

Original Article

Physical Activity and Academic Performance: A Study Among City University Undergraduates.

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Abstract

Background: While the physical health benefits of exercise are well-established, recent research has broadened the scope to include psychological and cognitive well-being. This study aimed to examine the correlation between regular physical activity and academic performance among City University students.

Methodology: A cross-sectional survey design was used, involving 337 participants who were selected through purposive sampling via Rao-Soft Software. Data were collected using self-reported questionnaires that addressed exercise frequency, academic performance, demographic factors, and stress levels.

Results: The findings revealed a moderately positive relationship between physical activity and academic achievement. However, this correlation did not reach statistical significance at the conventional alpha level. Other factors, including demographic characteristics and stress levels, were found to be stronger predictors of academic performance.

Conclusion: While physical activity may have an influence on academic outcomes, it is not a sole determinant. The interplay of mental health, socio-demographic variables, and physical activity suggests the need for more comprehensive, multi-variable research to better understand these complexes.

Keywords

Physical Activity, Academic Performance, Private Universities, Psychological Well-Being, Cognitive Wellness.



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Introduction

Physical activity has long been recognized for its beneficial effects on physical health, mental well-being, and cognitive performance. While the impact of exercise on physical health is well-documented, emerging evidence underscores its critical role in enhancing cognitive functioning and psychological wellness. Studies indicate that optimal cardiorespiratory fitness during youth is positively associated with academic success and reduced cognitive impairment risk later in life. Regular physical activity promotes concentration, reduces stress, improves sleep quality, and boosts mood factors that are essential for academic success¹.

University life represents a period of significant transitions, including reduced physical activity, heightened academic demands, and increased stress levels. These factors often contribute to diminished academic performance and mental health issues. Research suggests that physically active students tend to have better attention spans, cognitive flexibility, and emotional regulation compared to their less active peers. These benefits highlight the potential of regular exercise to buffer the academic and psychological challenges faced by university students².

Moreover, evidence suggests that exercise enhances brain structure and function, while also fostering personal development traits such as discipline, resilience, and time management attributes directly linked to academic achievement³. As global higher education enrollment continues to rise, it becomes increasingly important for institutions to recognize the role of non-academic factors, such as physical activity, in shaping student success. Incorporating wellness programs, sports, and physical education into academic settings may foster more balanced student development⁴.

Despite the growing belief in the benefits of physical activity, the direct relationship between exercise routines and academic outcomes remains underexplored, particularly in private-sector universities in developing regions⁵. Variables such

as gender, socioeconomic status, and academic discipline may moderate this relationship, indicating that academic performance is influenced by a complex interplay of lifestyle and personal factors⁶.

The objective of this study was to assess the physical activity levels among undergraduate students at private-sector universities in Peshawar and to explore the association between these activity levels and academic performance.

Methodology

Study Design

This study utilized a cross-sectional observational design in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines. The primary objective was to explore the relationship between physical activity and academic performance among undergraduate students at City University, Peshawar. The study was conducted over a three-month period, from February to April 2024.

Ethics

Ethical approval for the study was obtained from the Institutional Ethics Review Committee of City University, Peshawar. All participants were informed of the study's objectives and procedures, and they provided written informed consent before data collection. Participant anonymity and confidentiality were strictly maintained throughout the study, and ethical principles outlined in the Declaration of Helsinki were adhered to.

Setting

The study was carried out at City University, Peshawar, a private higher education institution offering a variety of undergraduate degree programs. Data collection took place within the university's classroom settings to ensure a controlled environment and reduce external distractions or environmental bias.

Participants

A total of 337 undergraduate students were recruited using convenience sampling. Participants were eligible if they were enrolled in any

undergraduate program at City University and were willing to voluntarily participate and provide informed consent. Students with diagnosed physical disabilities, chronic illnesses, or cognitive impairments that could interfere with their physical activity levels or academic engagement were excluded from the study. The sample was diverse in terms of academic disciplines and year of study, ensuring a broad representation of the student population.

Study Size

The required sample size was calculated using the Raosoft Sample Size Calculator, with parameters set at a 95% confidence level and 5% margin of error. Based on the total population of undergraduate students at the university, a minimum of 322 participants was estimated to be necessary. The final sample of 337 students exceeded this threshold, ensuring sufficient statistical power.

Variables

- Independent (Exposure) Variable: Physical activity level, categorized into low, moderate, and high based on standardized scoring from the IPAQ.
- Dependent (Outcome) Variable: Academic performance, operationalized using CGPA and supplementary indicators of academic behavior (e.g., class attendance, concentration, and study habits).

Data Sources/Measurement

- **Physical Activity:** Measured using the International Physical Activity Questionnaire (IPAQ) - Short Form, which assesses physical activity levels over the previous seven days. The tool is validated internationally and enables categorization of respondents based on MET-minutes/week into low, moderate, or high activity levels.
- **Academic Performance:** Measured via a standardized Academic Performance Scale, which included:

- Self-reported Cumulative Grade Point Average (CGPA)
- Responses to items evaluating academic behaviors such as attention span, study frequency, and classroom engagement.

Both instruments were administered in English, the medium of instruction at City University, and supervised by trained research assistants to ensure accurate and complete responses.

Bias

To minimize response and social desirability bias, several strategies were employed. Participants were assured of the confidentiality and anonymity of their responses, which encouraged honest reporting. The non-evaluative nature of the study was emphasized to further reduce bias. Surveys were administered in a standardized format with neutral instructions to ensure consistency in data collection. Additionally, no incentives were offered for participation, thereby reducing the likelihood of participation bias.

Quantitative Variables

CGPA was treated as a continuous variable. Physical activity levels were analyzed both as categorical (low/moderate/high) and continuous (total MET-min/week), depending on the specific analysis conducted. Additionally, other items from the Academic Performance Scale were analyzed as ordinal or categorical variables, as deemed appropriate for the analysis.

Statistical Methods

Data were coded, cleaned, and analyzed using IBM SPSS Statistics Version 25. Descriptive statistics, including mean, standard deviation, frequency, and percentages, were calculated for demographic and core study variables. Pearson's correlation coefficient was used to assess the linear relationship between total physical activity (MET-min/week) and CGPA for normally distributed data, while Spearman's rank-order correlation was employed for non-parametric data or when normality assumptions were violated. Chi-square tests were conducted to evaluate associations between categorical physical activity levels and

academic performance categories. The level of statistical significance was set at $\alpha = 0.05$. No data imputation was necessary, as complete datasets were obtained from all participants.

Results

Participants

A total of 337 undergraduate students from City University, Peshawar, participated in the study. All participants met the inclusion criteria and provided complete responses for both key variables physical activity (PA) and academic performance (AP).

There were no missing data. The sample represented a broad demographic, including students from a variety of academic disciplines and with a balanced gender distribution, enhancing the generalizability of the findings within the university context.

Descriptive Data

• Physical Activity Levels

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) and categorized into three levels, low, moderate, and high. The distribution of activity levels among participants was as follows, 46% ($n = 155$) of students reported high physical activity, 34% ($n = 114$) reported moderate physical activity, and 20.2% ($n = 68$) reported low physical activity. These figures indicate that a substantial proportion of students were actively engaged in physical activity, with nearly half demonstrating high levels of activity.

• Academic Performance

Academic performance, measured through a standardized Academic Performance Scale, was categorized into five levels (Table 1).

These results suggest that the majority of students (over 90%) rated their academic performance as either "good" or "excellent."

Outcome Data

To investigate the relationship between physical activity and academic performance, both categorical association tests and correlation analyses were performed.

The Chi-square test for independence revealed no statistically significant association between physical activity (PA) level and academic performance (AP) category. The results were as follows: Pearson Chi-Square: $\chi^2 (8) = 13.306$, $p = 0.102$; Likelihood Ratio: $\chi^2 = 13.296$, $p = 0.102$; and Linear-by-Linear Association: $\chi^2 = 1.004$, $df = 1$, $p = 0.316$.

These findings suggest that academic performance is not significantly influenced by the level of physical activity, as indicated by the categorical distributions.

Both Pearson's r and Spearman's ρ were computed to examine any linear and monotonic relationships between physical activity (PA) scores and academic performance (AP) levels. The results showed Pearson's $r = 0.055$, $p = 0.317$, and Spearman's $\rho = 0.066$, $p = 0.228$.

These low and non-significant correlation coefficients further support the lack of a statistically meaningful relationship between physical activity and academic performance in this sample.

Main Results

The results from both the Chi-square tests and the correlation analyses consistently indicate no statistically significant association between physical activity levels and academic performance among undergraduate students.

Despite a high proportion of students demonstrating high physical activity and strong academic performance individually, no predictive or associative relationship was observed between these variables.

Table 1: Distribution of Students by Academic Performance Levels.

Academic Performance Level	Percentage of Students
Excellent	49.9%
Good	40.9%
Moderate	8.0%
Poor	0.9%
Failing	0.3%

Table 2: Association Between Academic Performance Level and Physical Activity

Academic Performance Level	Physical Activity			P-value
	Low n(%)	Moderate n(%)	High n(%)	
Excellent	33 (19.6%)	50 (29.8%)	85 (50.6%)	0.102
Good	32 (23.2%)	48 (34.8%)	58 (42.0%)	
Moderate	2 (7.4%)	14 (51.9%)	11 (40.7%)	
Poor	0 (0%)	2 (66.7%)	1 (33.3%)	
Failing	1 (100.0%)	0 (0%)	0 (0%)	

*p<0.05 is considered statistically significant.

Discussion

This study aimed to explore the relationship between physical activity (PA) levels and academic performance (AP) among undergraduate students at City University, Peshawar. Using a sample of 337 participants categorized into low, moderate, and high physical activity groups, alongside their corresponding academic achievement levels, the findings offer nuanced insights into this frequently debated association⁷.

Descriptive statistics revealed that 46% of students engaged in high levels of PA, while 33.8% and 20.2% reported moderate and low activity levels, respectively. In terms of academic outcomes, 49.9% of students demonstrated excellent performance, and 40.9% achieved good performance. Although cross-tabulation showed that a higher proportion of students with high PA also exhibited excellent academic performance (e.g., 85 out of 155 students), the chi-square test ($\chi^2 = 13.306$, $p = 0.102$) did not yield a statistically significant association between PA and AP at the conventional alpha level of 0.05⁸.

These findings align with prior literature reporting mixed or modest positive associations between PA and academic achievement, which often vary due to differences in sampling, measurement tools, and confounding factors such as stress, sleep quality, and socioeconomic status¹². Similarly, a systematic review published in the Journal of Environmental Research and Public Health (2020) concluded that while some trends suggest a positive association, findings remain inconsistent and frequently lack robust statistical support^{9,10}.

Furthermore, demographic and psychosocial moderators may influence this relationship. For instance, prior studies have shown that stress levels and academic workload, especially during examination periods, may attenuate the cognitive benefits typically associated with physical activity^{11,12}. This may partly explain the lack of significant results in our study, as the data collection period could have coincided with elevated academic stress.

Another critical issue is the reliance on self-reported instruments for both PA and AP. Numerous studies have highlighted the limitations of self-reported data due to potential recall bias

and social desirability, which can lead to either underreporting or overestimation¹³. These factors may have diluted the strength of associations in our study. Future investigations should prioritize the use of objective measures, such as accelerometers for PA and verified academic transcripts or GPA records for academic performance, to enhance the reliability and validity of findings¹⁴.

The descriptive data showed that 40.9% of participants achieved good academic results, while a very small percentage (0.9% and 0.3%) fell into the poor or failing categories. These outcomes are comparable to findings from systematic reviews, which consistently reported weak or inconsistent links between PA and AP¹⁵⁻¹⁷. The use of self-reports in our study also invites caution, as inaccuracies in responses may arise. Additionally, external factors such as gender distribution, grade levels, socioeconomic background, and cultural variations likely influence the observed relationship between PA and AP.

For instance, past research confirmed that moderate-to-vigorous physical activity (MVPA) may benefit academic outcomes, with gender acting as a moderator in this association¹⁸. The interplay between exercise intensity and academic outcomes is complex, as each student brings a unique set of physical, mental, and emotional characteristics, and engages in PA in diverse ways.

Moreover, our sample was restricted to a single, private university, which may not fully reflect broader student demographics. Factors such as geographic location, academic calendar, and institutional differences could all affect generalizability¹⁹. Although our statistical analyses did not reveal a significant association, the descriptive findings underscore the need for more rigorous and comprehensive investigations into this subject.

Future studies should employ larger, more representative samples, use objective activity tracking tools, and include potentially confounding or moderating variables that may better explain the

intricate link between physical activity and academic performance²⁰.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design prohibits causal inference between physical activity and academic performance. Second, reliance on self-reported instruments such as the IPAQ and Academic Performance Scale introduces potential biases, including recall and social desirability bias. Third, the use of convenience sampling from a single private university in Peshawar restricts the generalizability of the findings to a broader student population. Moreover, important confounding variables including socioeconomic status, sleep quality, dietary habits, and mental health were not accounted for, despite their potential influence on both PA and AP. Finally, while the Academic Performance Scale provided a structured approach to evaluation, it may not adequately reflect inter-departmental academic diversity or variation in grading criteria. Future studies should consider adopting longitudinal, multi-site designs and integrate objective measures of both PA and AP to enhance internal and external validity.

Conclusion

This study assessed the relationship between physical activity and academic performance among university students. The results revealed minimal to no significant correlation between these two variables. Participants were categorized into low, moderate, and high PA levels, and academic performance ranged from failing to excellent. While some students with high PA levels demonstrated excellent academic outcomes (e.g., 155 participants), the overall findings challenge the common assumption that physical activity directly enhances academic performance. Instead, the results suggest that academic success is likely influenced by a complex interplay of factors beyond physical activity alone. Despite the absence of a statistically significant link, PA should still be promoted for its well-established health benefits. A holistic approach addressing emotional, cognitive, and social development remains essential for

supporting student achievement in both academic and physical domains.

Conflicts of Interest

The author(s) have no conflicts of interest.

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