ORIGINAL ARTICLE

Association between physical activity and the intensity of menstrual pain in young women

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ABSTRACT

This exploratory cross-sectional study examined physical activity patterns, menstrual characteristics, and menstrual pain intensity in 53 young women (mean age 19.98 ± 0.72 years). Physical activity during the previous seven days was estimated using the International Physical Activity Questionnaire framework and expressed as MET-min/week, while menstrual pain during the most recent cycle was assessed on a 0–10 numerical rating scale. Severe pain was reported by 19 participants (35.8%), and 39 participants (73.6%) were classified in the high physical activity category. Total physical activity was not significantly associated with pain intensity (*Spearman's rho* = .225, p = .105). Moderate physical activity showed a positive association with pain intensity (*Spearman's rho* = .428, p = .002), but the cross-sectional design does not permit causal interpretation. Rather than supporting a simple protective effect of greater activity volume, the findings suggest that the relationship between physical activity and menstrual pain may depend on individual symptoms, behavioural responses, measurement context, and unmeasured psychological or clinical factors. Because the sample was small, narrowly distributed by age, and dominated by highly active participants, the results should be interpreted as preliminary. Future studies should use larger and more heterogeneous samples, objective activity monitoring, validated multidimensional dysmenorrhea instruments, and repeated assessments across several menstrual cycles.

Keywords: sport medicine; menstrual pain; dysmenorrhea; physical activity; IPAQ; female students.

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INTRODUCTION

Menstrual pain, also known as dysmenorrhea, is one of the most common gynaecological problems among adolescent girls and young women. It is usually characterized by cramping pain in the lower abdomen occurring shortly before or during menstruation and may be accompanied by fatigue, nausea, headaches, dizziness, lower back pain, and limitations in everyday functioning (De Sanctis et al., 2015). Dysmenorrhea can significantly affect academic performance, social functioning, sports participation, sleep quality, and overall quality of life in young women (Gutman et al., 2022).

Dysmenorrhea is commonly classified into primary and secondary forms. Primary dysmenorrhea occurs in the absence of identifiable pelvic pathology and is most often associated with excessive production of prostaglandins, which increase uterine contractions and reduce uterine blood flow, leading to ischemia and pain (Matthewman et al., 2018). Secondary dysmenorrhea is associated with underlying gynaecological disorders such as endometriosis, adenomyosis, pelvic inflammatory disease, or uterine fibroids (De Sanctis et al., 2015). Among adolescents and young adults, primary dysmenorrhea is substantially more prevalent.

Previous studies have reported highly variable prevalence rates of menstrual pain, ranging from approximately 45% to over 90% depending on the population studied and the criteria used for pain assessment (Gagua et al., 2012). Such variability is partly explained by methodological differences, including age range, cultural factors, self-report bias, and pain measurement instruments. Nevertheless, the majority of studies consistently identify dysmenorrhea as a widespread public health issue among young women.

Physical activity is widely recognized as an important determinant of physical and mental health. According to the World Health Organization, adults should perform at least 150–300 minutes of moderate-intensity aerobic activity or 75–150 minutes of vigorous-intensity activity weekly, or an equivalent combination of both (World Health Organization, 2020). Regular physical activity contributes to cardiovascular health, metabolic regulation, improved mental well-being, stress reduction, and maintenance of healthy body composition (Bull et al., 2020).

The International Physical Activity Questionnaire (IPAQ) is one of the most commonly used tools for assessing physical activity in epidemiological studies. IPAQ expresses activity levels using metabolic equivalent units (MET-min/week), enabling comparison between walking, moderate activity, and vigorous activity (Craig et al., 2003). This standardized approach has been widely adopted in public health and sports science research.

The relationship between physical activity and menstrual pain remains insufficiently clarified. A number of studies suggest that physically active women experience lower menstrual pain intensity compared with inactive individuals (Daley, 2008). Exercise is believed to stimulate endorphin release, improve blood circulation, reduce stress levels, and positively influence hormonal regulation, all of which may contribute to reduced pain perception (Armour et al., 2019). Additionally, regular exercise may improve psychological resilience and reduce anxiety symptoms associated with menstrual discomfort.

Aerobic exercise, stretching, yoga, and recreational sports have been particularly highlighted as potentially beneficial interventions for reducing dysmenorrhea symptoms (Matthewman et al., 2018). Systematic reviews indicate that exercise interventions may reduce pain severity and improve quality of life; however, methodological heterogeneity between studies remains substantial. Variations in exercise type, duration, frequency, and participant characteristics make direct comparison difficult.

Despite evidence supporting beneficial effects of exercise, some cross-sectional studies report weak or inconsistent associations between physical activity and menstrual pain intensity. In some cases, women experiencing stronger pain may intentionally increase physical activity as a coping mechanism or form of symptom management. Furthermore, athletes and physically active individuals may demonstrate greater awareness of bodily sensations and therefore report symptoms differently compared to less active individuals.

Sedentary behaviour has also emerged as a potentially important factor influencing menstrual health. Prolonged sitting time has been associated with poorer cardiovascular and metabolic outcomes, increased inflammation, and reduced physical fitness (Bull et al., 2020). Some authors suggest that sedentary lifestyle patterns may contribute to increased menstrual discomfort, although evidence remains limited and inconsistent.

Research on dysmenorrhea among university students is particularly important because this population is frequently exposed to academic stress, irregular sleep patterns, dietary inconsistencies, and lifestyle changes that may influence hormonal balance and pain perception. University-aged women also represent a population with varying levels of physical activity participation, ranging from highly active individuals to predominantly sedentary lifestyles.

In Croatia and neighbouring countries, relatively few studies have simultaneously examined menstrual pain characteristics and objectively categorized physical activity levels using IPAQ methodology. Therefore, additional research is needed to better understand the relationship between activity patterns and dysmenorrhea symptoms in young women.

Accordingly, the present study was designed as an exploratory analysis of the association between self-reported physical activity and menstrual pain intensity in young women. Rather than assuming that higher activity volume is uniformly protective, the study considered the possibility that observed associations may reflect a complex interaction between activity behaviour, symptom-driven coping, pain perception, and measurement limitations.

The primary aim was to describe menstrual pain and physical activity patterns and to examine associations between total and domain-specific physical activity, sedentary behaviour, menstrual characteristics, and pain intensity. A secondary aim was to identify methodological issues relevant to future menstrual-health research using self-reported questionnaires.

METHODS

Sample and data collection

This exploratory cross-sectional study included 53 young women aged 19–22 years.

Data were obtained through an anonymous questionnaire and analysed as a secondary dataset. The narrow age range and convenience nature of the sample limit generalizability. Because most participants reported high physical activity, analyses involving activity categories were considered descriptive and hypothesis-generating rather than confirmatory.

Written informed consent form was signed according to the Declaration of Helsinki and subjects agreed to participate in the experiment which was approved by the University Ethics Committee.

Variables

The analysed variables were age, age at menarche, smoking status, chronic disease, therapy or medication use, menstrual cycle length and variability, days and average daily duration of vigorous activity, moderate activity and walking during the previous seven days, daily sedentary time, and menstrual pain intensity during the most recent cycle measured on a 0–10 numerical rating scale. The questionnaire did not include validated multidimensional measures of dysmenorrhea, hormonal contraceptive use, stress, sleep quality, diet, or body composition; these variables therefore could not be examined as potential confounders.

Data processing

Responses were cleaned and standardized before statistical analysis. Textual responses such as "*an hour and a half*", "*1:30*", "*3h*", "*every day*", and similar answers were converted into numerical values. For the menstrual cycle length variable, values below 15 days were considered invalid for interpretation because they most likely referred to bleeding duration rather than cycle length. Therefore, for inferential analysis only the valid range of 15–60 days was used.

Physical activity was expressed as MET-min/week according to the formula: walking = 3.3 × days × minutes, moderate activity = 4.0 × days × minutes, vigorous activity = 8.0 × days × minutes. Total physical activity was calculated as the sum of these components. Activity categories were simplified into low (<600 MET-min/week), moderate (600–2999 MET-min/week), and high (≥3000 MET-min/week).

Arithmetic mean, standard deviation, median, interquartile range, minimum, and maximum were used for descriptive statistics. Spearman rank correlation was used to examine associations between numerical variables and pain intensity because of the ordinal pain scale and non-normal distributions. Statistical significance was set at $p < .05$. Given the small sample, substantial imbalance across physical activity categories, and exploratory design, p-values were interpreted cautiously and no causal conclusions were drawn. Comparisons involving the low-activity category were not treated as inferentially meaningful because it contained only one participant.

RESULTS

The sample included 53 participants aged between 19 and 22 years. The average age at menarche was 12.95 ± 1.28 years. The average menstrual pain intensity was 4.81 ± 2.79, with a median value of 5.00.

Table 1. Descriptive indicators of analysed numerical variables.

Variable	n	Mean ± SD	Median (IQR)	Min	Max
Age (years)	53	19.98 ± 0.72	20.00 (20.00–20.00)	19.00	22.00
Age at menarche (years)	53	12.95 ± 1.28	13.00 (12.00–14.00)	11.00	16.00
Menstrual cycle length – valid range 15–60 days	38	29.92 ± 4.63	28.50 (28.00–30.00)	24.00	50.00
Cycle variability (days)	49	6.31 ± 8.54	5.00 (4.00–6.00)	1.00	56.00
Vigorous activity (days/week)	53	3.26 ± 1.97	3.00 (2.00–5.00)	0.00	7.00
Vigorous activity (min/day)	52	90.31 ± 56.40	90.00 (60.00–120.00)	1.00	250.00
Moderate activity (days/week)	51	4.22 ± 1.87	4.00 (3.00–6.00)	1.00	7.00
Moderate activity (min/day)	51	98.33 ± 61.32	75.00 (60.00–120.00)	30.00	300.00
Walking (days/week)	52	6.54 ± 1.28	7.00 (7.00–7.00)	1.00	7.00
Walking (min/day)	51	58.48 ± 44.09	47.50 (30.00–60.00)	10.00	200.00
Sedentary time (min/day)	39	187.45 ± 115.83	180.00 (120.00–240.00)	2.00	600.00
Total physical activity (MET-min/week)	53	5630.90 ± 4621.47	3892.00 (2986.00–6372.00)	577.50	23786.00
Menstrual pain intensity (0–10)	53	4.81 ± 2.79	5.00 (2.00–7.00)	0.00	9.00

Table 2. Frequency distribution of categorical variables.

Variable	Category	n (%)
Smoking status	non-smoker	35 (66.0%)
Smoking status	occasional smoker	11 (20.8%)
Smoking status	daily smoker	7 (13.2%)
Chronic disease	NO	50 (94.3%)
Chronic disease	YES	3 (5.7%)
Therapy/medication	NO	43 (81.1%)
Therapy/medication	YES	10 (18.9%)
Pain category	mild (0–3)	21 (39.6%)
Pain category	severe (7–10)	19 (35.8%)
Pain category	moderate (4–6)	13 (24.5%)
Physical activity category	high	39 (73.6%)
Physical activity category	moderate	13 (24.5%)
Physical activity category	low	1 (1.9%)

Association between physical activity and menstrual pain

Spearman correlation between total physical activity and menstrual pain intensity was positive but did not reach statistical significance (*Spearman's rho* = .225, *p* = .105). The strongest association was observed for moderate physical activity, where the correlation was positive and statistically significant (*Spearman's rho* = .428, *p* = .002). Walking, vigorous activity, and sedentary time did not show statistically significant associations with pain.

Table 3. Spearman correlations with menstrual pain intensity.

Variable	n	*Spearman's rho*	*p*
Total PA (MET-min/week)	53	.225	.105
Vigorous PA (MET-min/week)	52	.080	.571
Moderate PA (MET-min/week)	50	.428	.002
Walking (MET-min/week)	51	.086	.551
Sedentary time (min/day)	39	.063	.705
Cycle length (days)	38	.293	.074
Cycle variability (days)	49	-.022	.882

Pain according to physical activity category

Average pain values were similar in the moderate and high activity categories. The low activity category included only one participant, therefore reliable conclusions cannot be drawn for this group.

Table 4. Menstrual pain intensity according to physical activity category.

Activity category	n	Mean	SD	Median
Low	1	6.00	—	6.00
Moderate	13	4.69	3.12	5.00
High	39	4.82	2.74	5.00

DISCUSSION

The principal finding of this exploratory study is not evidence of a straightforward protective relationship between total physical activity and menstrual pain. Total physical activity was not significantly associated with pain intensity, whereas moderate physical activity showed a positive correlation with pain. This pattern should not be interpreted as evidence that moderate activity increases menstrual pain. Instead, it highlights that the relationship between activity behaviour and dysmenorrhea may be context-dependent and shaped by behavioural, perceptual, psychological, and clinical factors that were not measured in the present dataset.

A plausible conceptual interpretation is that physical activity and menstrual pain may influence each other bidirectionally. Regular activity may affect pain through circulation, mood, stress regulation, and endogenous analgesic mechanisms, as suggested by intervention research (Matthewman et al., 2018). At the same time, women with more severe symptoms may deliberately choose walking, stretching, or other moderate activities as coping strategies. Pain reporting may also differ according to body awareness, expectations, previous experiences, and psychological state. In a cross-sectional dataset, these pathways cannot be separated, which may help explain why observational studies produce inconsistent results even when exercise interventions report beneficial effects.

The positive association observed for moderate activity therefore requires restrained interpretation. Reverse causality is possible, and the association may also reflect residual confounding, reporting behaviour, or chance within a small sample. The study did not measure whether activity occurred during menstruation, whether participants exercised specifically to relieve symptoms, or whether the reported activity was occupational, recreational, or structured exercise. Consequently, the present finding should be viewed as hypothesis-generating and as support for more detailed temporal assessment rather than as a basis for clinical exercise recommendations.

Measurement limitations are central to interpretation. Menstrual pain was assessed using a single retrospective score from the most recent cycle, although dysmenorrhea includes pain duration, functional impairment, associated symptoms, medication use, and variation across cycles. Physical activity was also self-reported and required extensive cleaning of textual and inconsistent responses. IPAQ-based estimates are useful for population-level description but recall error and overestimation may contribute to the very high and widely dispersed MET-min/week values observed in this sample (Craig et al., 2003; IPAQ Research Committee, 2005). Objective monitoring and repeated symptom assessment would substantially improve measurement validity.

The questionnaire itself revealed an additional methodological issue relevant to menstrual-health research. Several participants appeared to confuse menstrual cycle length with bleeding duration, producing values of three to six days. This illustrates how apparently simple menstrual questions may be misunderstood unless the wording explicitly defines the interval being requested. Future questionnaires should distinguish cycle length, bleeding duration, pain duration, symptom timing, and cycle regularity, and should be pilot-tested before data collection.

The sample characteristics further restrict inference. Only 53 participants were included, all were between 19 and 22 years of age, and nearly three quarters were classified as highly active. The low-activity category contained only one participant, making category comparisons statistically unstable and preventing meaningful conclusions about dose-response patterns. The narrow age range reduces developmental heterogeneity but also limits generalizability to adolescents, older women, clinical populations, and less active groups.

Potential confounding also remains substantial. Hormonal contraceptive use, diagnosis of primary or secondary dysmenorrhea, psychological stress, anxiety, depressive symptoms, sleep quality, dietary habits, body composition, and analgesic use may influence both physical activity and menstrual pain. Because these factors were not measured, the observed correlations cannot be interpreted as independent associations. Future work should use multivariable models in adequately powered samples and should distinguish primary dysmenorrhea from pain related to underlying gynaecological conditions.

Within contemporary women's health and exercise science, these findings support an individualized rather than universal interpretation of exercise and menstrual symptoms. General recommendations that physical activity is beneficial should not be translated into the assumption that greater total activity will always correspond to lower pain in every individual. Symptom profile, exercise type, intensity, timing within the cycle, motivation for activity, and functional impact should all be considered when developing personalized advice.

The study should therefore be understood as a preliminary description of a highly active sample and as an illustration of the conceptual and measurement complexity surrounding dysmenorrhea research. Its main contribution is to show that total activity volume alone does not adequately explain menstrual pain intensity and that domain-specific associations may be influenced by reverse causality, measurement error, and unmeasured contextual factors. Longitudinal studies using accelerometers or wearable devices, validated dysmenorrhea scales, menstrual diaries, and repeated observations across several cycles are needed to clarify temporal relationships and identify which forms of activity may be helpful for specific symptom profiles.

CONCLUSION

In this exploratory sample of 53 young women, menstrual pain was common, with severe pain reported by 35.8% of participants. Total self-reported physical activity was not significantly associated with pain intensity, while moderate activity showed a positive association. This result does not demonstrate that moderate activity causes greater pain; it more likely reflects a complex and potentially bidirectional relationship involving symptom-driven behaviour, pain perception, measurement limitations, and unmeasured confounding. Because the sample was small, narrowly aged, and predominantly highly active, the findings should not be generalized or used to infer causal effects. The principal implication is that menstrual pain cannot be understood through total activity volume alone. Future research should use objective activity monitoring, validated multidimensional dysmenorrhea measures, assessment across multiple cycles, and individualized analysis of exercise type, timing, symptoms, and relevant psychological and clinical factors.

AUTHOR CONTRIBUTIONS

All authors meet the criteria for authorship in accordance with established ethical guidelines. Contributions are specified according to the CRediT (Contributor Roles Taxonomy) as follows: Conceptualisation: Boriss Bazanov, Ivica Franjko, Veljko Vukicevic. Methodology: Maki Grle, Goran Sporiš, Besnik Morina, Milna Milošević. Formal analysis: Davorin Antonić. Investigation: Ernest Šabić, Davor Lješević, Fredi Fiorentini, Zeljko Kovačević. Data curation: Naim Ćeleš, Davorin Antonić, Ivan Duroci, Hrvoje Ajman, Zeljko Širič. Writing – original draft: Ivana Grle, Goran Sporiš, Bozenka Galic Tiric. Writing – review & editing: Nijaz Skender, Jerko Prlić, Ahmet Naci Dilek, Adem Preljević. Supervision: Goran Sporiš, Dejan Tiric, Natalija Kurtović.

All authors have critically reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

ETHICAL APPROVAL

Ethical approval for this study was obtained within the framework of Faculty of Kinesiology 90/2025, which was approved by the relevant Ethics Committee and conducted in accordance with the Croatian Science Foundation's Code of Ethics. The study was carried out in accordance with the ethical principles of the Declaration of Helsinki.

AI USE DISCLOSURE

In accordance with current publishing ethics and transparency recommendations, artificial intelligence (AI) tools were used solely to assist with translation and language editing, with the aim of improving clarity and readability. No AI tools were used in the generation of scientific content, including the study design, data collection, analysis, interpretation of results, or the formulation of conclusions. The authors retain full responsibility for the content of the manuscript and confirm its originality, integrity, and accuracy.

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