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Comparative Study of Dysminor Yoga and Dysminor Gymnastics On Cardiovascular Responses in Adolescent Girls

Nur Chabibah*[1], Fitriyani[2], Rini Kristiyanti[3], and Septi larasati[4]

[123]*Midwifery Program ,Faculty of Health Science, Universitas Muhammadiyah Pekajangan Pekalongan, Indonesia*
[4]*Tangkil Kulon village midwife, Kedungwuni 2 health center, Pekalongan Regency, Central Java Province, Indonesia*

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ABSTRACT

Dysmenorrhea is one of the most common reproductive health problems among adolescent. Various non-pharmacological interventions have been recommended to alleviate menstrual discomfort and improve physiological adaptation. However, evidence comparing the physiological effects of these two interventions remains limited, particularly among adolescent populations. This study aimed to compare the effects of dysmenorrhea yoga and dysmenorrhea exercise on physiological parameters among adolescent girls with primary dysmenorrhea. A quasi-experimental study with a pretest-posttest comparison group design was conducted involving 30 adolescent girls who were allocated into a dysmenorrhea exercise group (n = 15) and a dysmenorrhea yoga group (n = 15). Physiological parameters, including oxygen saturation (SpO_2), heart rate, and respiratory rate, were measured before and after the intervention. Data were analyzed using paired and independent statistical tests with a significance level of $p < 0.05$. The results showed that oxygen saturation remained within normal physiological ranges in both groups and did not change significantly following intervention ($p > 0.05$). The dysmenorrhea exercise group demonstrated significant increases in heart rate ($p = 0.003$) and respiratory rate ($p < 0.001$), whereas the dysmenorrhea yoga group showed a significant increase only in respiratory rate ($p = 0.006$). Comparative analysis revealed significant differences between groups in heart rate ($p = 0.004$) and respiratory rate ($p = 0.009$), while no significant difference was observed in oxygen saturation ($p = 0.189$). Nevertheless, both interventions are safe and may serve as complementary non-pharmacological approaches to support adolescent reproductive health and physiological well-being.

Corresponding Author
Nur Chabibah
Affiliation 1; nurchabibahwidodo@gmail.com

INTRODUCTION

Adolescence represents a critical developmental period characterized by rapid physical, psychological, and reproductive maturation. During this stage, maintaining optimal physical fitness is essential because it supports cardiovascular health, musculoskeletal development, mental well-being, academic performance, and long-term health outcomes. However, many adolescent girls experience reproductive health problems that may interfere with physical activity and overall fitness, one of the most common being primary dysmenorrhea[1].

Dysmenorrhea is defined as painful menstruation originating from uterine contractions associated with increased prostaglandin production during the menstrual cycle. It is one of the most prevalent gynecological complaints among adolescent girls worldwide. Global studies report that the prevalence of dysmenorrhea ranges from 45% to 95%, with moderate to severe symptoms occurring in approximately one-third of affected adolescents[2]. In Indonesia, the prevalence of dysmenorrhea among adolescent girls has been reported to exceed 60%, making it a significant public health concern that affects quality of life, school attendance, physical activity participation, and psychosocial well-being[3].

Menstrual pain has consequences beyond discomfort. Adolescents experiencing dysmenorrhea frequently report fatigue, reduced physical endurance, sleep disturbances, emotional instability, decreased concentration, and limitations in daily activities. These symptoms may contribute to lower levels of physical activity and reduced cardiorespiratory fitness over time[4]. Physical fitness, particularly cardiorespiratory endurance, is a key indicator of adolescent health and is associated with lower risks of cardiovascular disease, obesity, metabolic syndrome, and mental health disorders in adulthood[5]. Therefore, interventions capable of reducing dysmenorrhea while simultaneously improving physical fitness are needed.

Non-pharmacological approaches have increasingly been recommended as first-line complementary therapies for dysmenorrhea because they are safe, inexpensive, and can be practiced independently. Among these interventions, dysmenorrhea exercise and yoga have gained considerable attention. Dysmenorrhea exercise consists of structured aerobic, stretching, and strengthening movements designed to improve pelvic blood circulation, reduce muscle tension, and stimulate endorphin release. Regular exercise has been shown to reduce menstrual pain intensity through increased production of endogenous opioids[6], improved oxygen delivery to tissues, and modulation of inflammatory mediators associated with menstrual pain[7].

Yoga, on the other hand, combines physical postures (asanas), breathing exercises (pranayama), and relaxation techniques that influence both physiological and psychological pathways. Previous studies suggest that yoga can reduce dysmenorrhea severity through improved autonomic nervous system balance, decreased sympathetic activity, reduced cortisol levels, enhanced pelvic circulation,

and increased pain tolerance [8]. Furthermore, yoga has been associated with improvements in flexibility, muscular endurance, balance, cardiorespiratory efficiency, and overall physical fitness among adolescents and young women [9].

Although both dysmenorrhea exercise and yoga have demonstrated effectiveness in reducing menstrual pain, most previous studies have focused primarily on pain intensity outcomes. Comparatively few studies have examined their effects on broader health indicators such as physical fitness, and direct comparisons between dysmenorrhea yoga and dysmenorrhea exercise remain limited. Understanding which intervention provides greater benefits for adolescent fitness is important because physical fitness is a key determinant of adolescent health and future disease prevention.

From a physiological perspective, dysmenorrhea exercise predominantly improves fitness through aerobic conditioning and musculoskeletal strengthening, whereas yoga may provide additional benefits through autonomic regulation, respiratory efficiency, stress reduction, and neuromuscular integration. These differences suggest that the two interventions may produce distinct effects on fitness outcomes among adolescent girls experiencing dysmenorrhea. However, current evidence remains insufficient to determine which approach is more effective in improving adolescent fitness. Therefore, this study aims to compare the effects of dysmenorrhea yoga and dysmenorrhea exercise on the fitness index of adolescent girls. The findings are expected to provide evidence-based recommendations for school health programs and adolescent reproductive health promotion strategies aimed at improving both menstrual health and physical fitness.

METHOD

Study Design

This study employed a quasi-experimental study with a pretest-posttest comparison group design to compare the physiological responses of adolescent girls following dysmenorrhea yoga and dysmenorrhea exercise interventions. Participants were assigned into two intervention groups, namely the Dysmenorrhea Yoga Group and the Dysmenorrhea Exercise Group. Physiological parameters, including oxygen saturation (SpO_2), heart rate, and respiratory rate, were measured before the intervention (pre-test) and after completion of the intervention program (post-test). The pretest-posttest comparison group design enabled the evaluation of within-group changes as well as differences in physiological responses between the two interventions.

Study Setting

The study was conducted at senior high schools in Pekalongan Regency, Central Java, Indonesia, from Maret to Juni 2026.

Participants

The target population consisted of adolescent girls aged 10–18 years who experienced primary dysmenorrhea. Participants who met the following criteria were included : 1) Female adolescents aged 10–18 years, 2) Experienced primary dysmenorrhea during the previous three menstrual cycles, 3) Menstrual cycle ranging from 21–35 days, 4) Not currently participating in structured sports training programs, 5) Physically healthy and able to perform moderate physical activity, 6) Willing to participate and signed informed consent forms (parental consent was also obtained for participants under 18 years old). Participants were excluded if they: 1) Had diagnosed gynecological disorders (endometriosis, adenomyosis, pelvic inflammatory disease), 2) Had cardiovascular, respiratory, or musculoskeletal disorders limiting exercise participation, 3) Used hormonal contraceptives, 4) Were absent from more than 20% of intervention sessions, and 5) Withdrew during the study period.

Sample Size

The minimum required sample size was 30 participants who divede in two group, dysmenorrhea exercise group (n = 15) and a dysmenorrhea yoga group (n = 15). Eligible participants were randomly allocated into the dysmenorrhea yoga group or dysmenorrhea exercise group using computer-generated random numbers. Allocation concealment was performed using sealed opaque envelopes prepared by an independent researcher.

Intervention Procedures

Dysmenorrhea Yoga Group

Participants received a dysmenorrhea yoga program developed from evidence-based yoga protocols for cardiovascular respon. Each session lasted approximately 45 minutes and consisted of: Breathing exercises (Pranayama) during 5 minutes, Warm-up movements during 5 minutes, Yoga postures (Cat-Cow Pose, Cobra Pose, Child Pose, Butterfly Pose, Supine Twist, Bridge Pose) during 25 minutes, Relaxation and mindfulness session during 10 minutes. The intervention was conducted one times under supervision of a certified yoga instructor. Cardiovascular and respiratory responses were measured before and after yoga activity. Physiological parameters, including oxygen saturation (SpO_2), heart rate, and respiratory rate.

Dysmenorrhea Exercise Group

Participants received a dysmenorrhea exercise program consisting of stretching and aerobic movements commonly recommended for menstrual pain management. Each session lasted approximately 45 minutes and consisted of: Warm-up exercises during 5 minutes, Aerobic and stretching movements during 30 minutes, Cool-down exercises during 10 minutes. The intervention was conducted three times per week for eight consecutive weeks under supervision of trained facilitators. Cardiovascular and respiratory responses were measured before and after dysmenorrhea Exercise

activity. Physiological parameters, including oxygen saturation (SpO_2), heart rate, and respiratory rate.

Data Collection Procedure

Baseline measurements were collected ten minute before intervention implementation. Post-test measurements were taken 10 minutes after a break from exercise in both yoga and diaminorrhea gymnastics activities. All assessments were performed by trained assessors blinded to group allocation.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics version 29. Descriptive statistics were presented as mean, standard deviation, frequency, and percentage. Normality was assessed using the Shapiro-Wilk test. For within-group comparisons used paired t-test. For between-group comparisons used Independent t-test . Statistical significance was set at $p < 0.05$.

RESULT AND DISCUSSION

Result

Table 1 Characteristics responden

Characteristics	Mean ± SD	Min-Max
Age	12.22 ± 1.50	10-16

A total of 30 adolescent girls completed the intervention program, consisting of 15 participants in the dysmenorrhea exercise group and 15 participants in the dysmenorrhea yoga group. The mean age of participants was 12.22 ± 1.50 years.

Table 2 Analisa Respon Kardiovaskular dan Respirasi Sebelum Yoga Disminore

Variable	Pre-test Mean±SD	Post-test Mean±SD	p-value
SpO_2 (%)	98.93 ± 0.26	98.87 ± 0.35	0.582
Nadi (x/menit)	93.47 ± 19.59	104.73 ± 19.45	0.003
RR (x/menit)	22.27 ± 1.28	25.20 ± 1.82	0.001

In the dysmenorrhea exercise group, oxygen saturation remained stable after intervention (98.93 ± 0.26 vs 98.87 ± 0.35; p=0.582). However, significant increases were observed in heart rate (93.47 ± 19.59 vs 104.73 ± 19.45 beats/min; p=0.003) and respiratory rate (22.27 ± 1.28 vs 25.20 ± 1.82 breaths/min; p 0.001).

Table 3 Analisa Respon Kardiovaskular dan Respirasi Sebelum Senam Disminore

Variable	Pre-test Mean±SD	Post-test Mean±SD	p-value
SpO_2 (%)	98.13 ± 0.35	98.27 ± 0.46	0.164
Nadi (x/menit)	96.47 ± 6.69	96.47 ± 6.69	1.000
RR (x/menit)	16.67 ± 1.99	17.93 ± 1.58	0.006

In the dysmenorrhea yoga group, oxygen saturation also showed no significant change (98.13 ± 0.35 vs 98.27 ± 0.46; p=0.164). Heart rate remained unchanged (96.47 ± 6.69 vs 96.47 ± 6.69 beats/min; p=1.000), whereas respiratory rate increased significantly following intervention (16.67 ± 1.99 vs 17.93 ± 1.58 breaths/min; p=0.006).

Table 4 Analisa Respon Kardiovaskular dan Respirasi Sebelum Senam Disminore

Variable	Δ Senam	Δ Yoga	p-value
SpO_2 (%)	-0.07	+0.13	0.189
Nadi (x/menit)	+11.27	0.00	0.004
RR (x/menit)	+2.93	+1.27	0.009

Comparison of changes between groups demonstrated significant differences in heart rate (Δ=11.27 vs 0.00 beats/min; p=0.004) and respiratory rate (Δ=2.93 vs 1.27 breaths/min; p=0.009), whereas oxygen saturation changes did not differ significantly between groups (p=0.189).

Discussion

The present study compared the physiological responses of adolescent girls following dysmenorrhea exercise and dysmenorrhea yoga. The findings indicate that both interventions maintained normal oxygen saturation levels while producing different cardiorespiratory adaptations. These findings suggest that although both interventions are safe and beneficial forms of physical activity, they may induce physiological responses through different mechanisms.

The absence of significant changes in oxygen saturation (SpO_2) in both groups suggests that pulmonary gas exchange remained efficient throughout the intervention period. Oxygen saturation values remained above 98% in both groups, indicating adequate arterial oxygenation and normal cardiopulmonary function[10]. Similar findings have been reported in studies evaluating moderate-intensity exercise and yoga interventions among adolescents, where oxygen saturation generally remains stable despite increased metabolic demands due to effective respiratory compensation

mechanisms[11]. Previous research has demonstrated that healthy adolescents possess substantial cardiopulmonary reserve capacity, enabling maintenance of arterial oxygen saturation during light-to-moderate physical activity[12].

A significant increase in heart rate was observed in the dysmenorrhea exercise group, whereas no significant change occurred in the yoga group. This finding is physiologically plausible because dysmenorrhea exercise incorporates rhythmic aerobic movements that increase energy expenditure and oxygen consumption. During aerobic exercise, sympathetic nervous system activation stimulates catecholamine release, increasing cardiac output and heart rate to meet the metabolic demands of active skeletal muscles[9]. Increased cardiac output enhances tissue perfusion and oxygen delivery[2], which may contribute to reduced menstrual discomfort through improved pelvic circulation and accelerated clearance of inflammatory mediators [6].

The greater increase in heart rate among participants performing dysmenorrhea exercise may also indicate a stronger acute cardiovascular training stimulus. Studies have shown that repeated elevations in heart rate during structured exercise can improve aerobic fitness, stroke volume, endothelial function, and cardiovascular efficiency over time[13]. Therefore, although the present study did not directly assess VO_2max, the observed cardiovascular response suggests a potential benefit of dysmenorrhea exercise for improving cardiorespiratory fitness among adolescent girls.

In contrast, the yoga group demonstrated stable heart rate values following intervention. This finding supports previous studies showing that yoga exerts its effects primarily through autonomic nervous system regulation rather than through substantial cardiovascular loading[14]. Yoga integrates physical postures, breathing techniques, and relaxation practices that stimulate parasympathetic activity while suppressing excessive sympathetic activation[15],[16]. Increased vagal tone has been associated with reduced resting heart rate, improved heart rate variability, and enhanced autonomic balance [17].

The significant increase in respiratory rate observed in both intervention groups indicates adaptive ventilatory responses to physical activity. However, the magnitude of change was significantly greater in the dysmenorrhea exercise group than in the yoga group. Increased respiratory rate during exercise represents a physiological mechanism designed to meet elevated oxygen demands and facilitate carbon dioxide elimination from metabolically active tissues[9]. Similar findings have been reported among adolescents participating in aerobic exercise programs, where respiratory rate increases proportionally with exercise intensity and energy expenditure[13].

Conversely, yoga breathing techniques emphasize controlled diaphragmatic breathing and respiratory efficiency rather than increased ventilatory frequency. Previous investigations have demonstrated that yoga practice improves respiratory

muscle strength, lung expansion, tidal volume, and breathing efficiency while reducing unnecessary respiratory effor[18].This mechanism may explain why respiratory rate increased less dramatically in the yoga group despite participants engaging in structured physical activity[19].

The contrasting physiological responses observed between dysmenorrhea exercise and yoga may reflect differences in exercise intensity and primary physiological targets. Dysmenorrhea exercise appears to function primarily as an aerobic conditioning intervention that enhances cardiovascular workload and metabolic demand[20]. In contrast, yoga emphasizes neuromuscular coordination, autonomic regulation, flexibility, mindfulness, and controlled breathing[21]. Consequently, the two interventions may improve health through complementary pathways rather than identical physiological mechanisms.

From a menstrual health perspective, both interventions may contribute to reducing dysmenorrhea symptoms. Physical exercise has been shown to stimulate endorphin release, improve pelvic blood flow[22], and decrease prostaglandin accumulation, thereby reducing menstrual pain intensity[6]. Similarly, yoga has demonstrated effectiveness in reducing dysmenorrhea severity through stress reduction, improved autonomic balance[8], decreased cortisol levels, and enhanced pain modulation pathways[23].

The findings of the present study support the growing body of evidence indicating that regular physical activity is beneficial for adolescent reproductive health and physical fitness[24]. Given that adolescence is a critical period for establishing lifelong health behaviors, interventions such as dysmenorrhea exercise and yoga may provide dual benefits by improving menstrual health while simultaneously promoting physical fitness and psychological well-being[25].

A noteworthy implication of this study is that dysmenorrhea exercise may be preferable when the primary objective is improving cardiovascular conditioning and physical fitness, whereas yoga may offer additional benefits related to autonomic regulation, stress management, flexibility, and emotional well-being. Therefore, rather than viewing these interventions as competing approaches, they should be considered complementary strategies within comprehensive adolescent reproductive health programs.

Several limitations should be acknowledged. First, the sample size was relatively small, which may limit generalizability. Second, the study assessed only physiological parameters and did not directly measure aerobic capacity, VO_2max, heart rate recovery, or menstrual pain intensity. Third, the intervention duration may not have been sufficient to capture long-term physiological adaptations. Future studies should incorporate direct fitness indicators, menstrual pain scales, hormonal biomarkers, and larger multicenter samples to better understand the comparative effectiveness of dysmenorrhea exercise and yoga on adolescent health outcomes.

CONCLUSION

Dysmenorrhea exercise resulted in significant increases in heart rate and respiratory rate, indicating a greater acute cardiovascular and ventilatory stimulus compared with dysmenorrhea yoga. In contrast, dysmenorrhea yoga maintained a relatively stable heart rate while producing a smaller increase in respiratory rate, suggesting that its physiological effects may be mediated through autonomic regulation and breathing control rather than increased cardiovascular workload.

The comparative analysis revealed significant differences between the two interventions in heart rate and respiratory rate responses, whereas oxygen saturation did not differ significantly. These findings suggest that dysmenorrhea exercise may provide greater benefits for cardiovascular conditioning and physical fitness development, while dysmenorrhea yoga may be more beneficial for promoting cardiorespiratory efficiency, autonomic balance, relaxation, and menstrual health.

Therefore, both interventions can be recommended as complementary non-pharmacological approaches for adolescent girls experiencing dysmenorrhea. Future studies should incorporate direct measures of physical fitness, such as VO_2max, Harvard Fitness Index, heart rate recovery, and dysmenorrhea severity scores, to further evaluate the long-term effectiveness of these interventions on adolescent health and fitness outcomes.

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