Archives available at journals.mriindia.com

International Journal on Research and Development - A Management Review

ISSN: 2319–5479
Volume 14 Issue 01, 2025

The Impact of Physical Education on Academic Performance and Cognitive Development among Collegiate students

Dr. Netaji Jadhav
Associate Professor, Bharati Vidyapeeth (Deemed to be University) College of Physical Education, Pune.
Director of Sports & Physical Education, Bharati Vidyapeeth University, Pune
netaji.jadhav@bharatividyapeeth.edu

Peer Review Information

Submission:21 April 2025
Revision:20 May 2025
Acceptance:15 June 2025

Keywords

Physical education (PE), Physical activity, Exercise, Academic performance, Cognitive development, Prefrontal cortex

Abstract

This article analyses the overall impact of physical education (PE) on the academic performance and cognitive development in collegiate students. Secondary qualitative data has been gathered to meet the primary aim of this study and thematic analysis was done to establish the findings. It is noted that PE improves cognitive processes that are controlled by the prefrontal cortex of the brain which results in improved academic performance through enhanced attention, decision-making skills, working memory, planning and scheduling of tasks. Moreover, PE helps reduce stress and anxiety level among students and enhances quality of sleep leading to better attention and energy among students. Having positive impact on insulin resistance, body mass control and metabolic rate, PE enhances cognitive development of collegiate students leading to improved academic performance.

INTRODUCTION

The importance of physical education (PE) for effective development of an individual has been recognised widely as it is noted to reduce stress, develop physical attributes, fitness, boost selfconfidence, improve sleep, and promote positive attitude, good health and overall lifestyle of individuals. An improved mood and ensured mental and physical well-being through PE has a significant effect on the academic performance of students. Additionally, PE is noted to be essential for success in professional as well as personal lives of students. Considering such aspects, this article intends to analyse the impact of PE on the academic performance and cognitive development in collegiate students.

OBJECTIVE:

To analyse the impact of physical education on the academic performance of college students
To evaluate the impact of physical education on the cognitive development of college students

METHODOLOGY

This study has gathered secondary qualitative data from previous research, academic and peer-reviewed journals, scientific studies and others published in the last five years on the impact of PE on academic performance and cognitive development of collegiate students to enhance reliability of findings in present times. According to Chatfield (2020), a well-planned analysis of secondary qualitative data reflects the utility and use of resources providing meaningful insights into a research topic. Therefore, for this article,

first relevant secondary data sources were identified and then categorised into subtopics, i.e. academic performance and cognitive development. Then the data is analysed critically to develop two themes based on the aforesaid objectives. The inherent codes and patterns existing in the chosen data sources were identified and presented through thematic analysis below.

Data Analysis Analysing the impact of physical education on the academic performance of collegiate students

Colleges and universities are the most ideal institutions to promote physical activities through PE programs among collegiate students. PE is noted to have a significant positive impact on every aspect of mental and physical health as physical activities can build resilience among students and enhance energy level and attention which is highly beneficial to improve academic performance, especially for collegiate students as for such students' academic pressure becomes extremely high leading to stress, anxiety and depression (Brown et al. 2024). Physical activities help reduce stress level and anxiety and help improve the overall learning and academic environment for the students promoting team spirit and better bonding.

Physical education not only improves mental and physical well-being among collegiate students, but rather improves the overall sleep quality which is primarily associated with academic and neurocognitive performance (Wang & Boros, 2021). Poor rest and sleep quality negatively impacts the academic performance of collegiate students and since academic stress is quite common among such students, improved sleep energizes students to perform better in academics. Negating the biological requirements for sleep, students trade off sleep to accommodate intense work schedules and social responsibilities. Therefore, the relevance of PE has increased in recent times for collegiate students to ensure that they lead a healthy and active lifestyle with enough rest and necessary sleep.

There is a mixed or small positive association between academic performance and physical activities. On multiple occasions, it has been identified that physical education has a "small-tomedium" positive impact on the academic achievements for students belonging to different age groups (Barbosa et al. 2020). Regular PE demonstrated a medium positive impact on the academic performance, however, acute activities did not show any significant benefits. Therefore, it can be argued that PE as a whole does not seem to have any detrimental effect on the academic performance of students and might in fact contribute to academic achievements. Hence, arguably taking part in PE, collegiate students can benefit a great deal by enhancing their academic performance.

Physical activities cause significant changes in the levels of endorphins in blood. Additionally, physical activities are noted to improve the overall quality of blood flow in the human brain, lowering the risks related to volume loss and other psychological issues (Zheng, 2022). Hence, it can be argued that collegiate students can adopt PE and engage in regular exercises to release various neurotransmitters and endorphins resulting in higher energy and enhanced alertness during academic activities in the classroom boosting their overall performance. Moreover, improved sleep quality enhances students attention span and learning quality and capabilities during the academic courses. Therefore, arguably, PE is considered to be an extremely important aspect for collegiate students to improve their academic performance.

Evaluating the impact of physical education on the cognitive development of collegiate students

The relationship between cognitive development and functions with PE is quite interesting and intricate. Studies have shown that physical activities enhance "neurotransmitter secretion levels" and "cerebral blood flow" which eventually results in enhanced levels of attention, effort and arousal suggesting positive cognitive functions (Haverkamp et al. 2020, p.2637). Additionally, repeated physical activities are noted to increase angiogenesis, neurogenesis and synaptogenesis. These morphological changes in the human brain structure leads to better cognitive outcomes. Hence, it becomes evident that effective PE courses resulting in repeated physical activities help with cognitive development among collegiate students.

Physical activities have long been considered as a critical factor to enhance cognitive performance through "upregulation of 5-HT2A receptors" and "downregulation of 5-HT1A receptors" related to cognition related activities in the human brain (Hayer & Benipal, 2023, p.125). Exercises, improves cognitive processes that are primarily controlled by "prefrontal cortex", such as working memory, planning, scheduling and other activities suggesting significant cognitive development among individuals. Hence, it becomes visible how PE, cognitive development and academic performance of collegiate students can be interconnected as enhancement of one aspect through PE helps the other, such that PE fostering cognitive development results in better academic performance of collegiate students.

Studies have shown that "endogenous BDNF levels" can be increased with the help of regular exercise and physical activities (Rozanska, Uruska & Zozulinska-Ziolkiewicz, 2020). Moreover, physical education has become an important factor that can positively influence insulin resistance, control body mass and metabolic rate which has a wholesome positive impact on the overall cognitive development of students (Rozanska, Uruska & Zozulinska-Ziolkiewicz, 2020). BDNF being a protein supporting the survival and growth of neurons and improving synaptic plasticity is critical for memory and learning capacity among students. Since physical activities arguably have a positive influence on the BDNF levels, it can be said that PE becomes extremely important for collegiate students' cognitive development and overall academic performance.

Regular physical exercise is noted to positively influence human brains' resilience. The overall cognitive functioning of the brain is said to improve significantly with incorporation of a healthy dose of physical activity in the early life of individuals (Arida & Teixeira-Machado, 2021). However, there is extremely limited research to establish a substantive connection between cognitive performance and exercise. Nevertheless, it has been noted that cognitive decline among people can be prevented by incorporating physical exercise into the daily routine of individuals, especially collegiate students. Additionally, daily physical exercises improve the prefrontal cortex which is responsible for performing various executive functions such as planning, decisionmaking, attention and others suggesting the impact of PE for facilitating cognitive development which in turn is helpful to enhance academic performance of collegiate students.

DISCUSSION

The data analysis shows that there is a significant relationship between PE, cognitive development and academic performance, especially within the context of collegiate students. Physical activities are noted to improve cognitive processes that are mainly controlled by "prefrontal cortex" such as attention, working memory, planning, decision-making scheduling and others (Hayer & Benipal, 2023). As per the data analysis, improvement in such cognitive functions in turn enhances the overall academic performance of students. Additionally, it is noted that PE enhances "cerebral blood flow" resulting in better attention, effort and arousal, the effect of which is reflected in academic performance of collegiate students as well (Haverkamp et al. 2020). Since exercise has a positive impact on insulin resistance, body mass control and metabolic rate, it influences overall cognitive development of students which eventually enhances the scope of academic achievements of students.

It is noted that exercise helps in stress and anxiety reduction. Since collegiate students experience a great deal of academic stress and often face depression and anxiety, making them take part in PE classes would ensure that stress and anxiety levels of such students are better managed which in turn would improve the overall academic performance of such students (Brown et al. 2024). According to the data analysis, routine physical activities enhance the sleep quality of collegiate students which has a positive relation with stress management and improved academic performance (Wang & Boros, 2021). Data analysis further suggests that regular PE has a medium positive impact on the academic performance of collegiate students (Barbosa et al. 2020). Hence, arguably, PE contributes positively towards the academic achievements of collegiate students.

CONCLUSION

PE, academic performance and cognitive development among collegiate students is highly interrelated as PE influences both to a great extent. It is noted that PE helps with stress and anxiety reduction and improves sleep quality which in turn positively impacts attention and energy level of students translating to better academic performance. Moreover, PE improves cognitive processes which are controlled by "prefrontal cortex" such as attention, working memory, planning and decision-making scheduling suggesting effective cognitive development, leading to better academic performance by collegiate students.

REFERENCES

Arida, R. M., & Teixeira-Machado, L. (2021). The contribution of physical exercise to brain resilience.Frontiers in behavioral neuroscience, 14, 626769. https://doi.org/10.3389/fnbeh.2020.626769

Barbosa, A., Whiting, S., Simmonds, P., Scotini Moreno, R., Mendes, R., & Breda, J. (2020). Physical activity and academic achievement: an umbrella review. International journal of environmental research and public health, 17(16), 5972. https://doi.org/10.3390/ijerph17165972

Brown, C. E., Richardson, K., Halil-Pizzirani, B., Atkins, L., Yücel, M., & Segrave, R. A. (2024). Key influences on university students' physical activity: a systematic review using the Theoretical Domains Framework and the COM-B model of human

behaviour. BMC Public Health, 24(1), 418. https://doi.org/10.1186/s12889-023-17621-4

Chatfield, S. L. (2020). Recommendations for secondary analysis of qualitative data. The Qualitative Report, 25(3), 833-842.

https://www.researchgate.net/profile/SherylChatfield/publication/340412653_The_Qualitative_Report_The_Qualitative_Report_Recommendations_for_Secondary_Analysis_of_Qualitative_Data_Recommendations_for_Secondary_Analysis_of_Qualitative_Data_Recommendations_for_Secondary_Analys/links/5e874289299bf13079762082/The-Qualitative-Report-The-Qualitative-Report-Recommendations-for-Secondary-Analysis-of-Qualitative-Data-Recommendations-for-Secondary-Analysis-of-Qualitative-Data-Recommendations-for-Secondary-Analys.pdf 5.

Haverkamp, B. F., Wiersma, R., Vertessen, K., van Ewijk, H., Oosterlaan, J., & Hartman, E. (2020). Effects of physical activity interventions on cognitive outcomes and academic performance in adolescents and young adults: A meta-analysis. Journal of sports sciences, 38(23), 2637-2660. https://doi.org/10.1080/02640414.2020.1794763

Hayer, H., & Benipal, S. (2023). How fitness can fuel the brain. 124-127. https://repository.rcsi.com/articles/journal_contribution/How_fitness_can_fuel_the_brain/23943345/1/files/41991321.pdf

Rozanska, O., Uruska, A., & Zozulinska-Ziolkiewicz, D. (2020). Brain-derived neurotrophic factor and diabetes. International journal of molecular sciences, 21(3), 841. https://doi.org/10.3390/ijms21030841

Wang, F., & Boros, S. (2021). The effect of physical activity on sleep quality: a systematic review.European journal of physiotherapy, 23(1), 11-18. https://doi.org/10.1080/21679169.2019.1623314

Zheng, R. (2022). Pleasure and Achievement: Dopamine and Endorphins. Highlights in Science,Engineering&Technology,6,83-89. https://pdfs.semanticscholar.org/4fb3/a88ff070092e0e0f0e3a8cd00c26be527f2f.pdf