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Association Between Physical Activity Level and Primary Dysmenorrhea Pain Intensity: A Cross-Sectional Study

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Abstract

Background: Primary dysmenorrhea is a common menstrual disorder among young women and may negatively affect daily activities, academic performance, and quality of life. Physical activity has been proposed as a potential non-pharmacological approach to reduce menstrual pain; however, evidence among female university students in Indonesia remains limited.

Objective: This study aimed to analyze the association between physical activity level and primary dysmenorrhea pain intensity among female university students.

Methods: A quantitative cross-sectional study was conducted among 40 female physiotherapy students aged 19–25 years. Physical activity level was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF), while pain intensity of primary dysmenorrhea was measured using the Numeric Rating Scale (NRS). Descriptive statistics were performed, followed by the Shapiro–Wilk test for normality. Pearson correlation analysis was used to examine the association between physical activity level and pain intensity, with a significance level set at $p < 0.05$.

Results: The mean total physical activity score was 3383.05 MET-minutes/week, while the mean dysmenorrhea pain intensity score was 4.33 on the NRS, indicating moderate pain. Pearson correlation analysis revealed a significant negative association between physical activity level and primary dysmenorrhea pain intensity ($r = -0.478$; $p = 0.002$), indicating that higher physical activity levels were associated with lower pain intensity.

Conclusion: This study demonstrates a significant negative association between physical activity level and primary dysmenorrhea pain intensity among female university students. These findings suggest that maintaining an adequate level of physical activity may have potential benefits in the non-pharmacological management of primary dysmenorrhea.

Keywords
Motor Activity; Primary Dysmenorrhea; Pain Measurement; Students; Female

Introduction

Menstruation is a normal physiological process in women of reproductive age and represents a key indicator of reproductive health. It involves the cyclic shedding of the endometrial lining accompanied by vaginal bleeding when fertilization does not occur. Hormonal fluctuations during the menstrual cycle, particularly changes in estrogen and progesterone levels, influence uterine contractility and may trigger various physical and psychological symptoms, including menstrual pain, fatigue, headache, lower back pain, and reduced functional capacity. Among these symptoms, dysmenorrhea is one of the most frequently reported complaints and remains a significant public health concern among young women.[1]

Dysmenorrhea is defined as painful menstruation characterized by cramping pain in the lower abdomen or pelvic region, which may radiate to the lower back, thighs, or legs.[2] Based on its etiology, dysmenorrhea is classified into primary and secondary types. Primary dysmenorrhea refers to menstrual pain that occurs in the absence of identifiable pelvic pathology and typically begins within the first two years after menarche, once ovulatory cycles are established. Pain usually lasts between 8 and 72 hours and is strongly associated with excessive production of uterine prostaglandins, particularly prostaglandin F2α, which induces strong uterine contractions, vasoconstriction, and transient uterine ischemia.[3] In contrast, secondary dysmenorrhea is caused by underlying gynecological conditions such as endometriosis, adenomyosis, pelvic inflammatory disease, or intrauterine device use.[4]

The prevalence of primary dysmenorrhea is high worldwide and varies widely depending on population characteristics and diagnostic criteria. Previous studies have reported prevalence rates ranging from 45% to 95% among women of reproductive age, with the highest prevalence observed in adolescents and young adults.[5] Young women frequently report that dysmenorrhea interferes with daily activities, academic attendance, and social participation. Local data from Indonesia indicate that dysmenorrhea remains highly prevalent among adolescents, with reported rates exceeding 70% in certain regions.[6] These findings underscore the substantial burden of dysmenorrhea on quality of life and productivity, particularly among female university students who face academic demands and psychosocial stressors.

Several risk factors have been identified as contributors to the severity of primary dysmenorrhea, including early menarche, nulliparity, irregular menstrual cycles, prolonged menstrual duration, family history of dysmenorrhea, smoking, and dietary habits.[7] In addition to these factors, lifestyle-related variables such as physical inactivity, prolonged sedentary behavior, inadequate sleep, and high stress levels have gained increasing attention. Among these modifiable factors, physical activity is considered a promising non-pharmacological approach due to its physiological and psychological benefits. Regular physical activity has been associated with improved blood circulation, enhanced endorphin release, reduced inflammatory mediators, and modulation of prostaglandin synthesis, all of which may contribute to pain reduction during menstruation.[8]

Previous studies have reported that women who engage in regular moderate-to-vigorous physical activity tend to experience lower intensity of menstrual pain compared with those who are physically inactive.[9] Physical activity is thought to reduce

dysmenorrhea symptoms by increasing pelvic blood flow, promoting uterine muscle relaxation, and enhancing pain tolerance through endogenous opioid mechanisms.[10] Conversely, low levels of physical activity have been associated with higher pain intensity and greater functional limitation during menstruation. Despite these findings, existing evidence remains inconsistent, and variations in study design, population characteristics, and measurement tools may contribute to heterogeneous results.[11]

Importantly, although the association between physical activity and primary dysmenorrhea has been explored in several international studies, research focusing on Indonesian female university students remains limited. Evidence is particularly scarce among students in health-related academic programs, such as physiotherapy, who may exhibit distinct activity patterns due to academic schedules, clinical practice requirements, and higher awareness of physical health. Furthermore, few studies have specifically examined this relationship within the local context of Bali, where sociocultural and lifestyle factors may influence physical activity behavior and menstrual health.

Therefore, there is a need for context-specific evidence to better understand the relationship between physical activity level and primary dysmenorrhea pain intensity among female university students in Indonesia. Addressing this gap may provide valuable insights for developing non-pharmacological strategies to manage menstrual pain and promote reproductive health in young women. The present study aimed to analyze the association between physical activity level and primary dysmenorrhea pain intensity among female physiotherapy students. It was hypothesized that higher physical activity levels would be associated with lower intensity of primary dysmenorrhea pain.

Methods

This study employed a quantitative cross-sectional correlational design to examine the association between physical activity level and primary dysmenorrhea pain intensity among female university students. A cross-sectional approach was selected because it allows assessment of the relationship between variables measured at a single point in time without intervention, which is appropriate for exploratory association analyses in observational research. The study was conducted at the Physiotherapy Study Program, Faculty of Health and Sciences, Universitas Dhyana Pura, Bali, Indonesia. Data collection was carried out between May and June 2025.

The study population consisted of all active female physiotherapy students enrolled at Universitas Dhyana Pura during the 2021–2024 academic cohorts. A total of 83 students met the general population criteria.

Participants were selected using a non-probability purposive sampling technique based on predefined eligibility criteria. The inclusion criteria were: (1) female students aged 19–25 years, (2) experiencing regular menstrual cycles, (3) reporting symptoms consistent with primary dysmenorrhea, and (4) willing to participate by providing informed consent. Exclusion criteria included: (1) history of diagnosed gynecological disorders such as endometriosis or pelvic inflammatory disease, (2) use of hormonal contraceptives or hormonal therapy, (3) presence of chronic medical conditions affecting pain perception, and (4) incomplete questionnaire responses. Of the 83 eligible students, 40 participants fulfilled the inclusion criteria and completed all study procedures. No missing data were identified in the final dataset. The independent variable was physical activity level, while the dependent variable was the intensity of primary dysmenorrhea pain. Body mass index (BMI) was recorded as a descriptive characteristic of the participants but was not included as an independent variable in the inferential analysis.

Physical activity level was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF). The IPAQ-SF is a widely used, internationally validated self-report instrument designed to measure physical activity performed during the previous seven days across walking, moderate-intensity, and vigorous-intensity activities. Physical activity data were converted into metabolic equivalent task minutes per week (MET-minutes/week) according to standard IPAQ scoring guidelines. Higher MET values indicate higher levels of physical activity.

Pain intensity was measured using the Numeric Rating Scale (NRS), a valid and reliable tool for assessing subjective pain intensity. Participants rated their average menstrual pain on a scale ranging from 0 (no pain) to 10 (worst imaginable pain). Pain intensity was treated as a continuous variable for statistical analysis. Body weight was measured using a calibrated digital scale, and height was measured using a stadiometer. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2) and categorized according to World Health Organization criteria. BMI data were collected to describe participant characteristics.

Data collection was conducted in three stages. First, ethical approval and institutional permission were obtained. Eligible participants received a detailed explanation of the study objectives and procedures and provided written informed consent. Second, participants completed the IPAQ-SF and NRS questionnaires under researcher supervision to minimize misunderstanding and recall bias. Third, anthropometric measurements were performed following standardized procedures. All data were anonymized to ensure participant confidentiality.

Several strategies were implemented to minimize potential bias. Clear written and verbal instructions were provided to reduce information bias during questionnaire completion. Researcher supervision during data collection aimed to limit recall and reporting bias. The use of validated instruments reduced measurement bias. Nevertheless, the potential for recall bias and social desirability bias inherent to self-reported measures could not be entirely eliminated. The sample size was determined based on feasibility and the total number of eligible participants available during the study period. A sample of 40 participants was considered adequate for correlation analysis in exploratory cross-sectional research; however, the limited sample size was acknowledged as a potential limitation affecting generalizability.

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were used to summarize participant characteristics and study variables, including mean, minimum, maximum, and standard deviation. Normality of continuous variables was assessed using the Shapiro–Wilk test. Because both physical activity level and pain intensity were normally distributed, Pearson correlation analysis was conducted to examine the association between physical activity level and primary dysmenorrhea pain intensity. Statistical significance was set at $p < 0.05$.

Results

A total of 40 female physiotherapy students were included in the final analysis. All participants completed the questionnaires and anthropometric measurements; therefore, no missing data were identified. Descriptive statistics for age, physical activity level, body mass index (BMI), and primary dysmenorrhea pain intensity are presented in Table 1.

Table 1. Descriptive Statistics of Study Variables (n = 40)

Variable	Minimum	Maximum	Mean	Standard Deviation
Age (years)	19	24	20.00	1.26
Physical activity (MET-minutes/week)	159.6	31,506.0	3,383.06	5,375.55
Body mass index (kg/m²)	14.94	34.69	22.70	5.28
Dysmenorrhea pain intensity (NRS)	1	9	4.33	1.86

As shown in Table 1, participants were predominantly young adults with a mean age of 20.00 years. The mean physical activity level was 3,383.06 MET-minutes/week, indicating substantial variability across participants. The mean BMI was within the normal range, while the mean dysmenorrhea pain intensity score indicated moderate pain. A linearity test was conducted to evaluate whether the relationship between physical activity level and primary dysmenorrhea pain intensity followed a linear pattern. The results of the linearity analysis are shown in Table 2.

Table 2. Linearity Test Between Physical Activity Level and Primary Dysmenorrhea Pain Intensity

Test Component	p-value
Linearity	0.002
Deviation from linearity	0.558

Based on Table 2, the linearity component was statistically significant ($p < 0.05$), while the deviation from linearity was not significant ($p > 0.05$). These findings indicate a significant linear relationship between physical activity level and dysmenorrhea pain intensity, supporting the use of Pearson correlation analysis. Pearson correlation analysis was performed to examine the association between physical activity level and primary dysmenorrhea pain intensity. The results are presented in Table 3**.**

Table 3. Pearson Correlation Between Physical Activity Level and Primary Dysmenorrhea Pain Intensity

Variables	n	r	95% CI	p-value
Physical activity (IPAQ-SF) vs. Dysmenorrhea pain intensity (NRS)	40	−0.478	−0.69 to −0.19	0.002

As shown in Table 3, Pearson correlation analysis revealed a statistically significant negative association between physical activity level and primary dysmenorrhea pain intensity ($r = −0.478$; $p = 0.002$). The 95% confidence interval did not cross zero, indicating a moderate inverse relationship between the two variables.

Overall, the results demonstrated that higher physical activity levels were associated with lower primary dysmenorrhea pain intensity among female physiotherapy students. These findings directly address the study objective and support the proposed hypothesis regarding the association between physical activity level and dysmenorrhea pain intensity.

Discussion

The present study demonstrated a significant negative association between physical activity level and primary dysmenorrhea pain intensity among female physiotherapy students. Pearson correlation analysis showed a moderate inverse relationship ($r = −0.478$; $p = 0.002$), indicating that students with higher levels of physical activity tended to report lower menstrual pain intensity. This finding supports the study hypothesis and aligns with previous evidence suggesting that physical activity may play a beneficial role in the non-pharmacological management of primary dysmenorrhea.

Importantly, this study contributes context-specific evidence from Indonesian female university students, particularly within a physiotherapy academic setting, where empirical data remain limited. The results strengthen existing literature by confirming that the association between physical activity and dysmenorrhea pain intensity is also observable in young women within the local sociocultural and educational context of Bali.

The observed inverse association between physical activity level and dysmenorrhea pain intensity is consistent with findings from previous studies conducted in different populations. Prior research has reported that women who engage in regular physical activity experience reduced menstrual pain compared with those who are physically inactive. Physical activity has been associated with lower prostaglandin production, improved pelvic blood circulation, and increased endogenous opioid release, all of which may contribute to pain modulation during menstruation.[9]

Studies among young women and university students have similarly demonstrated that moderate-to-high physical activity levels are linked to lower pain intensity and fewer functional limitations during menstruation. These findings support the notion that physical activity may serve as a protective factor against severe menstrual pain. Although the magnitude of correlation reported in previous studies varies, the moderate correlation observed in the present study is comparable to those reported in cross-sectional analyses using self-reported physical activity measures.[9,12]

However, some studies have reported weaker associations or inconsistent findings, which may be attributed to differences in study design, pain measurement tools, physical activity assessment methods, and participant characteristics. Variations in cultural context, lifestyle habits, and psychosocial stressors may also influence the relationship between physical activity and dysmenorrhea. Therefore, while the present findings are generally consistent with the literature, caution is warranted when making direct comparisons across studies.[10]

Several physiological mechanisms may explain the observed association between higher physical activity levels and lower dysmenorrhea pain intensity. Regular physical activity is known to enhance pelvic and systemic blood circulation, which may reduce uterine ischemia caused by excessive uterine contractions. Improved blood flow may alleviate hypoxia-related pain during menstruation.[10,13]

Physical activity also stimulates the release of endorphins, which act as endogenous analgesics and contribute to increased pain tolerance. Additionally, regular exercise has been associated with reduced inflammatory responses and modulation of prostaglandin synthesis, particularly prostaglandin F2α, a key mediator of uterine hypercontractility and menstrual pain. Through these mechanisms, physical activity may indirectly influence the intensity of dysmenorrhea symptoms.[14]

Beyond physiological pathways, behavioral and psychological factors may also play a role. Higher levels of physical activity are often associated with reduced stress, improved mood, and better sleep quality. These factors may contribute to lower pain perception and improved coping during menstruation. Given that university students frequently experience academic and psychosocial stress, the role of physical activity in stress regulation may be particularly relevant in this population.[15]

The participants in this study were predominantly young adults with a mean age of 20 years and were enrolled in a physiotherapy program. This academic environment may partially explain the relatively high mean physical activity level observed in the sample. Physiotherapy students often engage in practical sessions, clinical exposure, and campus activities that require physical movement, which may contribute to higher overall activity levels compared with students in non-health disciplines.

Despite remembering relatively high physical activity levels, the average dysmenorrhea pain intensity reported was in the moderate range. This finding suggests that while physical activity may be associated with lower pain intensity, it does not completely eliminate menstrual pain. Dysmenorrhea is a multifactorial condition influenced by hormonal, psychological, nutritional, and lifestyle-related factors. Therefore, physical activity should be considered as part of a broader, holistic approach to dysmenorrhea management rather than a standalone solution.

The findings of this study have several practical implications. From a clinical perspective, promoting regular physical activity may be a feasible and low-cost strategy to help manage primary dysmenorrhea among young women. Health professionals, including physiotherapists, can play a role in educating female students about the potential benefits of maintaining adequate physical activity levels as part of menstrual health management.

In the university setting, institutional initiatives that encourage physical activity, such as campus exercise programs, recreational sports, or active lifestyle campaigns, may indirectly contribute to improved menstrual health and academic productivity. Given that the present study focused on physiotherapy students, these findings may also reinforce the importance of integrating physical activity promotion into health education curricula.

This study has several strengths. It employed validated measurement instruments for both physical activity and pain intensity, used appropriate statistical analyses, and addressed a population that has been underrepresented in local research. Additionally, the inclusion of confidence intervals enhances the transparency and precision of the reported findings.

However, several limitations should be acknowledged. First, the cross-sectional design precludes any causal inference; therefore, the observed association should not be interpreted as evidence that physical activity directly reduces dysmenorrhea pain. Second, the relatively small and homogeneous sample size, consisting solely of physiotherapy students from a single university, limits the generalizability of the findings to other populations. Third, the use of self-reported questionnaires may introduce recall bias and social desirability bias. Finally, potential confounding factors such as stress levels, dietary patterns, sleep quality, and menstrual cycle characteristics were not controlled for in the analysis.

Future studies should consider longitudinal or interventional designs to better elucidate the causal relationship between physical activity and dysmenorrhea pain intensity. Larger, more diverse samples from different academic disciplines and geographic regions would improve generalizability. Additionally, future research should incorporate potential confounders, such as psychological stress, nutritional status, and menstrual history, to provide a more comprehensive understanding of factors influencing dysmenorrhea.

In summary, the findings of this study support the hypothesis that higher physical activity levels are associated with lower primary dysmenorrhea pain intensity among female university students. While the results should be interpreted with caution due to methodological limitations, they provide valuable evidence supporting the role of physical activity as a potential non-pharmacological component in the management of primary dysmenorrhea.

Conclusion

This study found a significant negative association between physical activity level and primary dysmenorrhea pain intensity among female physiotherapy students. Higher levels of physical activity were associated with lower menstrual pain intensity, as demonstrated by a moderate inverse correlation. These findings address the study objective and support the proposed hypothesis regarding the relationship between physical activity and dysmenorrhea pain intensity.

Although the cross-sectional design does not allow causal inference, the results suggest that maintaining an adequate level of physical activity may have potential benefits in the non-pharmacological management of primary dysmenorrhea among young women. Given the high prevalence of dysmenorrhea and its impact on daily functioning and academic performance, physical activity may be considered as a supportive strategy within a broader approach to menstrual health management.

The present study contributes local evidence from Indonesian female university students, particularly within a physiotherapy academic context. Future research using longitudinal or interventional designs and larger, more diverse samples is recommended to further clarify the role of physical activity in reducing dysmenorrhea pain intensity and to enhance the generalizability of these findings.

Author Contribution

Debora Andhini Putri Tristanto: Conceptualization, Methodology, Data curation, Formal analysis, Writing—original draft.
Luh Putu Ayu Vitalistyawati: Methodology, Writing—review & editing, Supervision.
Ni Made Rininta Adi Putri: Writing—review & editing.
I Gede Arya Sena: Writing—review & editing, Supervision.

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Conflict of Interest Statement

The author declares no conflict of interest.

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Ethics Statement

This study involved minimal risk and used anonymous self-reported questionnaires. Ethical permission was obtained from the study program management. All participants provided written informed consent prior to participation, and data confidentiality and anonymity were ensured throughout the research process.

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