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Relationship Between Physical Activity and Stress Among UNNES Sports Science Students

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Keywords

Physical activity; DASS-21; IPAQ

Abstract

Final-semester students are vulnerable to accumulated psychological stress from demanding academic obligations, including final assignments and workforce transition preparation, making stress a serious threat to well-being. Exercise and physical activity have long been known to mitigate this stress through biological and neuropsychological pathways. This study examines the relationship between daily physical activity intensity and psychological well-being among final-semester students at the Faculty of Sport Science. A quantitative correlational design was used, involving 200 respondents selected through random sampling from the Faculty of Sport Science class of 2022. Physical activity was measured using the IPAQ instrument and categorized by MET-minutes/week as low (below 600), medium (600-3000), and high (above 3000), while stress was assessed using the DASS-21, ranging from normal to very high. Data were analyzed using Spearman correlation and Chi-Square tests. Results showed a strong negative correlation between the variables ($r_s = -0.692$; $p < 0.001$), with strong association strength (Gamma = -0.850; $p < 0.001$). The distribution of stress categories differed significantly between activity groups ($\chi^2 = 117.784$; df = 8; $p < 0.001$). Students with higher physical activity had significantly better psychological well-being, reinforcing the need for active movement promotion strategies as mental health interventions in higher education.

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INTRODUCTION

In the dynamics of campus life, stress can be defined as a psychobiological reaction that arises when a person's capabilities are unable to keep pace with the demands of their environment. Students in their final semester are in the most psychologically vulnerable position, as they must simultaneously face a series of major obligations: writing a final thesis, taking comprehensive exams, planning their careers, and facing post-graduation uncertainty (Beiter et al., 2015). If not managed with adequate coping strategies, the consequences can lead to a decline in academic performance, impaired mental functioning, and even a reduction in overall quality of life.

The prevalence of stress among Indonesian college students is quite alarming. Stress levels among Indonesian college students range from 36.7% to 71.6%, with the primary factors being academic pressure and an inability to manage academic workloads. This situation is even more severe among senior students who must complete their theses within a limited timeframe while preparing to enter the workforce (Fajriawan et al., 2022). Various studies in Indonesia confirm that more than half of senior students experience moderate to severe stress (Danu et al., 2024).

In efforts to manage stress, movement-based approaches are gaining increasing attention as an affordable and proven non-medical solution. Physical activity can generally be defined as any form of activity that moves skeletal muscles and requires energy expenditure, encompassing various aspects of daily life such as sports, recreation, active travel, and activities at home or at work (Organization, 2020). WHO guidelines (2020) recommend 150–300 minutes of moderate-intensity physical activity per week for adults to achieve optimal benefits, including a reduction in symptoms of depression and anxiety (Bull et al., 2020).

From a neurological and hormonal perspective, physical activity triggers beneficial responses: the release of endorphins, the normalization of cortisol levels, and the regulation of neurotransmitters such as serotonin and dopamine, which collectively reduce the intensity of the stress response (Pearce et al., 2022);(Hu et al., 2020). A review analyzing 38 studies involving more than 20,000 students across various countries demonstrated a consistent association between higher levels of physical activity and lower levels of stress, depression, and anxiety (Martín-Rodríguez & González-Prieto, 2025).

Correlational quantitative studies using the IPAQ and DASS-21 among college students have been conducted in various contexts, including Brazil (Oliveira et al., 2023), Saudi Arabia (Ahsan & Abualait, 2025), and Turkey (Ketenci et al., 2023). Each of these studies confirmed a significant inverse relationship between physical activity and stress. (Tan et al., 2020) found that students with high physical activity and low sedentary time reported significantly lower stress scores compared to the inactive group.

In the Indonesian academic context, studies that specifically examine the population of final-year students remain relatively rare. The majority of existing research tends to combine various academic stages without identifying final-year students as a distinct subgroup with unique and distinct stress profiles. In fact, the unique nature of the stress experienced by this group both in terms of volume and complexity warrants dedicated research attention.

Based on this, this study was designed to answer the empirical question of whether there is a correlation between physical activity levels and stress intensity among final-year students at semarang state university. these findings are expected to serve as a scientific basis for the development of physical activity-based health promotion policies on campus.

METHODS

This study employed a quantitative correlational design. The target population consisted of all final-semester students in the Faculty of Sports Science at Semarang State University. A total of 200 students were selected as the sample through a random sampling procedure. Respondents included in this study met the following criteria: (1) enrolled as active students in their 8th semester, (2) willing to participate voluntarily, and (3) not currently undergoing treatment that affects their psychological condition.

Physical activity was assessed using the short form of the International Physical Activity Questionnaire (IPAQ-SF), a measurement tool whose reliability and validity have been verified

in 12 countries, with a test-retest reliability coefficient of approximately rho = 0.80, and which is recommended for the population aged 15–69 years. A systematic review of European Union countries confirmed that the IPAQ possesses internationally acceptable measurement properties. The measurement results are expressed in MET-minutes/week, which are then grouped into three categories: low (below 600 MET-minutes/week), moderate (600–3000 MET-minutes/week), and high (above 3000 MET-minutes/week).

The respondents' stress levels were measured using the stress subscale of the Depression Anxiety Stress Scale 21 (DASS-21) (Ruo et al., 2025), a widely validated multidimensional instrument designed to assess affective disorders including depression, anxiety, and stress within a single measurement set. A COSMIN-based systematic review encompassing 48 studies confirmed that the DASS-21 possesses high-quality evidence for bifactor structural validity and internal consistency (Tran et al., 2019) . Cross-national validation studies indicate that this scale is fully unidimensional with a Person Separation Index (PSI) reliability index of 0.82 for the stress subscale (Ruo et al., 2025). The seven stress items are scored 0–3 and then multiplied by two following the DASS-21 conversion guidelines. The results are interpreted across five levels: normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and very severe (≥ 34).

Data analysis was performed using SPSS version 25. The normality of the distribution was tested using the Shapiro-Wilk and Kolmogorov-Smirnov tests. Since the data were ordinal, the relationships between variables were evaluated using Spearman's correlation (rs) to determine the direction and strength of the relationship, as well as the Chi-Square test to assess differences in stress distribution among each physical activity group. The Gamma coefficient was calculated as an additional measure to assess the magnitude of the ordinal relationship. The significance level was set at $\alpha = 0.05$.

Research ethics were adhered to through the acquisition of permission from the Faculty of Sports Science, signed by the authorized party. All participants provided consent after receiving an explanation prior to data collection, and the confidentiality of individual identities and data was fully guaranteed.

RESULTS AND DISCUSSION

Of the 200 students involved, the IPAQ assessment showed that 55 students (27.5%) were classified as having low activity levels, 101 students (50.5%) had moderate activity levels, and 44 students (22.0%) had high activity levels. The mean MET categorization score was 1.95 (SD = 0.70). The DASS-21 assessment yielded a mean stress score of 2.60 (SD = 1.29), with the following breakdown: 62 respondents (31.0%) were in the normal range, 23 (11.5%) had mild stress, 62 (31.0%) had moderate stress, 40 (20.0%) had severe stress, and 13 (6.5%) had very severe stress. This demographic profile of stress is consistent with a study (Danu et al., 2024), which found that 48% of final-semester students in Indonesia experience high academic stress.

Table 1. Distribution of Respondents Physical Activity and Stress Categories (n=200)

Category	N	Pesentase (%)
Physical Activity		
Low (<600 MET-min/week)	55	27,5
Moderate (600–3000 MET-min/week)	101	50,5
High (>3000 MET-min/week)	44	22,0
Stress Level		
Normal (0–14)	62	31,0
Mild (15–18)	23	11,5
Moderate (19–25)	62	31,0
Severe (26–33)	40	20,0
Very Severe (≥34)	13	6,5

Data Distribution Test

The Shapiro-Wilk test yielded a p-value of 0.920 (TotalMET) and 0.956 (StressScore), indicating distributions that do not deviate significantly from normal. However, since both variables were analyzed in an ordinal-categorical form, nonparametric analysis remains the more appropriate methodological choice, in accordance with the principles of ordinal data analysis.

Findings on the Correlation Between Physical Activity and Stress

The Spearman correlation test yielded an rs value of −0.692 ($p < 0.001$; $n = 200$), indicating a significant inverse relationship: the more physically active a person is, the lower their stress levels. The strength of this correlation falls into the category of strong and statistically significant. These results align with findings from a longitudinal study of university students in Germany that confirmed the role of leisure-time physical activity in significantly reducing stress levels (Teuber et al., 2024).

Cross-Tabulation Analysis

Differences in the distribution of stress levels among the three physical activity groups were found to be significant via the Chi-Square test ($\chi^2 = 117.784$; $df = 8$; $p < 0.001$), confirming that an individual's membership in a particular activity group is significantly associated with their psychological state.

The negative correlation pattern found in this study is consistent with existing scientific evidence. Physically active individuals have better stress profiles this pattern was confirmed in a large-scale systematic review (Pearce et al., 2022) involving millions of participants from diverse demographic backgrounds, which found that an active lifestyle is consistently associated with a lower risk of psychological disorders. Similar findings were also reported in a PRISMA-compliant systematic review analyzing 38 studies conducted between 2020 and 2025, which consistently demonstrated an association between higher levels of physical activity and lower levels of stress, depression, and anxiety among college students (Martín-Rodríguez & González-Prieto, 2025).

The mechanistic explanation for these findings stems from three main pathways. The first pathway is neurobiological: physical exercise promotes the synthesis and release of monoamine compounds such as serotonin and dopamine, as well as endorphins, which are known to have mood-stabilizing effects (Hu et al., 2020) A comprehensive review by (Kandola et al., 2019) confirms that aerobic activity consistently produces neurobiochemical responses that reduce stress reactivity through modulation of the limbic system and prefrontal cortex. The second pathway is hormonal: regular physical activity maintains the balance of the HPA axis, preventing excessive production of cortisol a biological marker of stress. The third pathway is restorative: physical activity improves sleep quality and duration, which in turn strengthens an individual's ability to regulate emotions (Teuber et al., 2024). (Chang et al., 2022) add that physical activity also acts through pathways of psychological resilience and adaptive coping styles as mediators that significantly reduce negative emotions in students.

The Gamma coefficient of −0.850 provides a clearer picture of the strength of this relationship compared to the Spearman coefficient. This is to be expected because Gamma only accounts for data pairs with different directions (positive vs.negative), without considering pairs with identical values. In practice, this means there is a clear and consistent pattern: the higher the activity level, the lower the stress intensity.

Table 2. Cross - Tabulation of Physical Activity Groups and Stress Conditions

Physical Activity	Normal n(%)	Low n(%)	Moderate n(%)	High n(%)
Low	0 (0,0%)	0 (0.0%)	21 (38,3%)	21 (38,2%)
Moderate	28 (27,7%)	17 (16,8%)	37 (36,6%)	19 (18,8%)
Hight	34 (77,3%)	6 (13,6%)	4 (9,1%)	0 (0,0%)
Total	**62**	**23**	**62**	**40**

The cross-tabulation distribution reinforces this picture. In the low-activity group, not a single respondent was in a normal state. Conversely, in the high-activity group, 77.3% of respondents were in a normal state a striking contrast.

A similar pattern was also found by Oliveira et al. (2023) in a correlation study in Brazil using the same instruments (IPAQ and DASS), where students with low physical activity showed higher levels of anxiety and depression. (Tan et al., 2020), in an internet-based study of college students in Germany, also reported that the combination of high physical activity with low sitting time resulted in the lowest stress scores (Perceived Stress Scale −3.5; 95% CI −4.6 to −2.5; $p < 0.001$) compared to other combinations.

The findings of this study are highly relevant to the 2022 cohort of undergraduate students at the Faculty of Sports Sciences at Semarang State University, who will be entering their final semester of study in the 2025/2026 academic year. Sports science students possess unique characteristics compared to the general student population: their curriculum is heavily focused on sports practice, meaning they are structurally exposed to a higher volume of physical activity in their daily academic lives.

This uniqueness is confirmed by a study analyzing the physical activity of Sports science students conducted by researchers from the UNNES Journal of Sports Science and Fitness program, which found that, on average, Sports science students spend 3–4 hours per day on physical activity or sports during their leisure time far exceeding WHO recommendations (Bull et al., 2020). These findings indicate that students, structurally, have relatively high exposure to physical activity compared to students in non-sports faculties. However, high exposure to physical activity does not necessarily mean the absence of psychological stress, given that senior students still face the burden of theses, Literate, Agile, Nurturing, Trailblazing, Innovative, dan Problem-solving, and various comprehensive exams that demand high cognitive capacity and time management skills.

In the national context, a similar study conducted by Handayani & Fithroni (Handayani & Fithroni, 2022) on senior students at the Faculty of Sports Science, Surabaya State University (FIO UNESA), serves as the most methodologically relevant point of comparison. That study used a quantitative correlational design with the IPAQ instrument on 39 students from the class of 2018 and found that physical activity levels were significantly negatively correlated with stress levels in line with the findings of this study ($r_s = -0.692$; $p < 0.001$). These findings at FIO UNESA indicate that although Sports science /FIO students are generally more physically active than students in other faculties, physical activity levels within their group remain significantly correlated with the stress they experience.

A study conducted by Putri (Putri et al., 2024). on eighth-semester students at the Faculty of Sports Science, Cenderawasih University (UNCEN), also yielded supporting findings: there was a significant negative relationship between physical activity and stress levels among final-semester students ($p = 0.033 < 0.05$).

Interestingly, the UNCEN study found no significant association between sleep quality and stress levels when analyzed separately, suggesting that physical activity is a stronger predictor of stress than sleep quality among Sports science students thereby reinforcing the central role of physical activity as a dominant psychological protective factor.The stress experienced by the 2022 cohort of Sports science students during their final semester cannot be separated from the context of their academic environmentAs students who began their studies during the post COVID 19 pandemic transition period, the 2022 cohort experienced a shift in learning patterns from online to in-person, which required its own psychosocial adaptation. A study by Palilingan (Palilingan, 2023) of final-year students in the Public Health Program at the State University of Manado which is also part of the Faculty of Sports Science and Public Health found that among 60 active student samples from the 2018–2019 cohort, there was a significant association between physical activity and stress levels, highlighting that students with low levels of physical activity are more vulnerable to severe stress.

In addition, what sets the 2022 cohort of Sports science UNNES students apart is their exposure to a structured sports culture. Unlike students in general who exercise sporadically, Sports science students are accustomed to scheduled training programs, an understanding of sports theory, and monitoring of physical performance. This fosters a distinctive psychological

tendency: an understanding of the benefits of exercise for mental health can strengthen intrinsic motivation to stay active even amidst the pressures of writing a thesis. in a cross-national study (Belarus–Poland) found that students from the physical education faculty consistently exhibited lower stress levels and higher life satisfaction compared to non-sports students, with active coping strategies as the dominant response.

However, being a Sports science student does not automatically mean being free from the risk of high stress. The findings of this study indicate that 27.5% of respondents a combined group of students from various faculties at UNNES, including the Faculty of Physical Education still fall into the low-activity group (<600 MET-minutes/week). This figure indicates that even among students who, by definition, should be more active, some have not yet reached the protective threshold for physical activity. Specifically, in the context of the 2022 cohort at the Faculty of Sports Sciences at UNNES, the pressure to complete a thesis which requires significant screen time for data analysis and writing actually has the potential to reduce the time spent on physical activity, thereby creating a paradox in which students studying physical activity experience a decline in activity during their final semester.

This paradox aligns with the findings of DeYoung's research (DeYoung et al., 2023), which documented a decline in all types of physical activity during periods of high academic stress, accompanied by increased sedentary time and heightened stress perception. More specifically, a longitudinal study confirms that active breaks during intensive study sessions significantly reduce students' functional stress load, even without the need to increase overall daily exercise volume a finding highly relevant to the 2022 cohort of Sports science UNNES students who are currently working on their theses.

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There are several methodological considerations to note. The cross-sectional study design used does not allow for drawing causal inferences; the direction of the effect cannot be determined based solely on data from a single point in time. Longitudinal studies, such as the one conducted by Teuber in 2024, are better suited to confirm such causality. Additionally, the self-report nature of the IPAQ carries the potential for overreporting compared to actual conditions, as identified by Dyrstad in his comparison with accelerometer data. Finally, several variables known to influence stress such as sleep quality, social networks, nutritional status, and the physical training load specific to sports were not included as control variables. Specifically for Sports science students, the variables of study program (PJKR, IKOR, PGSD, PKO) and training intensity in each sport have the potential to be significant confounding factors and need to be controlled for in future research.

CONCLUSION

This study successfully identified a significant negative correlation between physical activity intensity and stress levels among senior students at semarang state university ($r = -0.692$; $p < 0.001$), with a strong relationship (gamma = −0.850; $p < 0.001$). students with higher levels of physical activity consistently demonstrated better psychological well-being. these findings reinforce the role of physical activity as a relevant preventive tool for mental health in the campus environment.

In the specific context of the 2022 undergraduate cohort in the faculty of sports science at unnes, these findings have dual implications. on one hand, a background in sports

education should provide a greater inclination and ability to manage stress through physical activity. on the other hand, academic pressures during the final semester including thesis writing, which involves intensive desk-based work have the potential to reduce the volume of physical activity even among students with a background in sports education. therefore, as an institution, the unnes faculty of sports science needs to proactively design a campus ecosystem that supports active movement habits among final-semester students, for example through scheduled sports programs during thesis supervision, flexible access to fitness facilities, and the strengthening of active, cohort-based communities.

To strengthen the causal basis, longitudinal studies or experimental designs with intervention and control groups are highly recommended as next steps, incorporating mediating variables such as sleep quality, psychological resilience, and coping styles. further research is also recommended to specifically compare physical activity and stress profiles across study programs within the faculty of sports science at unnes, as well as to use objective physical activity measurement tools such as accelerometers to improve data accuracy.

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