students fulfilled the eligibility criteria and were recruited as research subjects using a total sampling technique. Total sampling was applied because the number of eligible participants was limited and manageable, allowing all qualified subjects to be included to maximize statistical power and reduce selection bias.

Participants were divided into two intervention groups:

1. Abdominal Stretching Exercise Group

   Participants in this group performed Abdominal Stretching Exercise consisting of a structured series of stretching movements targeting the abdominal muscles. The exercise

protocol included warm-up, core stretching movements, and cool-down phases. Each session lasted approximately 10–15 minutes. The exercise was performed once daily for three consecutive days during the first and second day of menstruation. The intervention was supervised by the researcher to ensure correct posture, movement accuracy, and adherence to the protocol.

2. William's Flexion Exercise Group
   Participants in this group performed William's Flexion Exercise, which focused on strengthening the abdominal and gluteal muscles and stretching the lower back muscles to reduce lumbar tension. The exercise protocol included pelvic tilt, knee-to-chest movements, partial sit-ups, and hamstring stretching. Each session lasted approximately 10–15 minutes and was conducted once daily for three consecutive days during the first and second day of menstruation. Supervision was provided to ensure standardized execution of the exercise.

To maintain consistency, both intervention groups received standardized instructions, demonstration sessions prior to implementation, and identical exercise duration and frequency. The interventions were carried out in the school environment in a designated room under controlled conditions.

Menstrual pain intensity (dysmenorrhea) was measured before and after the intervention using the Numeric Rating Scale (NRS), a validated instrument ranging from 0 (no pain) to 10 (worst pain imaginable). Pretest measurements were taken prior to the first exercise session, while posttest measurements were conducted after completion of the intervention protocol. Pain assessments were performed individually in a private setting to minimize response bias and enhance participant comfort.

Data analysis was conducted using statistical software with a significance level of $\alpha = 0.05$. Normality testing was performed using the Shapiro–Wilk test. Homogeneity of variance between groups was assessed using Levene's test. Within-group differences in pain intensity before and after intervention were analyzed using the paired t-test. Between-group differences in post-intervention pain scores were analyzed using the independent t-test to determine the comparative effectiveness of Abdominal Stretching Exercise and William's Flexion Exercise.

This study received ethical approval from the institutional ethics committee. Written informed consent was obtained from all participants and their parents or guardians prior to data collection. Participants were informed about the purpose of the study, the intervention procedures, potential benefits, and their right to withdraw at any time without academic or personal consequences. Confidentiality and anonymity were strictly maintained throughout the study.

Several strategies were implemented to control potential confounding factors, including:

1. restricting participants to those with primary dysmenorrhea only;
2. excluding participants who consumed analgesics during the study period;
3. standardizing the timing, duration, and supervision of interventions;\ensuring similar baseline characteristics between groups; and\conducting pretest measurements to control for baseline pain differences.

C. RESULT AND DISCUSSION

1. Result

a. Distribution of Respondents in the Abdominal Stretching Exercise Group and William's Flexion Exercise Group

Table 1. Distribution of Respondents in the Abdominal Stretching Exercise Group and William's Flexion Exercise Group

Respondent Characteristics	Abdominal Stretching Exercise (n = 24)		William's Flexcion Exercise (n = 24)	
	F	%	F	%

Age (years)				
15	14	58.33	13	54.17
16	10	41.67	11	45.83
Total	24	100	24	100
Age at Menarche				
11	4	16.67	3	12.50
12	9	37.49	8	33.33
13	7	29.17	9	37.50
14	4	16.67	4	16.67
Total	24	100	24	100
Class Level				
IXA	8	33.33	7	29.17
IXB	9	37.50	10	41.67
IXC	7	29.17	7	29.17
Total	24	100	24	100

Based on Table 1, the distribution of respondents in both intervention groups shows comparable characteristics. In terms of age, the majority of students in the Abdominal Stretching Exercise group were 15 years old (58.33%), while the William's Flexion Exercise group also had a higher proportion of students aged 15 years (54.17%), indicating a similar age composition between groups. The age at menarche was likewise comparable across groups, with most participants reporting menarche at 12 or 13 years. In the Abdominal Stretching Exercise group, 37.49% experienced menarche at age 12 and 29.17% at age 13, whereas in the William's Flexion Exercise group, 33.33% reported menarche at age 12 and 37.50% at age 13. Class-level distribution was also relatively balanced. The largest proportion of students in the Abdominal Stretching Exercise group was from class IXB (37.50%), while the William's Flexion Exercise group similarly had the highest proportion of students in class IXB (41.67%). Overall, the respondent characteristics in both intervention groups were well balanced, supporting the comparability of the two groups for subsequent analysis.

b. Comparison of Pre-test and Post-test Dysmenorrhea Scores in Both Intervention Groups

Table 2. Pre-test and Post-test Dysmenorrhea Scores in the Abdominal Stretching Exercise and William's Flexion Exercise Groups

Pain Level	N	Mean ± SD (Pre-test)	Mean ± SD (Post-test)	Sig. (2-tailed)
Abdominal Stretching Exercise	24	2.79 ± 0.932	2.58 ± 0.717	0.022
William's Flexion Exercise	24	2.79 ± 0.884	1.54 ± 0.509	0.000

The analysis results show that both interventions had a significant effect on reducing dysmenorrhea among ninth-grade female students. In the Abdominal Stretching Exercise group, the mean pain score decreased from 2.79 to 2.58, with a p-value of 0.022, indicating a statistically significant reduction in menstrual pain. Meanwhile, the William's Flexion Exercise group demonstrated a greater reduction, with the mean score dropping from 2.79 to 1.54 and a p-value of 0.000, showing a highly significant improvement. These findings suggest that while both exercises effectively reduced dysmenorrhea severity, William's Flexion Exercise provided a more pronounced reduction in pain intensity compared to Abdominal Stretching Exercise.

c. Independent Samples t-Test of Post-test Dysmenorrhea Scores Between the Abdominal Stretching Exercise Group and William's Flexion Exercise Group

Table 3. Independent Samples t-Test of Post-test Dysmenorrhea Scores Between the Abdominal Stretching Exercise Group and William's Flexion Exercise Group

Levene's Test for Equality of Variances		**t-test for Equality of Means**								
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score	Equal variances assumed	1.381	.246	5.802	46	.000	1.042	.180	.680	1.403
	Equal variances not assumed			5.802	41.477	.000	1.402	.180	.679	1.404

The results of the Independent Samples t-Test indicate that there was no significant difference in variance between the two groups (Levene's Test, p = 0.246), allowing the analysis to proceed under the assumption of equal variances. The t-value of 5.802 with a significance level of p = 0.000 demonstrates a highly significant difference in post-test dysmenorrhea scores between the Abdominal Stretching Exercise group and the William's Flexion Exercise group. A mean difference of 1.042 indicates that the William's Flexion Exercise group experienced a substantially greater reduction in menstrual pain compared to the Abdominal Stretching Exercise group. The 95% confidence interval (0.680–1.403), which does not include zero, further confirms that this difference is statistically meaningful and consistently favors the effectiveness of William's Flexion Exercise.

2. Discussion

a. Effect of Abdominal Stretching Exercise and William's Flexion Exercise on Dysmenorrhea Reduction (Pre-test and Post-test Comparison)

Both interventions significantly reduced dysmenorrhea. Abdominal Stretching Exercise decreased mean pain from 2.79 to 2.58. This effect can be explained by the release of endogenous endorphins and improved pelvic blood circulation. Moderate physical activity activates descending inhibitory pathways that suppress nociceptive transmission(Guyton, A. C., & Hall, 2016). Further describe that stretching enhances vasodilation and tissue oxygenation, reducing ischemia-induced uterine pain(Tortora, G. J., & Derrickson, 2017).

William's Flexion Exercise resulted in a more pronounced reduction (mean 2.79 to 1.54). This aligns with the American College of Sports Medicine(Ge et al., 2021) (American College of Sports Medicine, 2021) guidelines, which state that strengthening exercises involving the abdominal, lumbar, and gluteal muscles improve neuromuscular coordination, promote parasympathetic dominance, and enhance blood

flow to pelvic organs. Improved muscular endurance also stabilizes posture and reduces musculoskeletal strain that can exacerbate menstrual pain.

The American College of Obstetricians and Gynecologists (American College of Obstetricians and Gynecologists, 2021)emphasizes that regular core and pelvic exercises reduce prostaglandin-mediated uterine contractions by improving pelvic circulation and decreasing local ischemia. Strengthened trunk muscles also reduce reflex muscle spasm in the lumbosacral region, which is commonly associated with dysmenorrhea.

These findings are consistent with (Anggreini, S. N., Desriva, N., & Ramadhani, 2022) and (Putri, M., & Hidayat, 2023). who reported significant pain reduction following William's Flexion Exercise. Further demonstrated that strengthening-based exercise was more effective than stretching alone in reducing menstrual pain (Dewi et al., 2022.).

b. Comparison of Post-test Dysmenorrhea Scores Between Both Intervention Groups (Independent Samples t-Test)

The Independent Samples t-Test results confirm that William's Flexion Exercise was significantly more effective than Abdominal Stretching Exercise in reducing dysmenorrhea among ninth-grade students. Levene's Test showed homogeneous variances ($p = 0.246$), validating the use of equal variances assumed. The t-value of 5.802 and $p = 0.000$ indicate a strong difference between groups, with a mean difference of 1.042 and a 95% confidence interval of 0.680–1.403 confirming superiority of the flexion exercise. Statistical comparison confirmed that William's Flexion Exercise was superior. Its combined mechanism of muscle strengthening, pelvic stabilization, and autonomic regulation explains its greater effect. While abdominal stretching mainly promotes flexibility and mild endorphin release, it does not sufficiently enhance pelvic muscle strength or lumbar stability.

The physiological benefits of William's Flexion Exercise stem from its ability to strengthen pelvic, abdominal, and lumbar muscles, improving spinal alignment and reducing pelvic floor tension. American College of Obstetricians and Gynecologists, (2021) states that enhanced muscular stability reduces vascular compression and prostaglandin-driven contractions. Guyton, A. C., & Hall, (2016) emphasize that improved circulation increases tissue oxygenation, reducing ischemic menstrual cramping.

These results are in line with earlier empirical studies. Anggreini, S. N., Desriva, N., & Ramadhani, (2022) found significant reductions in dysmenorrhea after William's Flexion Exercise among adolescents. Additional Indonesian findings further reinforce this pattern: Putri, M., & Hidayat, (2023) reported significant reductions in primary dysmenorrhea after William's Flexion Exercise among university students; Dewi et al., (2022.) demonstrated that core-strengthening interventions reduced menstrual pain more effectively than stretching alone; and Hartati, S., & Amelia, (2021) observed improvements in lumbar mobility and pain reduction following lumbar flexion-based exercises.

While abdominal stretching also offers benefits through flexibility enhancement and endorphin release(Tortora, G. J., & Derrickson, 2017), its lack of a strengthening component limits effectiveness in improving pelvic blood flow compared to William's Flexion Exercise. American College of Sports Medicine, (2021) notes that resistance-based and core-strengthening exercises produce deeper neuromuscular adaptation compared with low-intensity stretching. (College of Obstetricians and Gynecologists,

(2021) similarly highlights that pelvic muscle strengthening improves uterine perfusion and reduces vascular compression during menstruation.

Overall, both statistical findings and supporting literature consistently demonstrate that William's Flexion Exercise provides a more substantial therapeutic effect in reducing dysmenorrhea. Its combined influence on muscle strengthening, vascular improvement, and neuromuscular relaxation confirms it as the superior intervention for adolescents experiencing menstrual pain.

3. Limitation

Several limitations should be considered when interpreting these findings. First, the quasi-experimental design without randomization limits causal inference and may allow unmeasured confounding variables to influence outcomes. Second, the study was conducted in a single junior high school, restricting generalizability to broader adolescent populations. Third, dysmenorrhea intensity was measured using a self-reported Numeric Rating Scale, which is subjective and may be influenced by individual pain perception and reporting bias.

A critical limitation concerns the difference in intervention duration. William's Flexion Exercise was performed in three 45-minute sessions, whereas Abdominal Stretching Exercise was conducted in three 15-minute sessions. This discrepancy may act as a confounding variable, as longer exercise duration itself could contribute to greater endorphin release, muscular adaptation, and pain reduction. Therefore, the superior effect observed in the William's Flexion Exercise group may be partially attributable to longer exposure rather than solely to the type of exercise.

Future studies should standardize exercise duration and intensity between intervention groups, use randomized controlled designs, include larger and more diverse samples, and incorporate objective physiological indicators such as prostaglandin levels or muscle activity to strengthen causal interpretation.

D. CONCLUSION AND SUGGESTIONS

This study found that both Abdominal Stretching Exercise and William's Flexion Exercise significantly reduced dysmenorrhea among ninth-grade female students. However, William's Flexion Exercise produced a greater reduction in menstrual pain compared to Abdominal Stretching Exercise. These findings indicate that strengthening- and flexion-based exercises may offer more substantial benefits than stretching alone for managing dysmenorrhea in adolescents.

Nevertheless, this conclusion should be interpreted cautiously because the study used a quasi-experimental design with a specific and limited sample drawn from one junior high school, which may restrict generalizability to broader adolescent populations.

Based on these findings, schools are encouraged to integrate structured exercise programs, particularly William's Flexion Exercise, into adolescent health education or school-based health promotion activities. In addition, health professionals such as nurses and midwives are advised to provide guidance and counseling on appropriate non-pharmacological exercise interventions for adolescents experiencing dysmenorrhea.

For future research, it is strongly recommended to conduct randomized controlled trials (RCTs) with standardized intervention duration and intensity to validate these findings. Further studies should also involve larger and more diverse samples and explore combinations of exercise with other non-pharmacological approaches to strengthen evidence for dysmenorrhea management strategies.

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