

Association between Physical Activity, Emotional Intelligence, and academic stress among undergraduate physiotherapy students: A cross-sectional study

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Abstract

Academic stress is prevalent among university students and may be influenced by modifiable factors such as physical activity (PA) and emotional intelligence (EI). However, the interrelationships among these variables in undergraduate physiotherapy students remain poorly understood. This study examined the associations between PA, EI, and academic stress, and explored whether EI mediates the relationship between PA and academic stress. A cross-sectional study was conducted among 484 undergraduate physiotherapy students aged 18–25 years from a private physiotherapy college in India. PA, EI, and academic stress were assessed using the International Physical Activity Questionnaire (IPAQ), Schutte Self-Report Emotional Intelligence Test (SSEIT), and Academic Stress Scale, respectively. Pearson's correlation, multiple linear regression, and mediation analyses were performed. Most participants demonstrated moderate-to-high PA (83.7%), moderate EI (73.3%), and low-to-moderate academic stress (97.3%). PA was weakly positively correlated with EI ($r = 0.116, p = 0.011$) and weakly negatively correlated with academic stress ($r = -0.122, p = 0.007$). EI showed a moderate negative correlation with academic stress ($r = -0.262, p < 0.001$) and remained independently associated with lower academic stress after adjustment for age, gender, PA, and academic year ($\beta = -0.258, p < 0.001$). Although PA demonstrated a significant direct association with academic stress, EI did not significantly mediate this relationship. While EI remained independently associated with academic stress after adjustment for demographic variables, the findings suggest that PA and EI may contribute to academic stress through distinct but partially overlapping mechanisms. These findings support the inclusion of EI development and PA promotion as complementary strategies to enhance student well-being.

1. Introduction

University students face numerous challenges during their entire academic journey. In recent times, we have observed that increasing competition has contributed to greater academic workload and pressure among students. Academic stress is a complex issue, often manifested as anxiety and depression, caused by various demands and pressures related to academics [1]. Several factors are known to contribute to academic stress, including high academic expectations, homesickness, time management issues, fear of failure, changes in social circles, and emerging interpersonal relationships. [1, 2]

In addition, health professions programs such as physiotherapy further increase the academic burden, as students are expected to balance academics, clinical training, and personal life. Balancing academic requirements with clinical responsibilities may expose physiotherapy students to unique stressors that can influence both their emotional well-being and academic performance. [3, 4]

Studies suggest that undergraduate physiotherapy students experience low to moderate levels of academic stress. [3, 4]

Given the growing burden of academic stress among university students, considerable attention has been given to the factors that might assist in controlling its adverse effects. physical activity (PA) is one

such factor and is defined as any bodily movement produced by skeletal muscles that plays an important role in promoting an active and healthy lifestyle. It can be categorized into occupational, sports, conditioning, household, or other activities. [5]. It plays a crucial role in weight control, prevention, and management of lifestyle diseases, and in the cognitive and psychological domain, it reduces stress and anxiety levels, improves mood, and promotes socio-affective and emotional self-regulation, self-esteem, and well-being [5, 6].

While PA may contribute to stress reduction through physiological and psychological pathways, emotional intelligence (EI) may influence how students perceive, regulate, and cope with academic stressors. EI is defined as an individual's ability to control and self-regulate their feelings, to know others' emotions, and to use emotions as a basis of their actions and thoughts [7]. Higher EI has been associated with improved coping strategies and better stress and aggression management. [6, 7, 8]

Although previous studies have independently examined the associations between PA and EI, PA and academic stress, and EI and academic stress, limited evidence exists regarding their interrelationships among these variables in physiotherapy students. Additionally, EI may represent a potential mechanism linking PA and academic stress. PA has been shown to improve psychological well-being in students, including better emotional regulation, greater self-awareness, and improved mood. Thus, we hypothesize that the relationship between PA and academic stress may be partially explained by enhanced EI, which may help students better manage academic demands and stressors.

Therefore, the present study aims to examine the association between PA, EI, and academic stress among undergraduate physiotherapy students, and to explore the potential mediating role of EI in this relationship.

1. Methodology

2.1 Study Design

This was a cross-sectional study conducted from May 2025 to July 2025 among undergraduate physiotherapy students at a private physiotherapy college in India.

Participants:

The students were included in the study if they met the following criteria: i) Age range: 18–25 years, ii) Undergraduate students of Physiotherapy, and iii) Provided informed consent

Exclusion criteria: Student participants who could not perform regular PA due to any kind of lower limb injury(s) were excluded.

Sample size determination and sampling technique:

A census-based sampling approach was selected to maximise participation and reduce the sampling bias. No formal sample size calculation was performed. Therefore, all the students present on campus during the study period were enrolled in the study.

This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies. [9]

2.2 Data collection:

The study was approved by the Institutional Ethics Committee, Mahatma Gandhi Mission's Dental College & Hospital, Kamothe, Navi Mumbai, India (IEC Ref. No. MGM/DCH/IEC/319/25). All methods were performed in accordance with the relevant institutional guidelines and regulations and the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment. Participants meeting the inclusion criteria were informed about the study. EI was measured using the Schutte Self-Report Emotional Intelligence Test (SSEIT), physical activity with the International Physical Activity Questionnaire (IPAQ), and academic stress with the Academic Stress Scale.

2.3 Data analysis

The data obtained from the participants were entered into Microsoft Excel 2016 for record-keeping and data cleaning.

Following the completion of data entry, the dataset was subsequently imported into IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA) for the purpose of conducting thorough statistical analyses. Descriptive statistics were then determined to provide a summary of the demographic data. Specifically, the mean and standard deviation were calculated for continuous variables, including age, IPAQ (MET-min/week), SSEIT scores, and ASS scores. Furthermore, categorical data were presented in the form of frequencies and percentages.

The normality of all continuous variables was assessed using the Shapiro–Wilk test along with observing the histograms. Although there were minor deviations from normality, parametric tests of correlation were employed, as the sample size was large ($n = 484$). Non-parametric tests were also performed to assess the robustness of these findings.

Independent-samples t-tests were performed to compare PA, EI, and academic stress amongst the males and females. Multiple linear regression was conducted to identify the factors related to academic stress. Academic stress was entered as dependent variable, while age, gender, PA, EI, and academic year were entered as independent variables. Statistical significance was set at $p < 0.05$.

2. Results

A total of 498 students were screened based on the inclusion criteria. Of these, 496 consented to participate. 12 of them were excluded based on exclusion criteria, and thereby 484 student participants

entered the study. The participant's demographic data are presented in Table 1. The participants were predominantly female (80.6%) with a mean age of 20.83 ± 1.5 years.

Table 1. Demographics of the student participants

Domain	Result
Age (years)	20.83 ± 1.5
Gender (female/male)	390/94
Academic batch	96
First year	99
Second year	99
Third year	98
Fourth year	92
Interns	

a. Physical Activity

PA levels, measured using the International Physical Activity Questionnaire (IPAQ) categorical cutoffs, revealed that 52.1 % of student participants were moderately active, 31.6 % were highly active, and 16.3 % of them performed low activity. This indicates that most students engaged in at least moderate levels of PA. In terms of energy expenditure, the students performed a range of 0-10548 METs-min/week of activity with a mean of 2379 ± 1867.86 METs-min/week (Table 2).

b. Emotional Intelligence

The EI measured using the Schutte Self-Report Emotional Intelligence Test (SSEIT) revealed that 73.3% of the student participants had moderate EI, 16.9% had low EI, and 9.7% had high EI. The scores ranged from 41 to 163, with a mean of 122.06 ± 14.58 (Table 2).

Table 2. Descriptive characteristics of main variables

Domain	Result
PA in METs/week - IPAQ	2379.19 ± 1867.86
EI – SSEIT	122.06 ± 14.58
Academic stress	93.45 ± 27.69

c. Academic Stress

The Academic Stress Scale measured academic stress and reported that 51.4% of student participants had low academic stress, 45.9% had moderate academic stress, and only 2.7% had high academic stress. The score ranged from 0-200 with a mean of 93.45 ± 27.69 (Table 2).

3.4 Correlation analysis

Pearson's correlation test showed a weak yet significant positive correlation between PA and EI ($r=0.116$, $p=0.011$). PA showed a weak negative correlation with academic stress ($r=-0.122$, $p=0.007$), and EI showed a moderate negative correlation with academic stress ($r=-0.262$, $p<0.001$) (Table 3). Although statistically significant the observed correlations PA and EI ($r=0.116$) and between PA and academic stress ($r=-0.122$) were weak in magnitude.

Spearman's correlation showed similar results, confirming the robustness of the associations (Table 3).

Table 3. Correlations among PA, EI, and stress

Variables	PA (IPAQ)	EI (SSEIT)	Academic Stress (ASS)
PA (IPAQ)		0.116* (0.170**)	-0.122** (-0.146**)
EI (SSEIT)	0.116* (0.170**)		-0.262** (-0.275**)
Academic Stress (ASS)	-0.122** (-0.146**)	-0.262** (-0.275**)	

· Values are presented as Pearson's correlation coefficients, with Spearman's rho in parentheses

· * $p < 0.05$, ** $p < 0.01$

3.5 Gender differences

Male students reported significantly higher PA levels than female students (3712.64 ± 2302.18 vs. 2058.13 ± 1591.19 MET-min/week; mean difference = 1654.51 MET-min/week, 95% CI $1157.84-2151.18$, $p < 0.001$). However, no significant gender differences were observed for EI (121.01 ± 20.88 vs. 122.31 ± 12.62 , $p = 0.564$) or academic stress (93.05 ± 29.18 vs. 93.54 ± 27.37 , $p = 0.883$).

3.6 Multiple Linear Regression Analysis

EI emerged as the strongest independent correlate of academic stress ($\beta = -0.258$, $p < 0.001$), indicating that higher EI was associated with lower academic stress. Age was also independently associated with academic stress ($\beta = 0.101$, $p = 0.024$). In contrast, PA ($\beta = -0.084$, $p = 0.084$), gender ($\beta = -0.011$, $p = 0.824$), and academic year ($\beta = -0.028$, $p = 0.541$) were not independently associated with academic stress after adjustment for other variables.

3.7 Mediation Analysis

A mediation analysis was performed to determine if EI mediated the association between PA and academic stress. PA was significantly associated with EI ($\beta = 0.0009$, $p = 0.0107$), which in turn was significantly associated with academic stress ($\beta = -0.4774$, $p < 0.001$). PA also showed a direct effect on academic stress ($\beta = -0.0014$, $p = 0.0355$).

Despite significant associations among the variables, EI did not mediate the relationship between PA and academic stress, as the bootstrap confidence interval for indirect effect included zero (BootLLCI = -0.0011 , BootULCI = 0.0000) (Table 4).

Table 4. Mediation analysis

Relationship	β	p-value	95% CI
PA $\rightarrow$ EI	0.0009	0.0107	0.0002 to 0.0016
EI $\rightarrow$ Academic Stress	-0.4774	<0.001	-0.6421 to -0.3127
PA $\rightarrow$ Academic Stress (direct)	-0.0014	0.0355	-0.0027 to -0.0001
Indirect effect	-0.0004	—	-0.0011 to 0.0000

- Indirect effect estimated using bootstrapping (5000 samples)
- β = regression coefficient; CI = confidence interval, PA-PA, EI- EI

3 Discussion

The present study explored the relationships among PA, EI, and academic stress among undergraduate physiotherapy students. The findings revealed that the majority of students performed moderate-to-high PA, had moderate EI, and demonstrated low-to-moderate academic stress.

These findings may reflect the health-oriented nature of physiotherapy education, which emphasizes physical well-being, interpersonal communication, and patient-centred care. The observed gender differences in PA are consistent with previous studies reporting that male physiotherapy students engage in higher levels of PA than female students. [10, 11, 12]. These findings can be attributed to differences in participation in recreational sports, cultural influences, and perceived barriers to PA among female students.

Additionally, PA was positively correlated with EI, suggesting that higher levels of PA may contribute to improvements in mood, self-awareness, and emotional regulation. These results are consistent with the findings reported by Ubago-Jiménez et al [6], Acebes et al [7], and Wang et al[8], suggesting that students who engaged in greater PA demonstrated higher EI across all aspects. One study among physiotherapy students also reported that higher PA was associated with greater empathy and cognitive functioning [10].

The relationship between EI and academic stress observed in the present study is consistent with previous reports [13, 14, 15], suggesting that students with higher EI are better able to manage academic stress through adaptive coping strategies, effective emotional regulation, and greater resilience. Higher EI is known to buffer the negative impacts of academic stress[13, 14, 15]. Academic stress is influenced not only by academic workload but also by an individual's ability to perceive, regulate, and respond to emotional challenges.[16, 17] This may explain why EI remained independently associated with academic stress even after adjustment for PA and demographic characteristics.

Although PA was significantly associated with academic stress in the correlation analysis, this association was no longer significant after adjustment for EI and demographic variables. In contrast, EI remained an independent predictor of academic stress, suggesting that emotional competencies may play a more direct role in how students perceive and cope with academic demands than PA alone.

Contrary to our hypothesis, EI did not significantly mediate the relationship between PA and academic stress. While EI was independently associated with academic stress, the indirect effect was not statistically significant. This suggests that the beneficial effects of PA on academic stress may operate through alternative mechanisms, such as resilience, self-efficacy, sleep quality, or social support.[5, 18] It also implies that PA and EI may influence academic stress through independent yet partially overlapping pathways. Future longitudinal studies are needed to further explain these mechanisms.

These findings have important implications for higher education policy and student support systems. While recent initiatives under the National Education Policy (NEP) 2020 and University Grants Commission (UGC) have emphasized PA and wellness promotion within higher education institutions [19, 20], the present findings suggest that equal attention should be directed toward developing emotional competencies. Incorporating EI screening, counselling, resilience training, and emotional skills workshops into university support services may help students develop adaptive coping strategies and improve psychological well-being. As EI is a modifiable construct, such interventions could complement existing PA initiatives and contribute to a more holistic approach to student well-being. [21, 22]

Overall, these findings support integrating PA promotion and EI development within physiotherapy education to enhance students' psychological well-being and their ability to cope with academic demands.

Limitations

This study has some limitations. First, the cross-sectional design means that cause-and-effect relationships cannot be established. Second, the data were collected using self-reported questionnaires, which may lead to response bias. Third, there were potential confounders like dietary habits, sleep schedule, and socioeconomic status that were not addressed in this study. Lastly, the study was conducted only among physiotherapy students, so the findings may not be generalizable to students from other fields.

4 Conclusion

This study identified significant associations among PA, EI and academic stress in undergraduate physiotherapy students. EI demonstrated the strongest association with academic stress and remained independently associated after adjustment for demographic variables. Although PA was associated with academic stress in unadjusted analyses, this relationship did not remain significant after adjustment. Furthermore, EI did not significantly mediate the relationship between PA and academic stress. These findings highlight the potential importance of emotional competencies in understanding academic stress among physiotherapy students.

Declarations

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Author Contribution

All authors were involved in the conceptualization and design of the study. MJ, RB, and SS conducted the analyses, and all the authors drafted the manuscript. SS served as the study supervisor and revised the manuscript. All authors reviewed and gave their approval for the final version of the manuscript.

Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request, subject to ethical considerations.

References

1. Iqra, N. A systematic review of academic stress intended to improve the educational journey of learners. *Methods Psychol.* **11**, 100163 (2024).
2. Likisa, K. D. Challenges and prospects of competency-based education: The case of Adama Science and Technology University alumni students and Hawassa TVET College, Adama, Ethiopia. *J. Competency-Based Educ.* **3**, e01163 (2018).
3. Patel, J. K. & Hadiya, K. A. To assess the level of stress among university undergraduate physiotherapy students. *Indian J. Physiother Occup. Ther.* **14**, 33–39 (2020).
4. Collins, Z. I. et al. Stress factors among physiotherapy students at a university in Gauteng, South Africa. *Health SA.* **30**, 2803 (2025).

5. Caspersen, C. J., Powell, K. E. & Christenson, G. M. PA, exercise, and physical fitness: definitions and distinctions for health-related research. *Public. Health Rep.* **100**, 126–131 (1985).
6. Ubago-Jiménez, J. L., Cepero-González, M., Martínez-Martínez, A., Chacón-Borrego, F. & Linking, E. I. PA and aggression among undergraduates. *Int. J. Environ. Res. Public. Health.* **18**, 12477 (2021).
7. Ubago-Jiménez, J. L., González-Valero, G., Puertas-Molero, P. & García-Martínez, I. Development of EI through PA and sport practice. A systematic review. *Behav. Sci.* **9**, 44 (2019).
8. Wang, K. et al. The relationship between PA and EI in college students: The mediating role of self-efficacy. *Front. Psychol.* **11**, 967 (2020).
9. von Elm, E. et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J. Clin. Epidemiol.* **61**, 344–349 (2008).
10. Kuzmić, A., Filipec, M. & Jakovljević, M. The links between PA, metacognition, and empathy among physiotherapy students. *Healthc. (Basel).* **13**, 2350 (2025).
11. Keating, X. D., Guan, J., Castro Piñero, J. & Bridges, D. M. A meta-analysis of college students' PA behaviors. *J. Am. Coll. Health.* **54**, 116–126 (2005).
12. Huang, T. T. K. et al. Assessing overweight, obesity, diet, and PA in college students. *J. Am. Coll. Health.* **52**, 83–86 (2003).
13. Mayer, J. D., Caruso, D. R. & Salovey, P. The ability model of EI: Principles and updates. *Emot. Rev.* **8**, 290–300 (2016).
14. Tornquist, M. & Miles, E. Trait self-control and beliefs about the utility of emotions and emotion regulation in self-control performance. *Self Identity.* **22**, 639–668 (2023).
15. Mohamed, M. G. et al. The significance of EI in academic stress, resilience, and safe transition from high school to university: An SEM analysis among Northern Emirati university students. *Glob Transit.* **7**, 109–117 (2025).
16. Shanshan, W. & Loang, O. K. Academic support, peer pressure, and EI: a mixed-methods investigation in Shanghai's higher education landscape. *Int. J. Adv. Res. Educ. Soc.* **6**, 22–34 (2024).
17. Petrides, K. V. et al. Developments in trait EI research. *Emot. Rev.* **8**, 335–341 (2016).
18. Lepping, K. M. et al. PA, stress, and physically active stress management behaviors among university students with overweight/obesity. *Am. J. Lifestyle Med.* **17**, 601–606 (2023).
19. University Grants Commission. *Guidelines for Promotion of Physical Fitness, Sports, Students' Health, Welfare, Psychological and Emotional Well-being at Higher Educational Institutions in India* (University Grants Commission, 2023).
20. Ministry of Education. *National Education Policy 2020* (Government of India, 2020).
21. Nelis, D., Quoidbach, J. & Mikolajczak, M. Hansenne, M. Increasing emotional.
22. Hodzic, S., Scharfen, J., Ripoll, P., Holling, H. & Zenasni, F. How efficient are EI trainings: A meta-analysis. *J. Vocat. Behav.* **104**, 138–148 (2018).