Correlation Between Depression Symptoms and Physical Activity Among University Students

Zidni Imanurrohmah Lubis[1*],Alfidah Idnu Fadilallah[1], Anita Faradilla Rahim[1], Syiar Aprilla Tanazza[2]
[1]Department of Physiotherapy, University of Muhammadiyah Malang, Indonesia
[2]Department of Sport Medicine, University of Kaohsiung, Taiwan

ABSTRACT

Background: *Depression represents a critical public health concern among university students, with prevalence rates in Indonesia reaching 50.76%. While physical activity is known to benefit mental health, the relationship between depression symptoms and physical activity among Indonesian university students remains poorly understood, with previous studies showing mixed findings. This study aimed to examine the relationship between depression symptoms and physical activity among university students across multiple academic disciplines at Muhammadiyah University of Malang.*
Method: *This cross-sectional study involved 383 undergraduate students from class of 2023 across ten faculties. Depression symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9), while physical activity was measured using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Random sampling was employed with inclusion criteria of students aged 18-25 years. Data were analyzed using descriptive statistics and Spearman's rho correlation test with significance level set at α=0.05.*
Result: *The mean depression symptoms score was 10.45 (SD=5.596), indicating moderate depression symptoms, while mean physical activity level was 1812.93 MET-minutes/week (SD=1766.542). Spearman's rho analysis revealed a statistically significant negative correlation between depression symptoms and physical activity (r=-0.135, p=0.008), indicating that higher depression levels were associated with reduced physical activity. Routine depression symptoms screening using PHQ-9 should be integrated into student health assessments, and physical activity interventions should employ low-barrier, flexible approaches starting with modest achievable goals to address depression-related barriers.*

***Correspondence**
zidnilubis@umm.ac.id

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INTRODUCTION

Mental health challenges among university students have emerged as a critical public health concern, with depression being one of the most prevalent conditions. Depression is characterized as persistent sadness, loss of interest, feelings of guilt, disturbed sleep or appetite, and poor concentration.(1) It differs from normal mood fluctuations in persistence and intensity,(2) often lasting longer without direct relation to specific life events.(3)

University students face unique stressors including living away from home, peer pressure, and adaptation needs.(4) This transitional period involves identity formation, academic pressures, and establishing new social networks.(5) Prolonged stress impacts students holistically as mental and physical health are interconnected.(6) Inability to manage academic demands produces psychological pressure manifesting as depression, anxiety, and stress.(7) Research found 57.4% experienced moderate stress,(8) and unaddressed stress can progress to depression (see Figure 1).(9)

In Indonesia, depression rates reach 6.2% for ages 15-24 years,(10) with university students showing higher prevalence at 50.76%.(11) Studies found 26.9% experienced mild, 18.5% moderate, and 9.3% severe depression.(12) Among nursing students, 48.3% experienced mild, 21.5% moderate, and 8.1% severe depression.(3)

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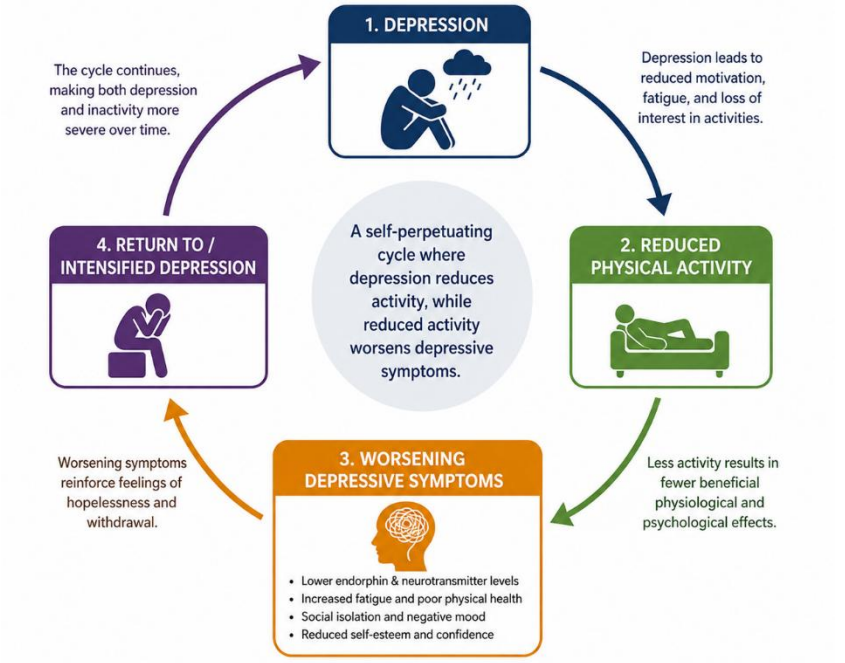


Figure 1. Cycle between depression symptoms and physical inactivity

One crucial factor in mental health research is physical activity. Physical activity, defined as bodily movement requiring energy expenditure,(13) maintains fitness (14) and supports psychological well-being.(15) Regular activity reduces depression risks and prevents cognitive decline.(16) WHO recommends 150-300 minutes moderate or 75-150 minutes vigorous activity weekly.(13) However, only 33.5% of Indonesians meet recommendations,(17) with 61.7% of students showing low activity.(18) This discrepancy raises important questions about the depression and physical activity relationship. The depression and physical activity relationship operates through multiple mechanisms. Depression causes dysregulation of serotonin, norepinephrine, and dopamine (19), reducing pleasure during activity.(20) It decreases motivation and causes anhedonia,(21) activates the HPA axis causing fatigue,(22) and leads individuals to avoid physical effort.(23) Students find it difficult to maintain activity routines.(24) This creates a vicious cycle where depression reduces activity while reduced activity worsens depressive symptoms.

International research shows more severe depression correlates with lower activity,(25) with physical activity protecting against depression.(23) However, Indonesian studies show mixed findings, one found 29.6% with low activity experienced moderate-severe depression without statistical significance (24), while another found no correlation despite 61.7% having low activity.(18)

These findings highlight critical gaps. Most research occurred in Western populations with limited Southeast Asian examination where cultural attitudes differ. Women are more vulnerable to mood disorders (26) and have lower activity due to societal norms.(27) Previous Indonesian studies focused on single faculties, limiting generalizability. Engineering students face complex coursework,(4) while medical students encounter clinical stressors.(28) These demands may differentially impact depression and physical activity capacity.

Given these gaps and escalating mental health crisis, comprehensive research across diverse disciplines is needed. Understanding this relationship is essential for evidence-based interventions addressing mental health and healthy behaviors. From physiotherapy perspectives, research can inform approaches overcoming psychological barriers.(6) Therefore, this study examined the relationship between depression level and physical activity among students at Muhammadiyah University of Malang across multiple faculties. We hypothesized higher depression would negatively associate with physical activity, consistent with biopsychosocial models.

METHOD

This study used quantitative observational analytical method with a cross-sectional study design used depression level as independent variable and physical activity as dependent variable. This method collects all

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data at one specific point in time, without requiring extended observation periods.

Data collection was conducted from September to October 2025 at University of Muhammadiyah Malang. The study utilized a quantitative observational analytic approach with a cross-sectional design, examined the relationship between depression symptoms and physical activity among undergraduate students at Muhammadiyah University Malang cohort 2023. The study employed random sampling technique to recruited participants from the target population. The total population consisted of 4,348 first-year undergraduate students (class of 2023) from Muhammadiyah University of Malang. Sample size was calculated using Slovin's formula with a 5% margin of error, resulting in a required sample of 383 participants with the inclusion criteria of undergraduate students at Muhammadiyah University Malang cohort 2023 within aged 18-25 years. Exclusion criteria in this study were vocational students at Muhammadiyah University Malang, students with a history of consultation with a psychologist/psychiatrist during the last 6 months, and those who were unwilling to be respondents.

Two validated self-report questionnaires were administered to collect data from participants. The first instrument was the Patient Health Questionnaire-9 (PHQ-9), which was used to assess depression symptoms among participants. This instrument consists of nine items that evaluate respondents' conditions over the past 14 days, with each item scored on a scale ranging from 0 to 4, where 0 indicates "not at all" and 4 indicates "always." The total depression score ranges from 0 to 36 points, with higher scores indicating more severe depression. The validity of the Indonesian version of the PHQ-9 has been examined, yielding a statistical result in the form of an Eta correlation coefficient of r = 0.527, indicating a positive correlation within the Indonesian version of the PHQ-9. Internal consistency was assessed using Cronbach's alpha, which yielded a value of 0.873, falling within the acceptable range of 0.7 to 0.95, thereby confirming the reliability of the scale.(29)

The second instrument was the International Physical Activity Questionnaire-Short Form (IPAQ-SF), which was used to measure physical activity levels. This questionnaire consists of seven questions assessing participants' physical activity over the past seven days, evaluating three types of activities: walking, moderate-intensity activities, and vigorous-intensity activities. Physical activity scores are calculated using Metabolic Equivalent of Task (MET) values, where walking equals 3.3 METs, moderate-intensity activity equals 4.0 METs, and vigorous-intensity activity equals 8.0 METs. Physical activity levels were categorized into three groups: low activity (<600 MET-minutes/week), moderate activity (600-3000 MET-minutes/week), and high activity (>3000 MET-minutes/week). The IPAQ-SF was administered using the validated Indonesian version, as adapted and validated by Dharmansyah and Budiana (2021).(30)

Data analysis was performed using IBM SPSS Statistics, univariate analysis involved calculating descriptive statistics including frequency distributions and percentages for categorical variables (age, gender, faculty). For bivariate analysis, the Kolmogorov-Smirnov test was first performed to assess data distribution normality, with significance level set at $\alpha = 0.05$. This study used Spearman's rho correlation test to examine the relationship between depression symptoms and physical activity as non-parametric statistical methods.

The study protocol was reviewed and approved by the Research Ethics Committee of the Faculty of Health Sciences, Universitas Muhammadiyah Malang, with ethical clearance number E.4.d/095/KEPK/FIKES-UMM/VIII/2025.

RESULT AND DISCUSSION

This study involved 383 undergraduate students from Universitas Muhammadiyah Malang, the class of 2023. The demographic characteristics of respondents are presented in the following sections.

This study involved 383 undergraduate students from University of Muhammadiyah Malang, class of 2023. The age distribution of respondents ranged from 18 to 25 years, falling within the early adulthood category. The majority of respondents were 20 years old, accounting for 47.8% (183 respondents), followed by 21 years old at 25.6% (98 respondents), 19 years old at 16.4% (63 respondents), 22 years old at 7.3% (28 respondents), 23 years old at 1.3% (5 respondents), 18 years old at 0.8% (3 respondents), 24 years old at 0.5% (2 respondents), and 25 years old at 0.3% (1 respondent). Respondents aged 20-21 (73.4%) represent a critical period where depression can establish sedentary patterns persisting into later life. Diverse faculty representation highlights discipline-specific stressors across engineering, medical, and social science programs.(4)(28)(31)

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Table 1. Respondent characteristics

Respondent Characteristics	n	%
Age		
18	3	0.8
19	63	16.4
20	183	47.8
21	98	25.6
22	28	7.3
23	5	1.3
24	2	0.5
25	1	0.3
Sex		
Male	116	30.3
Female	267	69.7
Faculty		
Islamic Studies	19	5
Teacher Training and Education	30	7.8
Social and Political Sciences	53	13.8
Law	29	7.6
Economics and Business	57	14.9
Psychology	34	8.9
Agriculture and Animal Science	30	7.8
Engineering	79	20.6
Medicine	12	3.1
Health Sciences	40	10.4
Total	**383**	**100**

The gender distribution of the sample is presented in Table 2 above, with further details described as follows. The predominance of female respondents is consistent with findings from previous studies suggesting that women tend to be more open and willing to discuss mental health issues compared to males (32). Female predominance (69.7%) reflects documented gender differences, women experience depression at twice men's rate due to hormonal and psychosocial factors (33), and engage in less physical activity due to cultural norms and safety concerns (27). However, supplementary analysis using the Mann-Whitney U test revealed no statistically significant differences in depression symptoms ($p = 0.544$) or physical activity levels ($p = 0.349$) between male and female respondents, suggesting that the predominance of female participants did not introduce gender bias and that the results may be generalized across genders.

Respondents were distributed across ten faculties at University of Muhammadiyah Malang. The Faculty of Engineering had the highest representation with 20.6% (79 respondents), followed by the Faculty of Economics and Business at 14.9% (57 respondents), Faculty of Social and Political Sciences at 13.8% (53 respondents), Faculty of Health Sciences at 10.4% (40 respondents), Faculty of Psychology at 8.9% (34 respondents), Faculty of Agriculture and Animal Husbandry and Faculty of Teacher Training and Education each at 7.8% (30 respondents), Faculty of Law at 7.6% (29 respondents), Faculty of Islamic Studies at 5.0% (19 respondents), and Faculty of Medicine at 3.1% (12 respondents). This diverse faculty representation ensures that the study findings reflect the experiences of students across various academic disciplines with different academic demands and stress levels.

Table 2. Gender differences in depression symptoms and physical activity: Mann-Whitney U Test Results

Variabel	Gender	N	Mean Rank	P-value	α
Depression symptoms	Male	116	186.80	0.544	0.05
	Female	267	194.26		
Physical Activity	Male	116	200.04	0.349	
	Female	267	188.51		

Note:* U = *Mann-Whitney U* value; p = significance value (2-tailed); significance level α = 0.05

Table 3. Descriptive statistics of depression symptoms and physical activity among students

Category	n	Mean	St. Dev
Depression symptoms	383	10.45 (0-27)	5.596
Physical Activity		1812.93 (0-12.852)	1766.542

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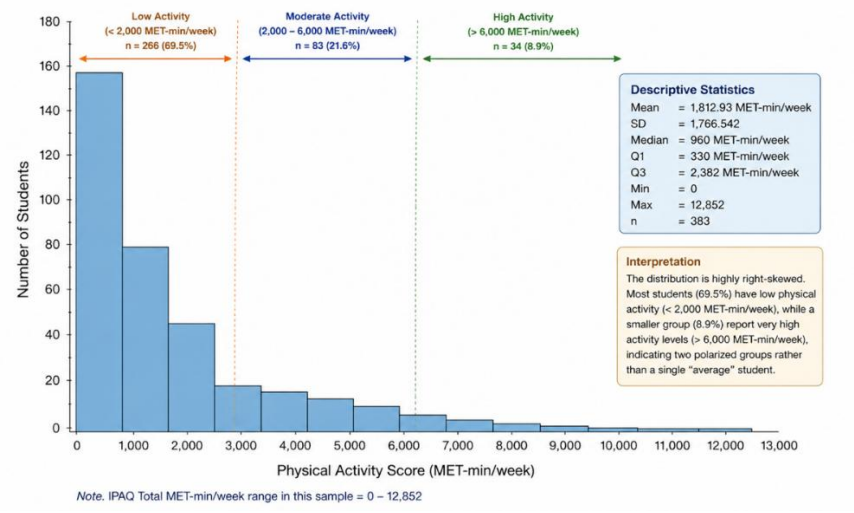


Figure 2. Histogram of physical activity scores among students

In addition to the gender distribution, the sample was also characterized by a relatively high proportion of students from the Faculty of Engineering. This may have influenced the findings, as engineering students are often engaged in academically demanding and sedentary activities such as prolonged computer use, laboratory work, and project-based assignments(34). Such patterns may contribute to lower levels of physical activity, which in turn could amplify the observed relationship between physical inactivity and depressive symptoms(35). Therefore, the results should be interpreted with caution, as the sample composition may limit generalizability to student populations with more diverse activity patterns..

The descriptive statistics revealed considerable variability in both depression symptoms and physical activity among respondents. For depression symptoms, the mean score of 10.45 (SD = 5.596) indicated that on average, the students experienced moderate depression symptoms. The scores ranged from 0 (no depression) to 27 (severe depression), demonstrating the wide spectrum of mental health conditions among the student population.

Physical activity levels showed even greater variability, with a mean of 1812.93 MET-minutes/week (SD = 1766.542) and a range from 0 to 12,852 MET-minutes/week. This wide range indicates extremely diverse physical activity patterns, with some students engaging in no physical activity whatsoever while others maintain very high levels of physical activity. The mean value of 1812.93 MET-minutes/week places the average student in the moderate physical activity category (600-3000 MET-minutes/week).

The extreme variability in physical activity (0 to 12,852 MET-minutes/week, mean = 1812.93, SD = 1766.542) reveals stark disparities. While the mean meets WHO recommendations, the large standard deviation indicates distinct subpopulations of highly active and completely sedentary students. Complete inactivity is concerning given associations with cardiovascular disease and worsening mental health (36). The Riskesdas 2018 finding that only 33.5% of Indonesians meet activity recommendations suggests these patterns reflect broader societal trends (17).

Table 4. Normality analysis

Variabel	N	P-value	α
Depression symptoms	383	0.000	0.05
Physical activity		0.000	

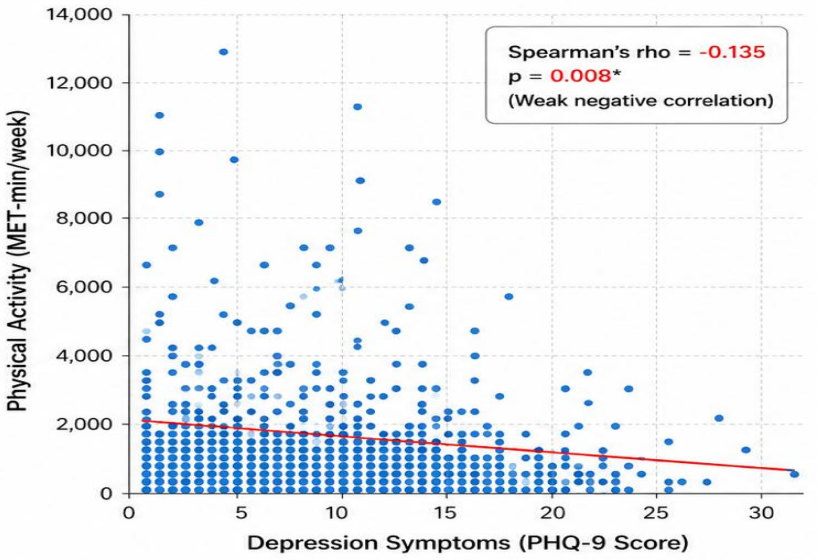
Note:* *Kolmogorov-Smirnov* analysis ; N = Respondent ; *p* = Significant value; α = Significance level

Table 5. Correlation between depression symptoms and physical activity among university students

Variable	N	Mean	P-value	r	α
Depression symptoms	383	10.45	0.008*	-0.135	0.05
Physical Activity		1812.93			

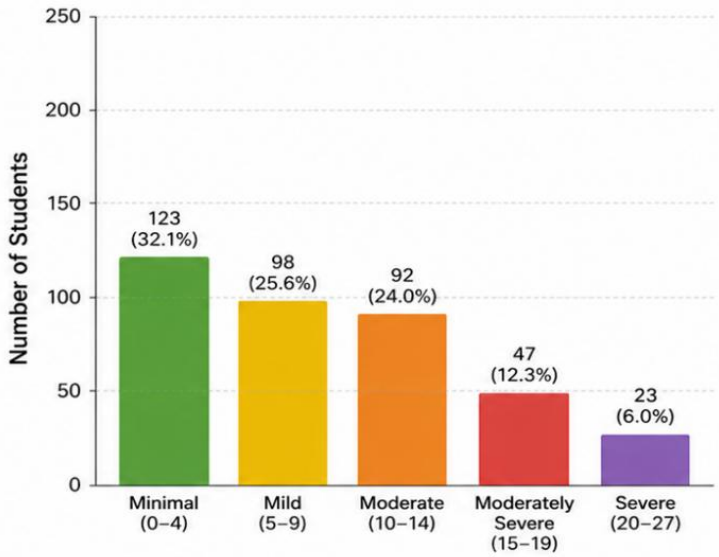
Note:* *Spearman's rho* analysis ; N = Respondent ; Mean = Average value ; * = Correlation ; *p* = Significant value ; r = Correlation value ; α = Significance level

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Note. Each point represents one student. The red line indicates the trend of the relationship. The correlation is statistically significant but weak, showing a slight downward trend.

Figure 3. Scatter plot of depression symptoms and physical activity among university student (n=383)



Depression Category (PHQ-9)	Score Range	n	%
Minimal	0 – 4	123	32.1
Mild	5 – 9	98	25.6
Moderate	10 – 14	92	24.0
Moderately Severe	15 – 19	47	12.3
Severe	20 – 27	23	6.0
Total		383	100.0

Note. PHQ-9 categories: Minimal (0–4), Mild (5–9), Moderate (10–14), Moderately Severe (15–19), Severe (20–27).

Figure 4. Distribution of depression categories among university student (n=383)

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The Kolmogorov-Smirnov test was conducted to assess the normality of data distribution for both variables. The results indicated that both depression symptoms ($p = 0.000$) and physical activity ($p = 0.000$) were not normally distributed, as the p-values were below the significance threshold of 0.05. The non-normal distribution of depression scores may reflect the skewed nature of mental health conditions in the general student population, where most students experience low to moderate levels of depression with fewer cases of severe depression. Similarly, the non-normal distribution of physical activity scores suggests that physical activity patterns do not follow a bell-shaped curve, possibly due to distinct subgroups of students (sedentary vs. active).

The Spearman's rho correlation analysis revealed a statistically significant negative correlation between depression symptoms and physical activity among students ($r = -0.135$, $p = 0.008$). The negative correlation coefficient indicates an inverse relationship between the two variables: as depression symptoms increase, physical activity levels tend to decrease. Although the correlation coefficient of -0.135 indicates a weak relationship according to conventional interpretation guidelines, the statistical significance ($p = 0.008 < 0.05$) confirms that this relationship is unlikely to have occurred by chance. This finding supports the alternative hypothesis (H_1) that there is a significant relationship between depression symptoms and physical activity among students, while the null hypothesis (H_0) is rejected.

This study demonstrates a statistically significant negative correlation between depression symptoms and physical activity among university students ($r = -0.135$, $p = 0.008$), indicating that higher depression symptoms are associated with reduced physical activity. While the correlation is weak, its statistical significance confirms a meaningful relationship consistent with biopsychosocial models of mental health. The mean depression score of 10.45 places students in the moderate depression category, aligning with Setyanto's (2023) findings among Indonesian university students.(12) This transitional period of university life, characterized by academic pressures and identity formation, creates vulnerability for mental health difficulties.(4)

Although the correlation between depression symptoms and physical activity was statistically significant ($r = -0.135$, $p = 0.008$), the magnitude of the association was weak. This suggests that while biological and psychological mechanisms linking depression and reduced physical activity are well established, these internal factors may not be the primary determinants of physical activity behavior in this population.

In the context of Indonesian university students, external and environmental factors are likely to play a more dominant role in shaping activity patterns. For instance, the tropical climate with high temperatures and humidity may discourage outdoor physical activity, particularly among students with limited access to climate-controlled facilities. In addition, inadequate pedestrian infrastructure and limited campus walkability may reduce opportunities for incidental physical activity.(37)(38) Academic demands, including prolonged sedentary study, laboratory work, and screen-based tasks, may further constrain students' time and motivation for exercise.(35)(39) These contextual constraints may attenuate the strength of the relationship between depression and physical activity, resulting in a statistically significant but weak correlation. Therefore, physical activity behavior in this population appears to be influenced by a complex interplay of psychological, biological, and environmental factors, with external barriers potentially overriding internal motivational processes.(39)(40)

The depression and physical activity relationship operates through multiple mechanisms. Neurobiologically, depression involves dysregulation of serotonin, norepinephrine, and dopamine, neurotransmitters crucial for motivation and energy.(19) Impaired dopaminergic systems cause anhedonia making exercise unrewarding.(41) Depression activates the HPA axis, elevating cortisol and causing fatigue that barriers physical activity.(42) This creates a vicious cycle, depression reduces activity biologically, while reduced activity exacerbates depression by limiting endorphin and BDNF production.(23) Psychologically, learned helplessness and negative thought patterns undermine self-efficacy for sustaining activity.(20)

The negative correlation observed ($r = -0.135$, $p = 0.008$) is consistent with Kim et al., (2021), who found Korean university students with low physical activity experienced significantly higher depression and poorer interpersonal relationships.(25) Their study showed a dose-dependent relationship, with moderate and high activity groups showing progressively better mental health outcomes. Similarly, Rifki & Tjandra (2024) found Indonesian medical students with minimal activity were more likely to experience moderate to severe depression, though they did not find statistical significance using different analytical approaches.

These findings have important practical implications. First, routine depression screening using PHQ-9 should be integrated into student health assessments. Second, physical activity interventions for students with depressive symptoms should move beyond general recommendations toward structured approaches such as Physical Activity on Prescription (PAP). In this model, campus health services do not merely advise students to "be more active," but provide individualized, low-barrier activity prescriptions tailored to students'

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psychological and contextual constraints. For instance, considering the presence of anhedonia and low motivation identified in this study, interventions may include simple and achievable programs such as 10–15-minute guided campus walking groups, scheduled at flexible times and integrated into students' daily routines. These structured yet accessible activities may help reduce psychological barriers to initiation, gradually building adherence and restoring motivation for physical activity.

Study strengths include adequate sample size (n=383), diverse faculty representation, and validated instruments (PHQ-9, IPAQ). Limitations include cross-sectional design precluding causal inference, self-report biases, weak correlation indicating numerous unmeasured factors (social support, facility access, sleep quality) substantially influence physical activity, female predominance (69.7%) limiting generalizability to males, and single-university restriction.

CONCLUSION

This study shows that students at Muhammadiyah University Malang have an average depression score of 10.45, indicating moderate symptoms of depression, while their physical activity levels vary with an average of 1812.93 MET-minutes/week, with the majority falling into the moderate to low category and not meeting WHO recommendations. The analysis results reveal a significant negative correlation between depression symptoms and physical activity, meaning that the higher the students' depression symptoms, the lower their physical activity, thus requiring serious attention to improve students' mental and physical well-being.

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