

Active protection? Differences in academic stress across physical activity levels in university students

Miftakhul Jannah¹ , Rachman Widohardhono² , Nabila Rachman³ ,
Eva Nandha Jalma Yael¹ , Adiwignya Nugraha Widhi Harita¹ ,
Damajanti Kusuma Dewi¹ , Kususanto Ditto Prihadi⁴ 

¹Universitas Negeri Surabaya, Department of Psychology, Surabaya, Indonesia;

²Universitas Negeri Surabaya, Faculty of Vocational, Department of Sport Coaching, Surabaya, Indonesia; ³Universitas Islam Negeri Maulana Malik Ibrahim, Department of Psychology, Malang, Indonesia; ⁴Sunway University, School of Education, Department of Educational Development and Innovation, Selangor, Malaysia.

Associate Editor: Paulo Henrique Guerra , Universidade Estadual Paulista "Júlio de Mesquita Filho", Instituto de Biociências, Departamento de Educação Física, Rio Claro, SP, Brazil. E-mail: paulo.guerra@unesp.br.

Abstract - Aim: Academic demands and performance expectations constitute significant stressors among university students. Physical activity among students varies from low to moderate and high levels. Physical activity has various health and psychological benefits. This study aimed to determine differences in academic stress in terms of level of physical activity carried out by university students. **Methods:** A cross-sectional survey was conducted involving 389 students aged 17-24 years. Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ) and categorized into low (<600 MET-min/week), moderate (600-2999 MET-min/week), and high (≥ 3000 MET-min/week). Academic stress was measured using the Perception of Academic Stress Scale (PASS). Due to violation of homogeneity of variance, differences were analyzed using the Kruskal-Wallis H test followed by Dunn's post hoc comparisons. **Results:** A significant difference in academic stress was observed across physical activity levels ($H(2) = 14.97$, $p < 0.001$). Students in the high physical activity group reported significantly lower academic stress compared to those in the low activity group. The effect size indicated a small but meaningful difference ($\eta^2 H \approx 0.03$). **Conclusion:** Higher levels of physical activity were associated with lower academic stress among university students. These findings support the stress-buffering perspective of exercise and emphasize the importance of promoting regular physical activity among university students. Managing academic stress while encouraging further longitudinal research to explore underlying mechanisms.

Keywords: academic pressure, healthy lifestyle, exercise, collegiate student, undergraduate student.

Introduction

Academic and social pressures constitute significant stressors that burden university students' lives. Stress occurs when there is a perceived imbalance between environmental demands and an individual's physical, psychological, and social coping resources¹. University students face high expectations, continuous information overload, academic pressure, unrealistic ambitions, limited opportunities, and competitive environments, all of which contribute to elevated stress levels²⁻⁴. Those academic stressors come from a curriculum with a high load, a lot of lecture material that must be studied and mastered, academic compe-

tence between friends to get the best grades and much coursework to be done. When working on a thesis, excessive stressors can become an obstacle for students in completing their thesis, such as the feeling of not being able to complete the thesis, which has an impact on increasing the study period⁵. It is interesting that academic stress can occur both on senior⁶ and new university students⁷.

Academic stress may also reflect students' attempts to adapt to academic demands. This stress arises when individuals face challenging academic situations involving physical, psychological, and emotional demands^{3,4,8,9}. However, failure to cope with the burden effect of academic stress will bring detri-

mental impact to a person¹⁰. For university students, academic stressors come from the results of perceptions and assessments in tertiary institutions¹¹.

Several factors influence university students' academic stress levels, including (a) type of study program, (b) gender, (b) college year, (c) classmate, and (d) social support⁷. Despite all those challenges, there are other factors such as (a) fear of change, (b) failures result in performance academic, (c) the minimum amount of free time, and (d) competition between friends¹².

There are three aspects of academic stress¹², namely: (a) Academic expectations both from internal and external factor of the student; (b) Faculty work and examinations; (c) Student academic self-perception including self-ability to meet the academic standards. Meanwhile, Dewi et al.⁷ emphasized that college year has the most dominant influence caused by individual perceptions academic setting and condition.

The perception of academic stress is subjective based on student's assessment of the academic demands and burdens they feel. These academic demands and burdens can become stressors related to academic conditions, which cause students to have perceptions of their inability to face these demands¹⁴. Preparing a thesis is a stage that dominantly influenced students' academic stress conditions⁵.

Preliminary studies have been carried out by conducting to at the Psychology State University of Surabaya students. We found that academic stress influences students' time management difficulties, negative mood swings, anxiety, nausea, lack of sleep, and procrastination. Yet students who actively engage in physical activities tend to have a better condition to deal with it⁵.

Being physically active is a potential solution to counter the negative effect of academic stress. Research by Nguyen-Michel et al.¹⁴ found that physical activity will reduce a stress levels by reducing muscles tension in the body. Furthermore, it will help reduce emotional tension when student fail to meet academic demands^{6,15-18}. It also helps a person by reducing stress hormones in limbic system¹⁹⁻²².

World Health Organization defines physical activity as planned, structured, and repetitive movement aimed at improving and maintaining physical fitness and health¹³. Moderate-intensity aerobic activities, such as walking or jogging, are commonly recommended for adults to promote cardiovascular and psychological well-being⁶. Physical activity prescriptions should consider individual physical condition and capacity to reduce the risk of injury³⁴. Injury prevention strategies and biomechanical considerations are increasingly emphasized in physical education contexts³⁴.

Problems regarding physical activity and stress have previously been studied in students. The results showed a negative relationship between physical activity and stress in students^{6,15,21}. Meta-analytic evidence consistently confirms the stress-buffering and anxiolytic effects of regular physical activity across non-clinical populations²⁶⁻²⁸. Physical activities also positively associated with stress tolerance²⁷. It also helps the students by improving their circadian rhythm when dealing with academic stress²⁴. However, several studies have found conflicting data where physical activity is positively associated with stress among students, both during pandemic and non-pandemic conditions^{24,25}.

These studies indicate that inconsistencies remain regarding the relationship between physical activity and academic stress. Thus, no research yet mapped the relationship between physical activity and academic stress based on the intensity level of the physical activity performed by collegiate students. Therefore, this study aims to examine the relationship between physical activity and academic stress based on the intensity of the physical activity performed. This research is expected to contribute to knowledge regarding the use of physical activity as a means to cope with stress caused by academic situations.

Methods

Participants

This research involved 389 university students from East Java Province, Indonesia, using convenience sampling of participants aged 17–24 years (mean 19.4, standard deviation 1.3), the sample comprised 103 males and 286 females. To obtain participants, the researchers created a google form and distributed the link to potential participants through various academic channels available to the authors. The data was then screened based on participant criteria, which included being an active student currently enrolled in a university in East Java, Indonesia.

All participants provided written informed consent in line with the Declaration of Helsinki, ensuring compliance with ethical standards. They were fully briefed on the study's objectives, procedures, and potential risks or benefits before voluntarily agreeing to participate. Ethical approval was granted by the Faculty of Psychology, Surabaya State University (Approval ID: B/3136/UN38.11/TU.00/2025), safeguarding research integrity and participant rights.

Research design

Data collection was carried out by distributing questionnaires to university students online. The

instrument was distributed through social media platforms commonly accessed by university students over a one-month period. The instrument used for physical activity variables in this study used the Global Physical Activity Questionnaire (GPAQ), which had been developed by Armstrong and Bull from World Health Organization¹³. This questionnaire was then adapted and interpreted into Indonesian. The questionnaire will contain 16 item questions categorized into three main sections such as physical activity at work, travel activities from one place to another, and activities spent for recreation or free time for one week. GPAQ has a reliability of 0.78. The adaptation of GPAQ will be explained in Table 1.

Physical activity data from GPAQ uses units of minutes-MET (Metabolic Equivalent of Task) per week. The data that have written by the participants will be calculated with this equation:

$$\begin{aligned} \text{Total Physical Activity MET} - \text{minutes/week} = \\ [(P2 * P3 * 8) + (P5 * P6 * 4) + (P8 * P9 * 4) \\ + (P11 * P12 * 8) + (P14 * P15 * 4)] \end{aligned}$$

The results of calculating the MET minutes/week units then categorized into three levels. Participants

with METs scores exceeding 3000 will be categorized as having a high level of physical activity. Furthermore, participants with METs scores between 600 and 3000 will be categorized with medium level of physical activity. Meanwhile participants with the scores lower than 600 are categorized in low level.

The instrument to measure stress variables uses an academic stress scale adapted from the Perception of Academic Stress Scale (PASS) by Bedewey and Gabriel¹². This PASS instrument is using likert type scale which consists 18-item statements and 5 alternative answer choices. PASS consists three aspects which are academic expectations, lecture demands and examinations, and students' academic self-perceptions. This adapted version consisted of 13 items. Alternative answer choices 1-10. The reliability results in this academic stress scale trial were 0.69. Cronbach's alpha of 0.69 is considered acceptable for exploratory research and cross-cultural adaptation contexts. The adaptation references of PASS instrument will be explained in Table 2.

Academic stress measurement data were obtained by summing the total scores provided by the participants. However, in the adapted PAS scale, there

Table 1 - GPAQ Adaption

Code	GPAQ	GPAQ adaptation (Indonesian)	Note
	Activity at work/university	Kegiatan saat bekerja/kuliah	
P1	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 min continuously?	Apakah dalam kegiatan sehari-hari Anda melakukan aktivitas dengan intensitas berat? (menyebabkan nafas terengah-engah dan jantung berdebar sangat cepat)	If yes, go to P2 If no, go to P4
P2	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Berapa hari dalam seminggu Anda melakukan aktivitas berat?	Number of day _
P3	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Berapa lama dalam 1 hari Anda melakukan aktivitas berat tersebut?	Hours : minutes _ : _ Hrs mins
P4	Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 min continuously?	Apakah dalam kegiatan sehari-hari Anda melakukan aktivitas dengan intensitas sedang? (menyebabkan nafas atau nadi sedikit lebih keras dari biasanya)	If yes, go to P5 If no, go to P7
P5	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Berapa hari dalam seminggu Anda melakukan aktivitas sedang?	Number of days _
P6	How much time do you spend doing moderate-intensity activities at work on a typical day?	Berapa lama dalam 1 hari Anda melakukan aktivitas sedang tersebut?	Hours : minutes _ : _ Hrs mins
Code	GPAQ	GPAQ adaptation (Indonesian)	Note
	Travel to and from places	Perjalanan dari satu tempat ke tempat lain	
P7	Do you walk or use a bicycle (pedal cycle) for at least 10 min continuously to get to and from places?	Apakah Anda berjalan kaki atau bersepeda minimal 10 menit untuk pergi ke suatu tempat secara rutin?	If yes, go to P8 If no, go to P10

(continued)

Table 1 - Continuation

Code	GPAQ	GPAQ adaptation (Indonesian)	Note
	Activity at work/university	Kegiatan saat bekerja/kuliah	
P8	In a typical week, on how many days do you walk or bicycle for at least 10 min continuously to get to and from places?	Berapa hari dalam seminggu Anda melakukan kegiatan tersebut?	Number of days _
P9	How much time do you spend walking or bicycling for travel on a typical day?	Berapa lama dalam 1 hari Anda melakukan aktivitas tersebut?	Hours : minutes _ : _ Hrs mins
Code	GPAQ	GPAQ adaptation (Indonesian)	Note
	Recreational activities	Aktivitas di waktu senggang atau rekreasi	
P10	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football] for at least 10 min continuously?	Apakah Anda melakukan olahraga yang tergolong berat seperti bermain bola, fitnes, lari, atau rekreasi lain minimal 10 menit dalam seminggu terakhir ini?	If yes, go to P11 If no, go to P13
P11	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Berapa hari dalam seminggu Anda melakukan kegiatan tersebut?	Number of days _
P12	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Berapa lama dalam 1 hari Anda melakukan aktivitas tersebut?	Hours : minutes _ : _ Hrs mins
P13	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, volleyball] for at least 10 min continuously?	Apakah Anda melakukan olahraga yang tergolong sedang seperti berenang, voli, bersepeda, atau rekreasi lain minimal 10 menit dalam seminggu terakhir ini?	If yes, go to P14 If no, go to P16
P14	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	Berapa hari dalam seminggu Anda melakukan kegiatan tersebut?	Number of days _
P15	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Berapa lama dalam 1 hari Anda melakukan aktivitas tersebut?	Hours : minutes _ : _ Hrs mins
Code	GPAQ	GPAQ adaptation (Indonesian)	Note
	Sedentary Behavior	Aktivitas di waktu senggang atau rekreasi	
P16	How much time do you usually spend sitting or reclining on a typical day?	Berapa lama waktu yang Anda habiskan untuk duduk atau berbaring dalam satu hari?	Hours : minutes _ : _ Hrs mins

Table 2 - Adaptation of PASS instrument.

No.	PASS (1-5 rating scale; 1 = strongly disagree to 5 = strongly agree)	PASS Adaptation In Indonesian (1-10 rating scale; 1 = strongly disagree to 10 = strongly agree; UF = unfavorable item)
1.	Am confident that I will be a successful student	Saya yakin bahwa saya dapat menyelesaikan skripsi saya dengan baik (UF)
2.	Am confident that I will be a successful in my future career	Saya yakin bahwa saya akan sukses dengan perjalanan karir saya setelah lulus kuliah (UF)
3.	I can make academic decisions easily	Saya mampu mengambil keputusan antara melanjutkan studi S2 atau bekerja setelah lulus kuliah (UF)
4.	The time allocated to classes and academic work is enough	Waktu yang diberikan untuk mengikuti perkuliahan dan mengerjakan skripsi sudah cukup (UF)

(continued)

Table 2 - Continuation

No.	PASS (1-5 rating scale; 1 = strongly disagree to 5 = strongly agree)	PASS Adaptation In Indonesian (1-10 rating scale; 1 = strongly disagree to 10 = strongly agree; UF = unfavorable item)
5.	I have enough time to relax after work	Saya tetap mempunyai waktu istirahat yang cukup setelah mengerjakan tugas kuliah dan skripsi (UF)
6.	My teachers are critical of my academic performance	Dosen pembimbing saya memberikan kritik atas kemampuan akademik saya dalam membuat skripsi
7.	I fear failing courses this year	Saya merasa takut jika tidak dapat menyelesaikan skripsi dan tidak lulus mata kuliah di tahun ini
8.	I think that my worry about examinations is weakness of character	Saya merasa bahwa kelemahan saya adalah sering merasa khawatir dengan progress skripsi yang sedang saya kerjakan
9.	Teachers have unrealistic expectations of me	Dosen pembimbing saya memiliki harapan yang tinggi terhadap waktu penyelesaian skripsi saya (UF)
10.	The size of the curriculum (workload) is excessive I believe that the amount of work assignment is too much	Saya merasa materi kuliah saya di semester ini terlalu banyak Saya merasa tugas kuliah dan pengerjaan skripsi saya di semester ini terlalu berat
11.	Am unable to catch up if getting behind the work	Saya merasa kesulitan untuk mengejar ketertinggalan saya dalam mengerjakan skripsi dari teman saya, jika saya melewati sesi bimbingan skripsi dengan dosen pembimbing
12.	The unrealistic expectations of my parents stress me out	Harapan orang tua atau kerabat agar saya menyelesaikan skripsi dan lulus secepatnya membuat saya merasa tertekan
13.	competition with my peers for grades is quite intense	Persaingan saya untuk melakukan uji kelayakan skripsi dengan teman saya cukup ketat
14.	The examination questions are usually difficult	Saya merasa bahwa pertanyaan-pertanyaan yang diberikan dosen penguji saat sidang skripsi akan sulit
15.	Examination time is short to complete the answers	Saya merasa waktu untuk yang disiapkan untuk melaksanakan uji kelayakan sangat singkat
16.	Examination times are very stressful to me out	Saya merasa bahwa waktu uji kelayakan dan sidang skripsi adalah situasi yang menegangkan bagi saya
17.	Even if I pass my exams, am worried about getting a job	Meskipun saya menyelesaikan skripsi dan lulus kuliah, saya khawatir tidak dapat mencari pekerjaan nantinya

are 6 unfavorable items that will reduce the participant's score when they tend to agree with the statements provided. The calculated results are then categorized into five level: (a) very high for participant scores ranging from 106-120 points; high for scores ranging from 82-105; moderate for scores ranging from 58-81; low for scores ranging from 34-57; and very low for scores ranging from 10-33.

Statistical analysis

All statistical tests used JASP for Windows version 0.19.1.0 Descriptive statistics were used to describe the participants, means, and standard deviation for variables. The assumption check performed before testing the differences in academic stress at each level of physical activity. It was found that the data was normally distributed after testing using the Shapiro-Wilk test (see [Table 3](#)). However, the data was not homogeneous after being tested using Levene's homo-

geneity test (see [Table 4](#)). Due to violation of homogeneity of variance (Levene's $p = 0.003$), differences in academic stress across physical activity levels were analyzed using the Kruskal-Wallis test. Post hoc comparisons were conducted using Dunn's test. Effect size

Table 3 - Descriptive statistics and Shapiro-Wilk Distribution / normality test.

	AS
Valid	389
Missing	0
Mean	91.319
Std. Deviation	18.085
Shapiro-Wilk	0.993
P-value of Shapiro-Wilk	0.058
Minimum	31.000
Maximum	130.000

Table 4 - Test for equality of variances / homogeneity (Levene's).

F	df1	df2	p
5.836	2.000	386.000	0.003

(η^2H) was calculated using the formula $\eta^2H = (H - k + 1) / (n - k)$, where H represents the Kruskal-Wallis statistic, k the number of groups, and n the total sample size.

Results

Description of research data

Based on the description of the data, it is known that the students who filled out the questionnaire in this study totaled 103 male students with a percentage of 26.50% and 286 female students with a percentage of 73.50%. In other words, most of the subjects in this study were female (see Table 5). The following data set is a category of subject conditions for each variable in this study. The classification of high, medium, and low sports activity in the sports activity variable is calculated through MET (see Table 6).

Categorization of physical activity scores

The data shows that 129 students, with a percentage of 33.2%, have a high level of physical activity, 68 students, with a percentage of 17.5%, have a moderate level of physical activity, and the remaining 192 students, with a percentage of 49.4%, have a low level of physical activity. So most students have a low level of physical activity. Data for academic stress variables are divided into very high, high, moderate, low, and very low categories. The classification was performed in Table 6 about categorization of physical activity scores (see Table 6).

Academic stress score result

Based on these data, there were 86 students with a percentage of 22.1% who had very high academic

Table 5 - Description of research data.

Gender	Amount	Percentage
Man	103	26.50 %
Woman	286	73.50 %
Total	389	100.00%

Table 6 - Categorization of physical activity scores.

Category	MET formula	Amount	Percentage
High	≥ 3000	129	33.16 %
Moderate	600-2.999	68	17.48 %
Low	< 600	192	49.36 %

stress, 187 students with a percentage of 48.07% with high academic stress, 102 students with a percentage of 26.2% with moderate academic stress, 13 students with a percentage of 3.3% with low academic stress, and as many as one students with a percentage of 0.3% with low academic stress. So it can be seen that most students have high academic stress (see Table 7).

Kruskal-Wallis test result

The Kruskal-Wallis test revealed a statistically significant difference in academic stress across physical activity levels, $H(2) = 14.97$, $p < 0.001$. The calculated effect size ($\eta^2H = 0.03$) indicated a small but meaningful practical difference according to conventional interpretation guidelines (see Table 8). Post hoc analysis using Dunn's test showed that students in the high physical activity group reported significantly lower academic stress compared to those in the low activity group (see Table 9).

Discussion

The present findings demonstrate a significant difference in academic stress across physical activity levels, indicating that students with higher engagement in physical activity reported lower stress levels. These results align with contemporary psychobiological models of stress regulation, which emphasize the

Table 7 - Academic Stress Score Results.

Category	Amount	Percentage
Very high	86	22.11 %
High	187	48.07 %
Moderate	102	26.22 %
Low	13	3.34%
Very low	1	0.26%

Table 8 - Kruskal-Wallis test result.

Factor	Statistic	df	p	95% CI for Rank η^2		
				Rank η^2	Lower	Upper
PA	14.966	2	< 0.001	0.034	0.004	0.079

Table 9 - Dunn's post hoc test result.

Comparison	z	W_i	W_j	r_{rb}	p	p_{bonf}	p_{holm}
1-2	0.558	219.787	210.382	0.058	0.577	1.000	0.577
1-3	3.664	219.787	172.898	0.238	< 0.001	< 0.001	< 0.001
2-3	2.363	210.382	172.898	0.199	0.018	0.054	0.036

Note. Rank-biserial correlation based on individual Mann-Whitney tests.

role of behavioral health factors in moderating stress reactivity¹. Within university populations, sustained academic demands may activate prolonged stress responses; however, regular physical activity has been shown to attenuate perceived stress through improvements in autonomic balance and affective regulation^{6,7}. Evidence from cardiovascular reactivity research further supports the protective role of physical fitness in moderating physiological stress responses²⁹. Large-scale epidemiological data involving over one million individuals also demonstrate a robust association between physical exercise and reduced mental health burden³⁰. The observed group differences support the stress-buffering perspective, suggesting that higher levels of structured movement may function as a protective behavioral mechanism in academic contexts.

Beyond physiological adaptation, physical activity may enhance adaptive coping processes. Empirical findings suggest that engagement in moderate-to-vigorous activity is associated with improved cognitive flexibility and moment-to-moment emotional regulation⁹. Such improvements may strengthen students' capacity to appraise academic challenges as manageable rather than overwhelming. This cognitive-emotional adjustment mechanism further supports the stress-buffering hypothesis within academic environments¹⁰.

From a physiological perspective, academic stress may activate neuroendocrine responses involving cortisol secretion and sympathetic nervous system arousal. Prolonged activation of these systems has been associated with cognitive fatigue and reduced emotional stability²⁰. Regular physical activity contributes to improved stress recovery through modulation of hypothalamic-pituitary-adrenal (HPA) axis functioning and enhanced cardiovascular regulation^{21,22}. Recent longitudinal evidence further demonstrates that physically active university students experience lower daily stress load and improved academic performance-related outcomes¹⁶. These mechanisms may explain the lower stress levels observed in the high physical activity group in the present study.

Therefore, physical activity may serve as a protective behavioral factor to protect new and final-year university students from potential negative effects of academic stress. Being physically active may help a student adapt to stressors⁴ by increasing comfort and pleasure feeling while increasing concentration and cognitive function⁸. Being physically active will also improve blood circulation and reduce stress hormone production that have and impact on increasing heart health and concentration¹⁷⁻²². Improved concentration may assist university students in managing stress

related to academic assignments. In addition, exercising regularly will help university students by increasing β -endorphin hormone which associated with happiness and positive mood^{19,20}.

It also leads students to create effective coping strategies aided by mindfulness reinforcement¹¹. In emotional factor, physical activity can increase stress tolerance in students⁵. A study by Teuber³¹ confirmed that physical activity negatively associated with stress and positively associated with perceived study ability. Those effects occur when the physical activity done in both free time or while studying⁶. Evidence from broader educational populations further suggests that sustained physical activity contributes to improved mental health indicators and academic adjustment³⁵.

However, convenience sampling conducted in this research may reduce the representativeness and generalizability from this article³³. These limitations position the study as preliminary evidence regarding the role of physical activity in academic stress. Based on the limitation and findings of this study, several recommendations for future research can be proposed. Future studies could conduct other sampling technique to ensure the representativeness and generalizability of the research. The future research could also explore potential mediating variables such as physical health, social support, or sleep quality. Researchers can also examining moderating factors like gender, and academic program. Second, longitudinal researches are recommended to track changes in academic stress and physical stress. It can also combined with both physical and psychological interventions such as yoga class, aerobic exercises, and sport club to reduce academic stress. Finally, future researches can explore the incorporating contextual factors such as university environment, institutional policies, or cultural influences. Researchers can also employ multi-method approaches including in-depth interviews and physiological measures to gain a comprehensive understanding of how physical activities influences academic stress.

Conclusion

The study found clear differences in academic stress across levels of physical activity. The findings indicate that students who engage in regular exercise tend to report lower academic stress. These findings indicate that physical activity levels were associated with differences in academic stress. The findings support the stress-buffering hypothesis, although causal inference cannot be established. These findings highlight the importance of promoting regular physical activity to support student well-being and academic performance. However, the research is limited by its

sample, which consisted of a specific group of students from East Java with a narrow age range and a higher proportion of women, restricting the generalizability of the results to broader or more diverse populations.

AI use statement

No AI was used in this research.

Funding

The authors declare no funding for this project.

Author contributions (CRediT)

Miftakhul Jannah: conceptualisation, investigation, methodology, supervision, visualization, writing - original draft, writing - review and editing. **Rachman Widohardhono:** methodology, data curation, writing - review and editing. **Nabila Rachman:** conceptualisation, writing - original draft, writing - review and editing. **Eva Nandha Jalma Yael:** writing - original draft, visualization. **Adiwignya Nugraha Widhi Harita:** methodology, visualization. **Damajanti Kusuma Dewi:** conceptualisation, data curation. **Kususanto Ditto Prihadi:** methodology, writing - review and editing.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest statement

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

References

- O'Connor DB, Thayer JF, Vedhara K. Stress and health: a review of psychobiological processes. *Annu Rev Psychol.* 2021;72: 663-88. [doi](#)
- Pascoe MC, Hetrick SE, Parker AG. The impact of stress on students in secondary school and higher education. *Int J Adolesc Youth.* 2020;25(1): 104-12. [doi](#)
- Karaman MA, Lerma E, Vela JC, Watson JC. Predictors of academic stress among college students. *J Coll Couns.* 2019;22(1): 41-55. [doi](#)
- Restrepo JE, Bedoya Cardona EY, Cuartas Montoya GP, Cassaretto Bardales M, Vilela Alemán YP. Academic stress and adaptation to university life. *An Psicol.* 2023;39(1): 62-71. [doi](#)
- Sitepu TAZ, Jannah M. Aktivitas olahraga dan stres akademik mahasiswa yang mengerjakan skripsi. *Character J Penelit Psikol.* 2022;9(1): 220. [doi](#)
- Tan S, Jetzke M, Vergeld V, Müller C. Physical activity and perceived stress among university students. *JMIR Public Health Surveill.* 2020;6(4): e20119. [doi](#)
- Dewi DK, Savira SI, Satwik YW, Khoirunnisa RN. Profil perceived academic stress pada mahasiswa. *J Psikol Teor Terapan.* 2022;13(3): 395-402. [doi](#)
- Trigueros R, Padilla A, Aguilar-Parra JM, Lirola MJ, García-Luengo AV, Rocamora-Pérez P, et al. The influence of teachers on motivation and academic stress and their effect on learning strategies. *Int J Environ Res Public Health.* 2020;17(23): 9089. [doi](#)
- Zhai X, Ye M, Gu Q, Huang T, Wang K, Chen Z. Physical fitness and academic performance among college students. *J Am Coll Health.* 2022;70(2): 395-403. [doi](#)
- Moeller RW, Seehuus M, Simonds J, Lorton E, Randle TS, Richter C, et al. Coping, physical activity, and mindfulness in student adjustment. *Front Psychol.* 2020;11: 1858. [doi](#)
- Kim ES, Kubzansky LD, Soo J, Boehm JK. Maintaining healthy behavior: psychological well-being and physical activity. *Ann Behav Med.* 2017;51(3): 337-47. [doi](#)
- Bedewy D, Gabriel A. Perception of academic stress scale. *Health Psychol Open.* 2015;2(2): 2055102915596714. [doi](#)
- Armstrong T, Bull F. Development of the WHO global physical activity questionnaire. *J Public Health (Berl).* 2006;14(2): 66-70. [doi](#)
- Nguyen-Michel ST, Unger JB, Hamilton J, Spruijt-Metz D. Physical activity and perceived stress in college students. *Stress Health.* 2006;22(3): 179-88. [doi](#)
- Maher JP, Hevel DJ, Reifsteck EJ, Drollette ES. Physical activity and positive affect during COVID-19. *Psychol Sport Exerc.* 2021;52: 101826. [doi](#)
- Kekäläinen T, Luchetti M, Terracciano A, Gamaldo AA, Mogle J, Lovett HH, et al. Physical activity and cognitive function. *Int J Behav Nutr Phys Act.* 2023;20(1): 137. [doi](#)
- Smith L, Jacob L, Butler L, Wolf M. Physical activity, endorphins, and mental wellbeing. *Int J Environ Res Public Health.* 2023;20: 8352. [doi](#)
- Chen Q, Yu Z, Luo L. Exercise intensity and endorphin release. *Psychoneuroendocrinology.* 2024;152: 107927. [doi](#)
- Nowacka-Chmielewska M, Grabowska K, Grabowski M, Meybohm P, Burek M, Matecki A. Neurobiological mechanisms of exercise-induced stress resilience. *Int J Mol Sci.* 2022;23(21): 13348. [doi](#)
- Pahk K, Joung C, Kwon HW, Kim S. Chronic exercise and stress-associated brain activity. *Front Endocrinol.* 2023;13: 1046838. [doi](#)
- Luo Z, Chen J, Dai Y, So KF, Zhang L. Exercise and stress resilience neural circuit. *Commun Biol.* 2023;6: 624. [doi](#)
- De Nys L, Anderson K, Ofosu EF, Ryde GC, Connelly J, Whittaker AC. Physical activity, cortisol, and sleep. *Psychoneuroendocrinology.* 2022;140: 105843. [doi](#)
- Byshevets N, Andrieieva O, Dutchak M, Shinkaruk O, Dmytriv R, Zakharina I, et al. Physical activity and stress in higher education students. *Phys Educ Theory Methodol.* 2024;24(2): 245-53. [doi](#)

24. Wang H, Zhao S, Fang T, Xiao L, Yin D, Sun Z. Sleep quality and stress as influences on college students' physical activity participation: a cross-sectional study. *Front Public Health*. 2025;13: 1640974. [doi](#)
25. Liu M, Zhou X, Chen L. Physical activity, depression, anxiety, and stress in college students. *Front Psychol*. 2024;15: 1396795. [doi](#)
26. Stubbs B, Vancampfort D, Rosenbaum S, Ward PB, Schuch FB. Anxiolytic effects of exercise: a meta-analysis. *Psychiatry Res*. 2017;249: 102-8. [doi](#)
27. Gerber M, Pühse U. Exercise and stress-related health complaints. *Scand J Public Health*. 2009;37(8): 801-19. [doi](#)
28. White RL, Vella S, Biddle S, Sutcliffe J, Guagliano JM, Uddin R, et al. Physical activity and mental health: systematic review. *Int J Behav Nutr Phys Act*. 2024;21: 134. [doi](#)
29. Hamer M, Steptoe A. Physical fitness and cardiovascular stress reactivity. *Psychophysiology*. 2007;44(5): 739-46. [doi](#)
30. Chekroud SR, Gueorguieva R, Zheutlin AB, Paulus M, Krumholz HM, Krystal JH, et al. Exercise and mental health in 1.2 million individuals. *Lancet Psychiatry*. 2018;5(9): 739-46. [doi](#)
31. Teuber M, Leyhr D, Sudeck G. Physical activity improves stress load among students. *BMC Public Health*. 2024;24: 18082. [doi](#)
32. Rebar AL, Stanton R, Geard D, Short C, Duncan MJ, Vandelanotte C. Physical activity and depression/anxiety: meta-meta-analysis. *Health Psychol Rev*. 2015;9(3): 366-78. [doi](#)
33. Zrineh A. Sampling methods and sample size determination in clinical research. *Heliyon*. 2024;10(5): e27752. [doi](#)
34. Wang M, Pei Z. Injury prevention in physical education. *Mol Cell Biomech*. 2024;21(2): 412. [doi](#)
35. Biddle SJH, Ciacconi S, Thomas G, Vergeer I. Physical activity and mental health in youth. *Br J Sports Med*. 2019;53(14): 873-80. [doi](#)

Corresponding author

Miftakhul Jannah. Universitas Negeri Surabaya, Department of Psychology, Surabaya, Indonesia.
E-mail: miftakhuljannah@unesa.ac.id.

Manuscript received on January 15, 2025

Manuscript accepted on December 28, 2025



Motriz. The Journal of Physical Education. UNESP. Rio Claro, SP, Brazil - eISSN: 1980-6574 - under a license Creative Commons - Version 4.0