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The effect of ideal body mass index and physical fitness level on dysmenorrhea reduction
El efecto del índice de masa corporal ideal y el nivel de aptitud física en la reducción de la dismenorrea

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Abstract. Many women experience dysmenorrhea, which affects their daily activities due to physical and psychological symptoms. This study aims to analyze the impact of an ideal body mass index (BMI) and physical fitness level on reducing dysmenorrhea. An experimental research approach with a control group pretest-posttest design was employed. The study involved 92 female students, with a final sample of 80 divided into high and low-fitness groups. Participants were selected through purposive sampling, ensuring they had an ideal BMI, regular menstrual cycles, and experienced dysmenorrhea. Data collection included questionnaires on demographics, BMI, menstrual characteristics, pain intensity, pain quality, and a 2.400 m Cooper physical fitness test. The results revealed that participants with an ideal BMI and high physical fitness showed a significant reduction in dysmenorrhea, with an average decrease of 35,95 and a standard deviation of 4,681. Those with an ideal BMI but low physical fitness also experienced a reduction, with an average decrease of 31,4 and a standard deviation of 1,827. The study concludes that ideal BMI and physical fitness significantly influence the reduction of dysmenorrhea, with a more pronounced effect in those with higher physical fitness levels. Factors such as BMI, diet, and exercise routine are critical in managing dysmenorrhea.
Keywords: body mass index, physical fitness, dysmenorrhea, menstrual pain, women's health

Resumen. Muchas mujeres padecen dismenorrea, lo que afecta sus actividades diarias debido a síntomas físicos y psicológicos. Este estudio tiene como objetivo analizar el impacto de un índice de masa corporal (IMC) ideal y un nivel de aptitud física en la reducción de la dismenorrea. Se empleó un enfoque de investigación experimental con un diseño de pretest-postest de grupo de control. El estudio involucró a 92 estudiantes mujeres, con una muestra final de 80 dividida en grupos de alta y baja aptitud física. Las participantes fueron seleccionadas a través de un muestreo intencional, asegurando que tuvieran un IMC ideal, ciclos menstruales regulares y experimentaran dismenorrea. La recopilación de datos incluyó cuestionarios sobre demografía, IMC, características menstruales, intensidad del dolor, calidad del dolor y una prueba de aptitud física de Cooper de 2.400 m. Los resultados revelaron que las participantes con un IMC ideal y una alta aptitud física mostraron una reducción significativa de la dismenorrea, con una disminución promedio de 35,95 y una desviación estándar de 4,681. Las personas con un IMC perfecto pero con una condición física baja también experimentaron una reducción, con una disminución promedio de 31,4 y una desviación estándar de 1,827. El estudio concluye que el IMC ideal y la condición física influyen significativamente en la reducción de la dismenorrea, con un efecto más pronunciado en aquellas con niveles de condición física más altos. El IMC, la dieta y la rutina de ejercicios son fundamentales para controlar la dismenorrea.
Palabras clave: índice de masa corporal, aptitud física, dismenorrea, dolor menstrual, salud de la mujer

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Introduction

Every woman who is about to menstruate sometimes feels complaints or pain that interferes with women's activities (Lestari et al., 2019). One study states that complaints that arise can include depression, feelings of hopelessness, anxiety, tension, sudden changes in mood, irritability, sensitivity, decreased interest in daily activities, difficulty concentrating, feeling weak, lack of energy, changes in appetite, overeating, picky eating, and sleep disturbances. Apart from that, physical complaints can include breast tightening, swelling, headaches, joint or muscle pain, and weight gain (Israel et al., 1985). This complaint is menstrual pain during menstruation, which is usually called dysmenorrhea (Fajaryati, 2012).

Dysmenorrhea is cramping pain and is often accompanied by lower back pain, nausea and vomiting, headaches and diarrhea (Hamer & Denniston, 1933). Dysmenorrhea is a widespread complaint felt by women in their teens and early twenties (Blasi et al., 2022; Manouchehri et al., 2020). Femi-Agboola et al. (2017) showed that most school absences in teenage girls are due to pain during menstruation. Menstrual pain is a widespread complaint felt by women in their teens and early twenties. The pain is often so severe that women must stay in bed for a day or two, thus usually missing work (Cahyaningtias & Wahyuliati, 2007; Komaini et al., 2023). The pain is often so severe that women have to stay in bed for a day or two, resulting in frequent absences from work (Woosley & Lichstein, 2014). A study states that the leading cause of dysmenorrhea or menstrual pain is due to uterine muscle contractions. The hormone prostaglandin triggers these uterine muscle contractions, which will increase before menstruation begins (Itani et al., 2022). The uterine muscle contractions are too assertive and press on nearby blood vessels, resulting in the oxygen supply to the uterus being hampered. Low uterine oxygen supply causes pain and cramps before menstruation or during menstruation (Larasati & Alatas, 2016). One study states that dysmenorrhea is a painful sensation like cramps in the lower abdomen along with other symptoms such as sweating, tachycardia, headache, nausea, vomiting, diarrhea and tremors (Solihatunisa, 2012). The pain starts when you first experience menstruation. In general, pain will increase at the age of 15-17 years and peak at 20-24 years, after which it will continue to decline (Sadeghi et al., 2018). Dysmenorrhea occurs due to excess or imbalance in the amount of prostaglandin (PG) secreted from the endometrium during menstruation. Prostaglandin F2α

(PGF2α) is a powerful myometrial stimulant and vasoconstrictor in the endometrium. According to Naja (2019), prostaglandins increase the myometrial response during the menstrual phase, producing the hormone oxytocin. The hormone oxytocin also can strengthen uterine contractions. So, it can be concluded that prolonged uterine contractions and decreased blood flow to the myometrium are the leading causes of dysmenorrhea. During the menstrual cycle, prostaglandin levels increase significantly. Very high levels of PGE2 and PGF2a are found in menstrual blood, myometrium, and endometrium of women who experience primary menstrual pain. Women with severe dysmenorrhea have high levels of prostaglandins during the menstrual cycle. This high concentration occurs for 2 days of the menstrual phase. A 3-fold increase in endometrial prostaglandins occurs from the follicular to the luteal phase, with a further rise occurring during menstruation. The increase in prostaglandins in the endometrium after a decrease in progesterone at the end of the luteal phase results in increased myometrial tone and excessive uterine contractions.

An ideal body is essential because all body organs will be of good quality (Koohestani et al., 2020). With an ideal body, blood flow throughout the body will be smoother, and the functional quality of the human body's organ systems will improve daily (Boutcher, 2011). So, in this case, several studies state that women who have an ideal body will reduce the pain of dysmenorrhea (Moradpour, 2019).

Everyone cannot ignore the importance of physical fitness in everyday life because physical fitness is one of the most essential factors to support daily activities (Dehghanzadeh et al., 2014). One study states that physical fitness is the body's ability to carry out physical activities without experiencing excessive fatigue (Tarhani et al., 2022). Providing light exercise in the first two days of menstruation reduces the incidence of dysmenorrhea in school girls from 46,7 to 10,8 percent (Ning et al., 2020). Routine and regular exercise can improve physical fitness (Huang et al., 2022). Good physical fitness can reduce the pain of dysmenorrhea because the supply of blood and oxygen to blood vessels experiencing vasoconstriction increases. The pain response also decreases due to the production of prostaglandin being suppressed, which results in the production of the hormone endorphin, which inhibits the transmission of pain (Lundeberg et al., 1985).

Methodology

The method used in this research is an experimental method using Pretest-Posttest Control Group Design. This research was conducted at Bandung National Middle School, which has a population of 92 female students in 9th grade. The sampling technique used purposive sampling with the criteria of having a standard body mass index, regular menstrual cycle, and experiencing dysmenorrhea pain. All students were given information in advance regarding the purpose of this study and collected consent forms that their parents had signed. After an initial test using the Indonesian Physical Fitness Test (TKJI), 80 female students met the criteria to sample. They were divided into two groups: high and low physical fitness. The research instruments used were questionnaires on demographic data and body mass index, menstrual characteristics, measurement of pain intensity and quality of pain (visual analog scale/VAS), and a 2.400 M physical fitness test (Cooper test). After the data was collected, analysis was then carried out using Statistical Product and Service Solution (SPSS) Series 26. Next, a hypothesis test was carried out to determine the differences between the two sample groups using the paired samples t-test with statistical significance set at <0.05.

Results

Table 1.
Sociodemography based on age

Variable	Mean	Median	SD	Min	Max
Age	15,25	15	0,709	14	16

Based on the table above, the study's results obtained the average age of respondents is 15,25 years with a standard deviation of 0,709. In the table, the youngest respondent is 14 years old, and the oldest respondent is 16 years old. This study aligns with research (Dya & Adiningsih, 2019), which shows that the respondents' age range is 14-17 years.

Table 2.
Sociodemography based on body mass index

Variable	Frequency
Skinny	5
Ideal	80
Fat	7

The analysis results in the table above show that 5 students have a thin body mass index, 80 are ideal, and 7 are fat. So, this study only took samples of students with perfect bodies, which amounted to 80 students.

Table 3.
Respondent Characteristics Based on Age of Menarche, Menstrual Cycle, and Duration of Menstruation

Variable	Frequency	Percentage
Age of Menarche		
Early (< 10 years old)	0	0
Standard (10 – 13 years old)	80	100
Late (> 13 years old)	0	0
Total	80	100
Menstrual Duration		
Shortened (< 4 days)	8	10
Standard (4-8 days)	56	70
Lengthened (> 8 days)	16	20
Total	80	100

The analysis results in the table above show that the characteristics of respondents are based on the age of menarche; most of them experienced their first menstruation at a standard age (10–13 years old), and as many as 80 female students (100%). There were no students who experienced their first menstruation at an early age (<10 years old) or a late age (>13 years old). Based on the analysis results in the table above, the characteristics of the research respondents

based on the duration of menstruation in grade IX female students of SMP Nasional Bandung have different menstrual durations. Of the 80 research respondents, 56 were found to have standard menstrual durations, namely in the range of 4-8 days (70%), experiencing menstrual durations of <4 days. As many as 8 respondents (10%) and 16 respondents (20%) experienced menstrual durations > 8 days.

Table 4.
Pain intensity and pain quality scale

Variable	Mean	SD	Min	Max
Pain intensity and pain quality scale	5,13	2,081	1	10

The table above shows that in the ninth-grade students of SMP Nasional, it was found that the average respondent experienced pain during menstruation, commonly known as dysmenorrhea. The scale of each individual also varies from a scale of 1 to 10. From 80 respondents, the average dysmenorrhea scale was 5,13 with a standard deviation of 2,081, the lowest value of 1 and the highest value of 10.

Table 5.
Hypothesis Testing on Ideal Body Mass Index Group and High Physical Fitness Level

	Sig.	Conclusion
pain quality	.000	Significance

Hypothesis testing in the group that has an ideal body mass index and a high level of physical fitness shows a significance value (Sig.) (2-tailed) of 0,000, which is smaller than the alpha value (0,05). Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted. It can be concluded that there is an average difference between the initial test scores and the final test, which shows the influence of ideal body mass index and a high level of physical fitness on reducing dysmenorrhea pain.

Table 6.
Hypothesis Testing on Ideal Body Mass Index Group and Low Physical Fitness Level

	Sig.	Conclusion
pain quality	.000	Significance

Hypothesis testing in the group that has an ideal body mass index and a low level of physical fitness shows a significance value (Sig.) (2-tailed) of 0,000, which is smaller than the alpha value (0.05). Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted. It can be concluded that there is an average difference between the initial and final test scores, which shows the influence of ideal body mass index and a low level of physical fitness on reducing dysmenorrhea pain.

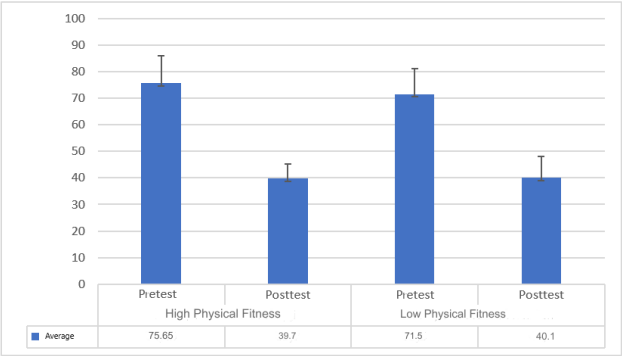

Figure 1. Pain Quality Average

Based on Figure 1, it can be seen that all groups experienced a decrease in both the average score and standard deviation of the quality of dysmenorrhea pain. The data shows that the group with an ideal body mass index and high level of physical fitness in the initial test had an average score of 75,65, which then fell to 39,7 in the final test. The standard deviation also decreased from 10,29 to 5,609. Meanwhile, the group with an ideal body mass index and low level of physical fitness initially had an average score of 71,5, which fell to 40,1 in the final test. The standard deviation in this group fell from 9,762 to 7,935.

Regarding the average results, the group with an ideal body mass index and a high level of physical fitness experienced a more significant decrease, namely 35,95, compared to the group with an ideal body mass index but low physical fitness, which experienced a decrease of 31,4. If we consider the standard deviation, the group with an ideal body mass index and a high level of physical fitness also showed a more significant decline, namely 4,681, compared to the group with an ideal body mass index but low physical fitness, which experienced a decrease of 1,827. Thus, it can be concluded that reducing dysmenorrhea is more significant in the group with an ideal body mass index and high physical fitness than in the group with an ideal body mass index but low physical fitness.

Discussion

From the results of the data analysis, female students with high physical fitness and an ideal body mass index reduced pain caused by dysmenorrhea. It aligns with previous research stating that an ideal body mass index will reduce menstrual pain (dysmenorrhea) (Senjaya, 2013). Apart from that, other research says that maintaining physical fitness can be a solution to reducing dysmenorrhea pain because exercise is one of the activities that, according to theory, can reduce pain during dysmenorrhea (Fajaryati, 2012). Exercise is very influential in reducing the degree of dysmenorrhea pain because it can stimulate the release of beta-endorphins, namely hormones that work as non-specific pain analgesics, which can reduce the degree of dysmenorrhea pain and improve blood circulation in the body (Cahyaningtias & Wahyuliati, 2007; Murtiningsih et al.,

2018). Good physical fitness can reduce the intensity of dysmenorrhea pain, as can be seen from the influence of physical fitness exercises on the level of dysmenorrhea in students (Ningsih et al., 2013; Pertiwi et al., 2015). Several types of exercises are suitable for reducing dysmenorrhea pain, as explained by Huang et al. (2022) in their study, which stated that high-intensity interval training (HIIT) using a spinning bike has been shown to have a positive effect in reducing the severity of dysmenorrhea. It was obtained from a VAS survey, which showed that HIIT physical exercise has helped reduce pain severity significantly by around 29 mm on the VAS. Several sports are recommended to minimize dysmenorrhea, such as jogging, swimming or gymnastics (Ningsih et al., 2013; Zanada et al., 2024).

Low ideal body mass index and physical fitness influence and reduce dysmenorrhea pain. Dysmenorrhea can be treated by light exercise and certain foods, such as fruit and vegetables (Nafiroh Defi, 2013). Additionally, consuming omega-3 fatty acids in daily food helps reduce menstrual pain (dysmenorrhea) (Famimah et al., 2017).

Based on the results of data analysis, the quality of dysmenorrhea pain shows that the group with an ideal body mass index and high physical fitness experienced a more significant reduction in dysmenorrhea compared to the group with an ideal body mass index but low physical fitness. This decrease can be seen from the average value and standard deviation, where the group with an ideal body mass index and high physical fitness had a more significant decrease than the group with an ideal body mass index and low physical fitness.

Conclusion

Based on the research results referring to the problem formulation in this study, the researchers concluded that there is an influence between ideal body mass index and physical fitness level on dysmenorrhea. The results showed that both the group with an ideal body mass index and high physical fitness and the group with an ideal body mass index and low physical fitness experienced an effect on dysmenorrhea. However, the effect on reducing dysmenorrhea was more significant in the group with an ideal body mass index and a high level of physical fitness compared to the group with an ideal body mass index but low physical fitness.

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