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ORIGINAL ARTICLE

Role of sports participation in preventing academic burnout among undergraduate medical students.

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ABSTRACT… Objective: To explore the role of sports participation in preventing academic burnout among undergraduate medical students. **Study Design:** Cross-sectional Analytical study. **Setting:** Aziz Fatimah Medical and Dental College, Faisalabad, Pakistan. **Period:** April 2025 to September 2025. **Methods:** Among undergraduate MBBS students from first to final year. Participants were recruited through convenience sampling, and data collected using a structured questionnaire including demographic variables, the International Physical Activity Questionnaire Short Form, and the Oldenburg Burnout Inventory. Descriptive statistics and linear regression analyses were performed to assess associations between physical activity and burnout outcomes (total burnout, disengagement, and exhaustion). The adjusted model controlled for age, gender, and body mass index. Statistical significance was set at $p < 0.05$. **Results:** A total of 246 students were included (mean age 20.91 ± 1.58 years; 58.9% male). In unadjusted analyses, physical activity showed weak inverse associations with all burnout outcomes but was significantly associated only with exhaustion ($\beta = -0.129$, $p = 0.042$). After adjustment for age, gender, and BMI, physical activity was no longer significantly associated with any burnout outcome. However, female gender emerged as a significant predictor of higher total burnout ($\beta = 0.298$, $p < 0.001$), disengagement ($\beta = 0.207$, $p = 0.003$), and exhaustion ($\beta = 0.323$, $p < 0.001$). **Conclusion:** Academic burnout appears multifactorial, and physical activity alone may be insufficient for burnout prevention. More comprehensive and gender-responsive student well-being strategies are needed.

Key words: Academic Burnout, Physical Activity, Sports Participation.

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INTRODUCTION

Undergraduate medical students face a multifaceted set of challenges as they transition from high school to higher education. Entering a highly competitive academic environment and often needing to adapt to evolving curricula and educational practices. These demands can adversely affect academic performance and contribute to the development of burnout.[1] Burnout has emerged as a major challenge among medical students due to the intense nature of their studies and the sustained pressure of medical training. Academic burnout not only undermines students' performance but also affects their physical and mental health, often leading to depression and anxiety.[2] In addition, burnout is associated with unprofessional clinical behaviour[3] and, in severe cases, may even result in dropping out of medical school.[4] These consequences highlight the urgent need to address burnout within medical education using mitigating practices.

Physical activity is posited as an effective strategy for improving mental health among adults, reducing symptoms of depression and anxiety.[5] In light of this, participation in sports and other forms of physical activity has been recognized as a potentially feasible and cost effective intervention for combating academic stress among university students.[6] Synthesised evidence from studies conducted across the Americas and Europe indicates that the promotion of physical activities, along with other healthy lifestyle habits, enhances students' quality of life through multiple benefits, while physically inactive students often display low levels of motivation.[7] Furthermore, participation in sports contributes to the development of pro-social behaviour, improved social skills, enhanced self-esteem, and better overall mental health.[8]

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The institutional environment also plays a crucial role in shaping students' interest in sports participation. Existing research shows a positive correlation between nurturing a conducive sports environment at institutes and mental health status of students.[9] Another study of Saudi universities reported higher levels of participation when students were provided with adequate facilities, whereas lack of resources resulted in decreased engagement.[10] Similarly, research among Chinese university students revealed that active involvement in sports was positively linked with academic performance and the development of effective study habits.[11] A study by Hassnain et al. (2023) explored the relationship between physical activity and burnout among postgraduate students across multiple universities in Lahore. Their findings revealed a negative relationship between leisure time sports and academic burnout, indicating that engaging in sports activities was associated with lowered burnout levels.[12]

Despite growing evidence that physical activity can alleviate stress and enhance psychological well-being among university students, its specific role in mitigating academic burnout among undergraduate medical students remains insufficiently explored. Existing research largely focuses on general student populations or well-resourced settings, with limited attention given to individuals in the early transition into medical education or contexts where access to structured sports programs and facilities is constrained. Taking this into account, the current study aims to explore the role of sports participation in reducing academic burnout among medical undergraduates enrolled at a college-level institute.

METHODS

The current cross sectional analytical study was undertaken after receiving ethical approval from Institutional Ethical Committee (Ref. No: IEC/380-25) of Aziz Fatimah Medical and Dental College (AFMDC). The study population consisted of undergraduate students enrolled in the MBBS program from 1st, 2nd, 3rd, 4th, and 5th (final) year at AFMDC. Sample size was calculated using Cochran's formula[13], with a 95% confidence level Z = 1.96, an assumed proportion of 0.5 to ensure maximum variability, and a margin of error of 5%, and adjusted for finite population, yielding a final sample size of 250. Participants were recruited using non-probability convenience sampling for logistical feasibility and accessibility of participants within academic setting.

A structured questionnaire consisting of three sections was used to collect data:

1. Demographic Information (age, gender and basal metabolic index (BMI)),
2. International Physical Activity Questionnaire (IPAQ; short version) to assess levels of physical activity and,
3. Oldenburg Burnout Inventory (OLBI; adapted version for students) to measure academic burnout.

Digital informed consent was obtained at the beginning of the form after participants were informed about the purpose of the study, and it was clearly stated that participation was voluntary. Only data from participants who provided consent was included in the final results. Access to the collected data was restricted to the researchers through official Gmail accounts to ensure data security and confidentiality.

The IPAQ short version was developed by Craig et al. and has been validated across multiple countries, demonstrating a median criterion validity correlation of approximately 0.30 against objective measures, along with good test–retest reliability ($\rho \approx 0.80$).[14] Regionally adapted versions have also reported comparable reliability (ICC ≈ 0.79–0.82) in South Asian populations, supporting its applicability in similar contexts.[15] It assesses physical activity levels over the last seven days based on established metabolic equivalent (MET)-minute thresholds, categorizing into low (<600 MET-min/week), moderate (600-2999 MET-min/week), and high (≥3000 MET-min/week).

The OLBI 16-item inventory developed by Demerouti et al. was used to measure burnout across two dimensions, disengagement and exhaustion, with reported Cronbach's alpha values typically ranging from 0.70 to 0.87 and satisfactory construct validity across diverse populations.[16] Item responses for each component were then added to obtain total

burnout score, with higher scores indicating greater academic burnout.

Statistical analysis was conducted using SPSS version 27. Descriptive statistics for continuous variables were presented as mean ± standard deviation (SD), whereas categorical variables such as gender were summarized as percentages. Linear regression analysis was performed to assess the relationships between key variables. The level of statistical significance was set at $p < 0.05$.

RESULTS

A total of 246 undergraduate medical students who provided informed consent alongside valid responses were included in the final analysis. The mean age of participants was 20.91 ± 1.58 years and the sample consisted of mostly males (59.1%) and comprised of mainly normal weight (60.2%) or overweight (22.8%) individuals.

TABLE-I

Demographic characteristics of sample (N=246)

Age	20.91 ± 1.58
Gender	
Male	58.9% (n=145)
Female	41.1% (n=101)
BMI	
Underweight	13.0% (n=32)
Normal weight	60.2% (n=148)
Overweight	22.8% (n=56)
Obese	4.1% (n=10)

Simple linear regression analyses were conducted to examine the unadjusted association between physical activity and burnout across both OLBI domains as well as total burnout scores. The results indicated a consistent negative association between physical activity and all burnout outcomes, suggesting that increased levels of physical activity were associated with reduced burnout scores. However, the strength of these associations was minimal. Physical activity did not exhibit a statistically significant association with total burnout (β = -0.118, p = 0.064) or disengagement (β = -0.081, p = 0.206), although weak inverse trends were noted. Conversely, a statistically significant albeit small association was observed with exhaustion (β = -0.129, p = 0.042). Across all models, physical activity accounted for a very small proportion of variance in burnout outcomes (R^2 ranging from 0.007 to 0.017), indicating limited explanatory power.

TABLE-II

Unadjusted model of association between physical activity and burnout domains (total, disengagement and exhaustion)

Outcome	β	p-value	95% CI	R^2
Total burnout score	-0.118	0.064	-1.581,0.045	0.014
Disengagement	-0.081	0.206	-0.665,0.145	0.007
Exhaustion	-0.129	0.042	-0.998,-0.017	0.017

Note: β = standardized regression coefficient; CI = confidence interval; R^2 = coefficient of determination. All models are unadjusted simple linear regressions.

Subsequently, multiple linear regression analyses were performed adjusting for age, gender and BMI. After controlling these covariates, physical activity was no longer significantly associated with total burnout (β = -0.062, p = 0.329), disengagement (β = -0.042, p = 0.519), or exhaustion (β = -0.068, p = 0.278). In contrast, gender consistently emerged as a significant predictor across all adjusted models, with female participants demonstrating higher total burnout (β = 0.298, p < 0.001), disengagement (β = 0.207, p = 0.003), and exhaustion (β = 0.323, p < 0.001) compared with male participants. Model explanatory power remained modest, with R^2 values ranging from 0.045 to 0.112.

TABLE-III

Adjusted model (age, gender and BMI) of association between physical activity and burnout domains (total, disengagement and exhaustion)

Outcome	β	p-value	95% CI	R^2
Total burnout score	-0.062	0.329	-1.217, 0.409	0.094
Disengagement	-0.042	0.519	-0.550, 0.279	0.045
Exhaustion	-0.068	0.278	-0.755, 0.218	0.112

Note: β = standardized regression coefficient; CI = confidence interval; R^2 = coefficient of determination. All models are adjusted multiple linear regressions controlling for age, gender, and BMI.

DISCUSSION

The present study aimed to examine the association between physical activity and academic burnout among undergraduate medical students in Faisalabad. We found a weak inverse relationship between physical activity and burnout outcomes in unadjusted analyses. Higher physical activity was associated with lower total burnout (β = -0.118, p = 0.064) and disengagement (β = -0.081, p = 0.206), but these associations did not reach statistical significance. A statistically significant but small inverse association was observed between physical activity and exhaustion (β = -0.129, p = 0.042; 95% CI: -0.998, -0.017). However, after adjusting for age, gender, and BMI, physical activity was no longer significantly associated with total burnout (β = -0.062, p = 0.329), disengagement (β = -0.042, p = 0.519), or exhaustion (β = -0.068, p = 0.278). These findings suggest that physical activity may demonstrate a modest crude association with certain dimensions of burnout, particularly exhaustion, but cannot independently predict burnout outcomes in this sample after accounting for demographic factors.

.Physical activity explained only 0.7%–1.7% of variance in burnout outcomes in unadjusted analyses, while adjusted models demonstrated similarly modest explanatory power (R^2 = 0.045–0.112), indicating that the majority of variance in burnout remained unexplained by physical activity and the included covariates. This suggests that academic burnout is likely influenced by a broader constellation of factors beyond physical activity, including academic workload, coping resources, social support, psychological resilience, and institutional environment.[17,18] Our findings partly contrast with prior studies reporting protective effects of physical activity on academic burnout and student well-being. For example, Chen et al. (2022) reported that physical exercise reduced academic burnout through serial mediation by self-efficacy and resilience[19], while Hassnain et al. (2023) found that sports participation was associated with lower disengagement among postgraduate students.[12] In contrast, our study identified a significant association only with exhaustion in the unadjusted model, suggesting that among undergraduate medical students, physical activity may be more closely related to fatigue-related dimensions of burnout than to cognitive or attitudinal components such as disengagement. This difference may reflect contextual variation in academic demands, as undergraduate medical education is characterized by intensive workloads, rigid curricula, and high-stakes examinations that contribute substantially to student distress.[2] The disappearance of the physical activity association after adjustment suggests that the relationship between exercise and burnout may be indirect rather than independent. This finding is consistent with prior literature suggesting that the effects of physical activity on burnout may operate indirectly through mechanisms such as self-efficacy, resilience, and related psychosocial resources.[19,20]

A notable finding of this study was the consistent association between gender and burnout across all adjusted models. Female students demonstrated significantly higher total burnout (β = 0.298, p < 0.001), disengagement (β = 0.207, p = 0.003), and exhaustion (β = 0.323, p < 0.001) compared with male students, with gender emerging as the only significant predictor retained across all models. This suggests that gender may be a more salient correlate of academic burnout than physical activity in this cohort. Although findings regarding gender and burnout in medical education remain mixed, several studies have reported higher emotional exhaustion and psychological distress among female medical students[21], while others have found no significant association between gender and academic burnout.[2] In the Pakistani medical education context, these findings may reflect broader sociocultural and institutional pressures disproportionately affecting female students, including gendered role expectations, heightened academic and familial pressures, and limited psychosocial support, all of which warrant further investigation.[22]

These findings have important implications for student well-being interventions. Although physical activity remains beneficial for general physical and psychological health[6,8], the present findings suggest that promoting physical activity alone is unlikely to substantially mitigate academic burnout in medical students. Institutions should therefore adopt broader and more integrated strategies, including accessible mental health services, mentorship

programs, peer support initiatives, and interventions focused on stress management, coping skills, and academic workload balance.[23] Given the observed gender disparities, student support initiatives may additionally benefit from incorporating gender-responsive approaches tailored to the specific challenges experienced by female medical students.

This study has several strengths. First, it employed validated instruments to assess both physical activity and burnout, enhancing measurement reliability. Second, the use of both unadjusted and adjusted regression models allowed for a more nuanced examination of the relationship between physical activity and burnout while accounting for potential confounding by age, gender, and BMI. Third, the study contributes context-specific evidence from Pakistani medical students, adding to the growing literature on burnout determinants in medical education within South Asian settings. Several limitations should also be acknowledged. The cross-sectional design precludes causal inference regarding the observed associations. Physical activity was assessed through self-report, which may be subject to recall and social desirability bias, and objective measures such as accelerometry may improve measurement precision in future studies. Additionally, the study was conducted at a single institution, which may limit generalizability to other medical student populations. Future longitudinal research should explore psychological and environmental mediators—including resilience, coping styles, social support, and academic stressors—to better elucidate determinants of burnout in medical students.

CONCLUSION

The current findings reinforce the multifactorial nature of academic burnout and suggest that while physical activity remains important for general health and well-being, it is unlikely to be sufficient as a stand-alone strategy for burnout prevention. Medical institutions should therefore adopt more comprehensive and context-sensitive approaches to student well-being, including mental health support, stress management interventions, and strategies responsive to gender-specific challenges. Future longitudinal and multi-institutional studies are needed to further investigate the determinants of burnout and the mechanisms through which physical activity may be augmented to influence student well-being.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Amna Ikhlaq:** Conceptualization, methodology.
2	**Muhmmad Faizan Arshad:** Data curation, data analysis.
3	**Muhammad Mohid Ishaq:** Data analysis.
4	**Muhammad Umer Rafiq:** Methodology.
5	**Muhammad Omer Abubakar Asif:** Investigation.