

Physical activity levels among Malaysian University and State University of Medan Students: gender difference and the influence of BMI

Niveles de actividad física entre los estudiantes de la Universidad de Malasia y la Universidad Estatal de Medan: disparidad de género e influencia del IMC

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Abstract. The decline in physical activity has adversely impacted physical health, with university students being particularly affected. Thus, this study examined the effect of gender and Body Mass Index (BMI) on physical activity levels among Malaysian universities and Medan State University students. The research involved 130 students from education universities in Malaysia and Medan State Universities. The data were collected using the Physical Activity Questionnaire for Adolescents (PAQ-A). The study indicated significant differences in physical activity levels among university students. This difference might be affected by gender, with male students showing significantly higher physical activity levels than female students (Sig. = 0.001 and $\eta^2 = 0.082$). Therefore, it is important for universities to consider such factors in designing health and wellness programs, especially to increase female students' participation in physical activity. Nonetheless, the statistical test showed no significant difference was found in physical activity levels among the different Body Mass Index (BMI) categories. This finding indicates that, unlike gender, BMI does not significantly affect the physical activity levels of university students (Sig. = 0.310). The implications of these findings suggest an urgent need for tailored health interventions in university settings, particularly Medan State University. The university can create an environment that supports active lifestyles and contributes significantly to improving students' health and well-being by providing accessible sports facilities, organizing fitness classes, and promoting active transportation options. This strategy is expected to address the challenges of participation in physical activity, particularly among female students, thereby increasing awareness and participation in overall physical activity.

Keywords: Physical Activity, University Students, Gender Disparities, BMI Effects, Education

Resumen. La disminución de la actividad física ha repercutido negativamente en la salud física, siendo los estudiantes universitarios los más afectados. Este estudio examina el género y el Índice de Masa Corporal (IMC) en los niveles de actividad física entre los estudiantes universitarios de Malasia y la Universidad Estatal de Medan. En la investigación participaron 130 estudiantes de universidades de educación de Malasia y de la Universitas Negeri Medan, utilizando el Cuestionario de Actividad Física para Adolescentes (PAQ-A) para la recogida de datos. Los resultados de este estudio indicaron que existían diferencias significativas en los niveles de actividad física en función del género entre los estudiantes universitarios, donde los estudiantes varones mostraron niveles de actividad física significativamente más altos que las estudiantes mujeres (Sig. = 0,001 y $\eta^2 = 0,082$). Por lo tanto, es importante que las universidades tengan en cuenta estos factores a la hora de diseñar programas de salud y bienestar, especialmente para aumentar la participación de las estudiantes en la actividad física. No obstante, los resultados de las pruebas estadísticas también mostraron que no había diferencias significativas en los niveles de actividad física entre las diferentes categorías de Índice de Masa Corporal (IMC), lo que indica que el IMC no afecta significativamente a los niveles de actividad física de los estudiantes universitarios (Sig. = 0,310). Las implicaciones de estos resultados sugieren una necesidad urgente de intervenciones sanitarias adaptadas en entornos universitarios, en particular en la Universidad Estatal de Medan. Al centrarse en proporcionar instalaciones deportivas accesibles, organizar clases de fitness y promover opciones de transporte activo, las universidades pueden crear un entorno que apoye estilos de vida activos y contribuya significativamente a mejorar la salud y el bienestar de los estudiantes. Se espera que esta estrategia aborde los retos de la participación en la actividad física, especialmente entre las estudiantes, aumentando así la concienciación y la participación en la actividad física en general.

Palabras clave: Actividad física, estudiantes universitarios, disparidades de género, efectos del IMC, educación.

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Introduction

Physical activity is an important component of a healthy lifestyle that has a significant impact on physical fitness, mental health, and overall well-being. Among university students, understanding physical activity levels and the factors that influence them, such as gender and Body Mass Index (BMI), is critical to developing effective health promotion strategies. Research has consistently shown a significant relationship between BMI and physical fitness, with BMI as a predictor of various health outcomes (Waratmaja et al., 2022). In addition, physical fitness is closely related to cardiorespiratory endurance, often measured by maximal oxygen consumption (VO₂ max)

(Yuwono et al., 2018). This relationship emphasizes the importance of maintaining an active lifestyle to prevent weight gain and reduce the risk of obesity (Agus & Sari, 2020).

In many studies, gender differences in physical activity levels have been highlighted. Generally, earlier findings showed that men are more physically active than women. For example, research by Ali et al. (2024) showed a significant difference in physical activity levels between genders. They found that men tended to engage in more vigorous physical activity. Similarly, Huang et al. (2021) found that men tended to engage in more strenuous, work-related activities, while women were more involved in household activities. In addition, Moss et al. (2024) showed that gender

disparities played a role in physical activity, health risk behaviors, and depressive symptoms among university students. Their findings showed gender differences in students with obesity. This suggests that gender factors may influence the relationship between physical activity and mental health and demonstrates the importance of understanding gender inequalities in student health. Broader research has also shown gender differences in physical activity and health. For example, Bann et al. (2019) conducted a cross-country comparison of physical activity levels among students in 52 countries, showing differences in out-of-school physical activity participation by gender. In addition, the study of Kong et al. (2022) demonstrated the role of first offender advantage in gender disparities in physics subjects.

Besides gender, Body Mass Index (BMI) plays an important role in physical fitness and health. A higher BMI is often associated with lower levels of physical activity and fitness, increasing the risk of various health problems, including cardiovascular disease and type 2 diabetes (Agus & Sari, 2020). Research (Haque et al., 2019) showed that BMI is influenced by various factors such as age, distance to the bus stop, diet, daily physical exercise, marital status, education level, and recreational facilities. Further, Hufadz et al. (2023) reported a significant relationship between BMI and physical fitness level. This confirms that BMI can be a good indicator in evaluating a person's physical fitness level. In addition, research by Hw et al. (2020) showed a relationship between physical activity, BMI, and body composition in university students in Malaysia, emphasizing the importance of understanding these factors in health.

Several studies have explored interventions aimed at improving physical fitness among university students. For example, jogging has been shown to positively impact the physical fitness levels of college students, demonstrating the potential benefits of incorporating regular physical activity into daily routines (Raphaella & Sari, 2021). In addition, the knowledge and attitudes of university students, especially in the medical field, towards lifestyle factors such as diet and physical activity are crucial to preventing chronic conditions (Zulrafla & Kamarudin, 2021). These findings suggest the need for comprehensive health education programs that emphasize the importance of a balanced diet and regular physical activity.

Motor skills and physical education programs play a significant role in improving students' physical competence. Understanding college students' motor skills can provide insight into their level of physical activity and overall fitness (Herstiani-S & Anam, 2024). In addition, assessing the potential risk of injury and the level of flexibility in amateur team athletes is crucial to improving their physical health and performance (Irianto et al., 2021). This assessment can inform teachers or coaches to customize their training programs to minimize injury risk and improve flexibility. In addition, physical activity is also linked to academic achievement. Research indicated a positive impact of physical education on student learning outcomes

(Nasution et al., 2023). Thus, engaging students in regular physical activity can improve their cognitive function, concentration, and academic performance. This emphasizes the importance of integrating physical education into the academic curriculum to promote student well-being and success. Factors that influence academic performance, such as gender, major, and duration of gadget use, have been investigated and were proven as strategies to improve students' Grade Point Average (GPA) (Nasir, 2023).

Research suggests that students who lack exercise will be more susceptible to disease and poor health (Stults-Kolehmainen & Sinha, 2014). Unfortunately, physical inactivity has become a concerning problem among healthy, obese, and diabetic adults in Germany, as affirmed by (Linder et al., 2021). This study emphasizes the importance of considering socio-demographic variables when designing physical activity (PA) programs, especially for individuals with diabetes or obesity. In addition, Geiss et al. (2017) discussed changes in the prevalence of diagnosed diabetes, obesity, and physical inactivity in different regions of the United States from 2004 to 2012. They revealed that awareness of such trends can assist local policymakers in targeting efforts to reduce these health risks. In addition, Cannioto et al. (2017) found an association between lifetime physical inactivity and increased risk of bladder and kidney cancer based on a hospital-based case-control analysis. Lack of physical activity also contributes to sedentary behavior and anxiety among college students (Chen et al., 2020).

Because physical activity has several advantages that can make students more resilient and fit, students should do physical activity regularly (Hamer, 2012). In addition, exercise has the potential to improve one's quality of life and maintain happiness and well-being (Lapa, 2015). Given the barriers to exercise faced by university students while pursuing an undergraduate degree, it is imperative to understand how much they engage in physical activity to improve their quality of life during their education. Currently, there are very few empirical studies conducted in Malaysia looking at the influence of gender and BMI on the physical activity levels of university students. As there is still no conclusive data on the changes in physical activity levels of university students, it is imperative to conduct this study to determine the levels and variations of BMI and gender among Malaysian university students (Hall et al., 2021).

Indeed, research on human movement has touched on many areas. For example, some popular studies investigated the achievement of physical education learning outcomes (Martono et al., 2024; Komari et al., 2024a; Komari et al., 2024b; Septiantoko et al., 2024; Suyato et al., 2024; Widiyanto et al., 2024), motor development (Susanto et al., 2024; Susanto et al., 2024). Other studies examined specific areas of PE or sports, such as health and fitness sports (Widiyanto et al., 2024a; Widiyanto et al., 2024b; Syaukani et al., 2024; Pranoto, et al., 2024; Astuti et al., 2024), law and sports education (HB et al., 2024),

sports communication (Charlina et al., 2024), active lifestyle with exercise (Tafuri et al., 2024a), interval training and physiological (Latino et al., 2024a), circuit training programme (Tafuri et al., 2024b; Tafuri et al., 2024c; Latino et al., 2024b), injury risk on sports (Fahrosi et al., 2024; Anam et al., 2024a), endurance training and physiological (Latino et al., 2024c), therapeutic sports (Zanada et al., 2024), movement skills (Susanto et al., 2023; Anam et al., 2024b; Pranoto et al., 2024), and sports training and performance (Kurniawan et al., 2024; Susanto et al., 2024), curriculum and management of physical education learning (Mardiyah et al., 2024a; Yani et al., 2024; Mardiyah et al., 2024b), and the management of sports education and archery (Hamsyah et al., 2024; Mulyanti et al., 2024; Setyawan et al., 2024a; Setyawan et al., 2024b; Destriani et al., 2024).

Despite the myriad research, there is a lack of scholarly research on the effect of gender and Body Mass Index (BMI) on physical activity levels among Malaysian universities and Medan State University students. The dearth of studies on this topic can impede understanding and scientific development in the field. Hence, it is imperative to research this issue by thoroughly reviewing existing literature studies

Methods

Participants

This study involved 130 students from educational universities in Malaysia and Medan State University in Indonesia. The participants consisted of 42 male students (32.3%) and 88 females (66.7%). Regarding BMA, the majority of participants in this study fell into the normal BMI group (72.0%). This group was followed by groups with underweight by 26 students (20.0%), overweight by 21 students (16.2%), and obesity by 11 students (8.5%). According to the World Health Organization (WHO) guidelines, Body Mass Index (BMI) is classified as underweight when it is under 18.5, normal when it ranges from 18.5 to 24.9, overweight when it falls between 25.0 and 29.9, and obese when it is 30 or higher (Chen et al., 2020). This classification is crucial in assessing the health risks associated with BMI levels because studies have shown that BMI may lead to various health issues such as diabetes, cancer, heart disease, and chronic respiratory disorders (Getz et al., 2016; Itani et al., 2020; Lindell et al., 2017; Shimizu et al., 2021). The distribution of participants's BMI in this study is presented in Table 1.

Table 1.
Body Mass Index of University Students

Category	Frequency	Percent
Under 18.5 (Underweight)	26	20.0
18.5 - 24.9 (Normal)	72	55.4
25.0 - 29.9 (Overweight)	21	16.2
30.0 or higher (Obese)	11	8.5
Total	130	100.0

Table 2 displays BMI categories based on gender. The table shows that 25 male students and 47 female students

had a normal BMI. Meanwhile, 5 male students and 21 female students were underweight. After that, 7 male and 14 female students were overweight, and 5 male and 6 female students were obese. The participants were between 20 and 25 years old and have voluntarily completed the Physical Activity Questionnaire for Adolescents (PAQ-A). This questionnaire was adapted from Kowalski et al. (1997). The data were collected as soon as the researchers obtained permission from the ethics boards of the University of Malaya and Medan State University. Participants were given confidential training before answering the questionnaire.

Table 2.
Body Mass Index of University Students Based on Their Gender

	Gender		Total
	Male	Female	
Under 18.5	5	21	26
18.5 - 24.9	25	47	72
25.0 - 29.9	7	14	21
30.0 or higher	5	6	11
Total	42	88	130

Research instrument

Malaysian university students' level of physical activity was assessed using the Physical Activity Questionnaire for Adolescents (PAQ-A). This assessment was based on how often they had been physically active during the previous seven days. As argued earlier, this instrument was adapted from Kowalski et al. (1997). The questionnaire consisted of two sections. Part A was used to gather demographic data, and Part B was a 20-item activity rating on a five-point Likert scale from 1 (none) to 5 (more than seven times).

The Physical Activity Questionnaire for Adolescents (PAQ-A) was chosen because it has good validity and reliability. The PAQ-A had a validity value of 0.73 and a reliability value of 0.85 to 0.89. The PAQ-A consisted of 20 items with a 5-point rating system and demographic information. It took a student about 10 to 15 minutes to complete. The mean range for the degree of physical activity was interpreted using the scale in Table 3 to examine the mean value obtained through administering the PAQ-A questionnaire (Tschannen-Moran & Gareis, 2004).

Table 3.
Mean Score Interpretation Scale

Mean Score	Interpretation level
1.00-1.80	Very low
1.81-2.60	Low
2.61-3.40	Moderate
3.41-4.20	High
4.21-5.00	Very High

Data Analysis

After data collection, the IBM Statistical Package for Social Science (SPSS) version 27 was used to analyze the data. The analysis covered descriptive statistics, independent t-tests, and one-way ANOVA to examine the gender and BMI differences among university students in Malaysia and Indonesia.

Results

Before the data were analyzed, Skewness and Kurtosis normality tests were performed. The results showed that the data were normally distributed because the values ranged from -3.00 to +3.00, as shown in Table 4. Therefore, the analysis of the independent t-test can be used to perform inferential statistical analysis in this study. Based on the analysis, it was found that university students in this study obtained a mean of 2.40 (low) for the highest level of physical activity and a mean of 1.05 (very low) for the lowest level of physical activity. The overall mean score was 1.404 with an SD of 0.257 for physical activity level. According to the mean score interpretation scale, this finding is classified as very low.

Table 4.
Test of Normality and Overall Descriptive Statistics

N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
130	1.05	2.40	1.404	0.257	1.508	2.557

Following that, Levene's test for homogeneity of variances was performed. As provided in Table 5, the results showed no significant differences in physical activity with significance values greater than 0.5. This finding did not violate the assumption of homogeneity of variances. Thus, the one-way ANOVA can be used to perform inferential statistical analysis in this study.

Table 5.
Levene's Test for Physical Activity

F	df1	df2	Sig.
1.573	3	126	0.199

Table 6 shows the results of the independent t-test. It indicated a significant difference with a moderate effect size between males and females in physical activity with a Sig value of 0.001, which was less than 0.05, and $\eta^2=0.082$. Hence, the comparison of the genders has shown a significant difference with a moderate effect size in physical activity among education university students. It can be concluded that the male students engage in a better level of physical activity than females. Nonetheless, both male and female students' mean scores for physical activity are still very low.

Table 6.
Differences between Gender in Physical Activity of University Students

Group	N	Min	SD	t	df	Sig. (2-tailed)	η^2
Male	42	1.523	0.307	3.373	59.69	0.001*	0.082
Female	88	1.347	0.208				

*p<0.05

Subsequently, Table 7 compares BMI mean scores in physical activity using the one-way ANOVA test. The results revealed no significant difference between the four categories of BMI with a value of Sig. 0.310 > 0.310, con-

sisting of underweight, normal, overweight, and obese categories in physical activity. Therefore, there was no significant difference in physical activity among university students based on their BMI.

Table 7.
Differences between BMI in Physical Activity of University Students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.239	3	0.080	1.208	0.310
Within Groups	8.311	126	0.066		
Total	8.550	129			

Discussion

The results of the first statistical test showed a significant difference in physical activity levels based on gender among university students. Male students showed significantly higher levels of physical activity compared to female students, with a medium effect size (Sig. = 0.001 and $\eta^2 = 0.082$). This finding confirms earlier research, for example, by Lauderdale et al. (2015). Their research discussed motivational differences in physical activity between male and female university students, where this difference emerged between the inactive group (physically active 0-1 times per week) and the moderately active group (physically active 2-3 times per week), as well as between the inactive and highly active group (physically active 4-7 times per week). In addition, Obeidat and Aljarrah (2021) revealed the impact of practicing sports activities on the emotional state of university students. They claimed that participants' emotional responses were different based on gender. Meanwhile, the study of Ghimire et al. (2022) assessed physical activity levels and cardiorespiratory fitness in medical students. Similarly, they showed differences in physical activity levels by gender. Another study that is in line with the current finding is Song and Lim (2022), which showed an association between physical activity and depression among female university students in Korea. Their findings affirmed the importance of physical exercise in preventing and reducing depression among university students. In addition, research by Guo et al. (2022) showed associations between physical activity levels, time spent at rest, and physical fitness of female college students in China. They suggest differences in physical activity levels by gender. Finally, the study by Choi et al. (2015) also showed differences in social cognitive factors and physical activity among Korean university students by gender, suggesting that gender differences should be considered in developing interventions to increase physical activity. Various studies have confirmed significant differences in physical activity levels based on gender among college students. Factors such as motivation, cardiorespiratory fitness, emotional responses, and depression may influence physical activity levels. These differences should be considered when designing health and fitness programs suitable for college students based on gender. Previous studies have shown that physical activity in both men and women remains relatively low among university students. The low levels of physical activity in female

students could be due to various factors that need to be considered in designing interventions to increase participation in physical activity. Burton et al. (2021) showed barriers and drivers to physical activity among female university students in the United Arab Emirates, emphasizing the importance of understanding the factors influencing participation in physical activity. In addition, Cheah et al. (2014) identified factors related to physical inactivity among adolescent girls and boys in Borneo. They demonstrated the importance of understanding the social, psychological, and health barriers that influence physical activity levels. Similarly, Shahadan et al. (2022) showed an association between physical activity status and mental well-being among overweight and obese female university students. In addition, research by Joy and Vincent (2020) showed a low prevalence of physical activity among MBBS students in a medical college in Kerala. This finding indicates several challenges in encouraging participation in physical activity among students. Aljehani et al. (2022) also showed that limited facilities for physical activity, academic load, gender roles, and adherence to cultural standards were the main barriers to female students' participation in physical activity. On the other hand, Awadalla et al. (2014) showed environmental factors such as sports facilities, public transportation systems, climate, and campus safety as important determinants of physical activity. Thus, low levels of physical activity among university students, especially female students, can be caused by various factors such as social, psychological, environmental, and health barriers. Understanding these factors is key to designing effective intervention strategies to increase participation in physical activity among university students.

The results of the second statistical test showed no significant difference in physical activity levels among the different BMI categories (underweight, normal, overweight, and obese). This indicates that BMI does not significantly affect the physical activity levels of university students (Sig. = 0.310). This finding is consistent with several studies that suggest that physical activity levels may not differ significantly across different BMI categories, especially in younger populations such as university students. Relevant research to support this finding is the study of Junger et al. (2016) exploring physical activity, BMI indicators, and self-assessment of physical activity of university students in Visegrad countries. Although this study is not directly related to the influence of BMI on physical activity, it can provide insights into the factors that influence physical activity levels among the college student group. In addition, Mabli et al. (2020) conducted a randomized controlled trial of the Get Fit program in Harlem. They showed consistency with previous research on the program. Although not directly related to the effect of BMI on physical activity, this study emphasized the importance of appropriate interventions to address the problem of overweight and obesity among children. In terms of the relationship between physical activity, BMI, and health, research by Haque et al. (2019) might provide additional insights into the factors that influence BMI estimation and overall health. Thus,

although there was no significant difference in physical activity levels among different BMI categories, further research is needed to understand more deeply the relationship between BMI and physical activity among university students. Other factors such as motivation, environment, and healthy living habits may also play an important role in understanding physical activity patterns among college student groups.

The findings of this study have several important implications for university health programs and policies. Given the low levels of overall physical activity among university students, there is a clear need for targeted interventions to promote physical activity in university settings. Health promotion initiatives should consider the specific needs and challenges faced by different student groups, especially focusing on strategies to increase physical activity among female students. This is in line with research by Mahfouz et al. (2020), which showed an association between sleep quality and physical activity among university students in Saudi Arabia. Their research can provide insight into the factors that influence physical activity levels in a university setting. In addition, NA et al. (2017) identified that socio-cognitive factors associated with physical activity among university students may provide a better understanding of the factors that influence physical activity levels in a university setting. Thus, programs designed to raise awareness about the benefits of physical activity could be accompanied by opportunities for regular exercise that fit into students' schedules to be most beneficial. Universities can also create environments that support active lifestyles, such as providing easily accessible sports facilities, organizing fitness classes, and promoting active transportation options.

Conclusion

This study examines the effect of gender and Body Mass Index (BMI) on the physical activity levels among Malaysian university and Medan State University students. The findings showed a significant difference in physical activity levels based on gender among university students, where male students showed significantly higher physical activity levels than female students (Sig. = 0.001 and $\eta^2 = 0.082$). These findings are in line with previous studies showing the role of several factors, such as motivation, cardiorespiratory fitness, emotional responses, and depression, in influencing physical activity differences between genders. Therefore, it is important for universities to consider these factors in designing health and fitness programs, especially to increase female students' participation in physical activity. In contrast, the statistical test results showed no significant difference in physical activity levels among the different Body Mass Index (BMI) categories, indicating that BMI does not significantly influence the physical activity levels of university students (Sig. = 0.310). This is consistent with several studies that suggest that physical activity levels may not differ significantly

across different BMI categories, particularly in young populations such as university students. Therefore, further research is needed to understand the relationship between BMI and physical activity, as well as other factors such as motivation, environment, and healthy living habits that may also play an important role. The implications of these findings suggest an urgent need for tailored health interventions in university settings. By focusing on providing accessible sports facilities, organizing fitness classes, and promoting active transportation options, universities can create an environment that supports active lifestyles and contributes significantly to improving students' health and well-being. This strategy is expected to address the challenges of participation in physical activity, particularly among female students, thereby increasing awareness and participation in physical activity overall.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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