

THE RELATIONSHIP BETWEEN PHYSICAL FITNESS AND ACADEMIC PERFORMANCE IN UNIVERSITY STUDENTS: A CORRELATIONAL STUDY

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Abstract. *Background.* In recent years, increasing attention has been paid to the connection between physical activity and cognitive performance, especially in the academic context. The sedentary lifestyle of university students has raised concerns regarding both physical health and academic success. Previous research suggests that regular physical activity can enhance cognitive functions such as memory, attention, and executive control.

Objectives. The purpose of this study was to explore the relationship between physical fitness and academic performance among undergraduate students from the University of Bucharest. The research aimed to determine whether higher fitness levels are associated with better academic outcomes.

Methods. The study was conducted on a sample of students aged 19–21 who attended mandatory physical education classes. Physical fitness was assessed at the end of the first semester using standardized field tests: the Harvard Step Test (cardiorespiratory endurance), push-ups in 30 seconds (upper-body strength), sit-ups in 30 seconds (core endurance), and the Sit & Reach test (flexibility). Academic performance was measured based on students' final grade point averages (GPA). A lifestyle questionnaire regarding sleep, study habits, and perceived energy levels was also applied. Statistical analyses included descriptive statistics and correlation tests (Pearson/Spearman) between physical fitness scores, questionnaire responses, and GPA.

Results. Preliminary observations indicate that the overall fitness levels of participants were below the age-related average, particularly in cardiorespiratory endurance. A positive correlation is expected between higher physical fitness scores and higher academic performance, particularly in students who reported regular physical activity outside of class and better sleep habits.

Conclusion. This study highlights the potential impact of physical fitness on students' academic success. Promoting physical activity within university curricula may contribute to improved cognitive functioning and better academic outcomes. Further analysis will determine the strength and significance of these associations.

Keywords: physical fitness, academic performance, university students, cardiorespiratory endurance, cognitive function.

Introduction

In the current context, marked by increasing levels of sedentary behavior among the younger population, physical activity within higher education has gained strategic importance. Students are increasingly exposed to a sedentary lifestyle, with negative effects not only on physical health but also on cognitive functioning and academic performance.



Numerous recent studies indicate that physical activity influences not only somatic health but also cognitive abilities such as attention, working memory, and information processing speed. Despite this, in many Romanian universities, physical education remains undervalued in the educational process, and the relationship between fitness levels and academic success is rarely explored (Trudeau & Shephard, 2008; Donnelly et al., 2016).

This study aims to analyze this relationship among students at the University of Bucharest, using validated physical fitness testing tools and objective academic indicators.

Theoretical Foundation

Physical activity has a direct impact on the central nervous system by stimulating the release of neurotransmitters (dopamine, serotonin, norepinephrine) and neurotrophic factors (such as BDNF – Brain-Derived Neurotrophic Factor) that support cognitive processes (Ratey, 2008; Chaddock et al., 2011). Through mechanisms of neuroplasticity, physical exercise contributes to the formation of new synaptic connections, thereby enhancing learning capacity and executive functions.

According to research (Erickson et al., 2019; Singh et al., 2019), moderate to vigorous physical activity has been shown to improve working memory, sustained attention, and processing speed. Studies conducted on young populations (Torrijos-Niño et al., 2014; Van Dusen et al., 2011) have revealed a significant correlation between fitness level and academic performance, particularly in subjects such as mathematics and foreign languages.

Furthermore, according to Jean Piaget's theory of cognitive development, motor activity is essential in the construction of intelligence, and learning skills are fundamentally based on active interaction with the environment (Diamond & Ling, 2016).

The research organization

The purpose of the paper

The purpose of this research is to explore the relationship between physical fitness and academic performance in undergraduate students enrolled at the University of Bucharest. This paper aims to determine whether students with higher levels of general physical preparedness—assessed through standardized fitness tests—achieve better academic outcomes, as measured by their semester GPA.

By combining objective data from physical fitness evaluations (muscular strength, endurance, flexibility, and cardiorespiratory capacity) with academic results and lifestyle indicators (such as sleep, study habits, and self-reported energy levels), the study seeks to contribute to a better understanding of how physical health may influence cognitive functioning and educational success. The findings may support the integration of physical activity into higher education curricula as a means of enhancing student performance and well-being.

The hypothesis of the research

The research hypothesizes that there is a significant relationship between students' physical fitness level and their academic performance.

The objectives and the tasks of the research

Objective:

The main objective of this research is to analyze the relationship between physical fitness and academic performance in university students, by assessing various components of physical fitness and comparing them with academic outcomes.

Research tasks:

1. To assess the physical fitness level of students using field-based tests:
 - push-ups (upper body muscular strength),
 - sit-ups (core endurance),
 - Harvard Step Test (cardiorespiratory fitness),
 - Sit and Reach (flexibility).
2. To collect and centralize academic performance data (semester GPA).
3. To administer a lifestyle questionnaire covering study habits, sleep, perceived energy, and the subjective impact of physical activity on concentration.
4. To perform statistical analyses to determine correlations between fitness test results, academic performance, and lifestyle indicators.
5. To interpret the findings in the context of existing literature and highlight potential implications for educational and physical activity policies in higher education.

The research stages

The research was conducted during the first semester of the 2024–2025 academic year, within the Department of Physical Education at the University of Bucharest. The study involved a total of 60 undergraduate students enrolled in physical education classes, covering various sport disciplines such as fitness, aerobics, and table tennis.

Out of the 60 participants, 36 were female and 24 were male, aged between 19 and 21 years. All participants voluntarily took part in the research and were in good health, without physical limitations that could affect their performance during testing.

The research was structured in the following stages:

– *Initial organization and participant selection* – students were informed about the purpose and confidentiality of the study, and consent was obtained.

- Fitness testing phase – the following tests were administered during scheduled practical classes:
 - Push-ups in 30 seconds (upper body muscular strength),
 - Sit-ups in 30 seconds (core endurance),
 - Harvard Step Test (cardiorespiratory fitness),
 - Sit and Reach (flexibility).

– *Collection of academic performance data* – semester Grade Point Averages (GPA) were recorded based on self-reporting, cross-validated when possible.

– *Lifestyle questionnaire* – participants filled out a short online questionnaire regarding their sleep duration, study habits, physical activity frequency, daily energy levels, and their perception of how physical activity affects academic focus.

– *Data processing and statistical analysis* – results were organized in spreadsheets and analyzed using descriptive statistics and correlation tests (Pearson).

The research methods

In our approach we used the following research methods:

- a. *The study of specialized literature*, in order to understand the theoretical relationship between physical activity and cognitive performance, and to identify validated fitness assessment tools;

- b. *The statistical-mathematical method*, for processing and interpreting the quantitative data collected from the physical fitness tests and academic performance;
- c. *The experimental method*, by organizing and applying a set of physical fitness tests in real-life educational conditions;
- d. *The graphical method*, used to visually represent the statistical results and trends observed;
- e. *The questionnaire-based survey method*, in order to gather information on students' lifestyle, daily energy levels, sleep habits, study time, and the subjective impact of physical activity on concentration.

The questionnaire was developed using Google Forms and was administered online via email, ensuring accessibility and anonymity. Responses were automatically recorded and exported for analysis.

The spectrum of questions in our questionnaire included aspects related to:

- o frequency and type of physical activity practiced outside the physical education class,
- o average hours of individual study per day,
- o average hours of sleep per night,
- o perceived daily energy level,
- o and the self-reported impact of physical activity on academic focus and mental clarity.

Results and interpretation

The research involved 60 students (36 female and 24 male) who were assessed through a series of standardized physical fitness tests: push-ups (30 seconds), sit-ups (30 seconds), the Harvard Step Test (cardiorespiratory endurance), and the Sit and Reach test (flexibility). Academic performance was evaluated based on students' self-reported semester GPA. Additionally, data from a lifestyle questionnaire provided insight into habits related to study, sleep, and perceived energy levels.

Table 1 summarizes the average performance of participants across all physical fitness tests and their academic results.

Table 1. Descriptive statistics of the study variables

Variable	Mean	Min	Max	Std. Deviation
Push-ups (30 sec)	17.4	10	26	4.15
Sit-ups (30 sec)	19.4	13	27	3.57
Harvard Step Test (score)	75.3	54	112	13.45
Sit & Reach (cm)	18.7	11	24	3.02
Academic GPA	7.92	5.00	9.80	1.17

Descriptive analysis revealed that the average academic performance was 7.92, with values ranging from 5.00 to 9.80. In terms of physical performance, students averaged 17.4 push-ups, 19.4 sit-ups, 75.3 points on the Harvard Step Test, and 18.7 cm in the Sit and Reach test.

Statistical correlation analysis (Pearson) (table 2 and figure 1) showed the following:

- A very strong positive correlation between flexibility (Sit and Reach) and academic performance ($r = 0.82$)
- A strong positive correlation between cardiorespiratory fitness (Harvard Step Test) and GPA ($r = 0.76$)
- Moderate correlations for sit-ups ($r = 0.37$) and push-ups ($r = 0.20$) in relation to GPA

These results suggest that students with higher general physical fitness, particularly in flexibility and cardiovascular endurance, tend to achieve better academic outcomes.

Table 2. *Correlation matrix*

	Push-ups	Sit-ups	Harvard Test	Sit & Reach	Academic GPA
Push-ups	1.00	0.88	0.39	0.07	0.20
Sit-ups	0.88	1.00	0.51	0.23	0.37
Harvard Step Test	0.39	0.51	1.00	0.70	0.76
Sit & Reach	0.07	0.23	0.70	1.00	0.82
Academic GPA	0.20	0.37	0.76	0.82	1.00

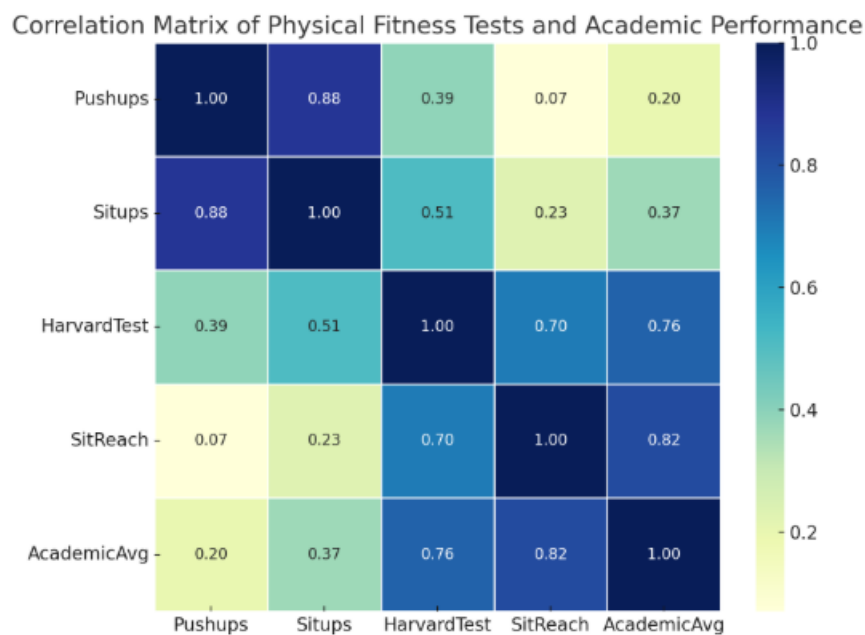


Figure 1. Correlation Matrix.

Conclusions and proposals

The findings of this research support the existence of a significant relationship between physical fitness and academic performance in university students. Among the physical tests administered, flexibility (Sit and Reach) and cardiorespiratory endurance (Harvard Step Test) showed the strongest positive correlations with academic achievement.

While muscular endurance (sit-ups) and upper-body strength (push-ups) also displayed positive relationships with GPA, their correlations were more moderate. These results suggest that physical components related to oxygen intake, circulation, and general mobility may have a closer connection with cognitive functioning and learning outcomes.

Furthermore, data collected through the lifestyle questionnaire revealed that most students maintain average study and sleep habits, and that a majority perceive physical activity as beneficial to their academic focus—supporting the hypothesis indirectly.

Proposals:

1. To promote and integrate regular aerobic and flexibility-based physical activities within the university curriculum, as they appear to be associated with better cognitive performance (Fedewa & Ahn, 2011; Tomporowski et al., 2008).
2. To encourage interdisciplinary research and programs that highlight the benefits of physical activity on academic and mental performance in higher education.
3. To use lifestyle questionnaires and simple field tests as screening tools in student populations, helping identify those who might benefit from increased physical activity.
4. To raise awareness among both students and faculty about the role of physical fitness not only in health, but also in educational success.

Limitations of the study:

- While the results are promising and support the initial hypothesis, certain limitations must be acknowledged. The sample consisted exclusively of students from the University of Bucharest, and the findings may not be generalizable to other academic or cultural contexts. Additionally, the academic performance data was self-reported, which may introduce bias or inaccuracy.
- Another limitation is the cross-sectional design of the study, which captures only a snapshot in time and does not account for possible changes in fitness or academic performance over a longer period. Moreover, while the questionnaire provided useful subjective insights, it relied on self-assessment, which may not always reflect objective behavior or psychological states.
- Future research could address these limitations by incorporating larger and more diverse student samples, verifying academic data institutionally, and applying a longitudinal approach to monitor progress over time.

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