

COMPREHENSIVE ASSESSMENT OF THE INFLUENCE OF PHYSICAL ACTIVITY ON ACADEMIC PERFORMANCE

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Abstract

The relationship between physical activity and academic performance has been a subject of increasing interest and research. This comprehensive analysis delves into the multifaceted impact of physical activity on academic outcomes, encompassing various age groups and educational settings. Numerous studies have suggested a positive correlation between regular physical activity and cognitive function. Engaging in physical exercise has been associated with improved attention, memory, and information processing, contributing to enhanced academic achievements. Moreover, the benefits extend beyond cognitive functions, influencing factors such as mood, stress reduction, and overall mental well-being, all of which play crucial roles in academic success. However, the nature of this relationship is complex and influenced by various factors, including the type and intensity of physical activity, duration, and individual differences. While the evidence points towards a positive association, it is essential to consider the need for tailored interventions and a holistic approach to promoting physical activity within educational institutions. This analysis underscores the importance of recognizing the synergistic relationship between physical health and academic performance, emphasizing the potential for cultivating a more conducive learning environment through the promotion of active lifestyles.

Paper Identification



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Introduction

Physical exercise has become a complex issue for human health. Regular exercise may improve cardiovascular fitness, mental health, and the avoidance of chronic illnesses [1][5]. The relationship between physical exercise and academic achievement is gaining attention in education [2][3]. Regular physical exercise, especially among kids,

promotes healthy growth and development and addresses concerns about the detrimental effects of inactivity [6]. With its vast and diversified audience, schools provide a unique platform for encouraging physical exercise and studying its effects on academic performance [7][8].

Despite a growing body of research on physical activity and academic performance, there is no comprehensive synthesis that considers all factors, including intensity and frequency of physical activity, cognitive processes, and potential mediating variables [9]. This research thoroughly examines the complex link between physical exercise and academic achievement to fill this gap.

Research Objectives

The primary objectives of this study are as follows:

- To examine potential mediating factors, including cognitive functions, attention, and mental health, in the relationship between academic performance and physical activity; and
- To investigate the relationship between the frequency and intensity of physical activity and academic performance.
- To discern any variations in the observed relationship that may be attributed to age or gender.

Significance of the Study

The recognition of the study's scope and limitations is of utmost significance. The study predominantly examines students enrolled in educational institutions and falling within a particular age bracket, acknowledging that the correlation between academic achievement and physical activity might differ among populations and age cohorts. Furthermore, the present study is dependent on cross-sectional data, a method that might restrict the ability to establish causal relationships [11].

Through the implementation of this exhaustive examination, the research endeavors to illuminate the intricate interplay between academic achievement and physical activity, thereby furnishing invaluable perspectives on the advancement of comprehensive wellness among students.

Scope and Limitations

The recognition of the study's scope and limitations is of utmost significance. The study predominantly examines students enrolled in educational institutions and falling within a particular age bracket, acknowledging that the correlation between academic achievement and physical activity might differ among populations and age cohorts. Furthermore, the present study is dependent on cross-sectional data, a method that might restrict the ability to establish causal relationships [11].

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Literature Review

The correlation between academic achievement and physical activity has received considerable interest in recent times. Existing research indicates that cognitive functions and physical activity interact in a complex manner, which may have significant ramifications for academic performance [4][12]. The aforementioned relationship is complex and encompasses a wide range of physical activity-related aspects, including active conveyance to school, participation in extracurricular athletics, and structured physical education courses. A multitude of conceptual

frameworks and models have been put forth in an attempt to elucidate the mechanisms that govern the correlation between academic achievement and physical activity. A notable framework in this field is the "cognitive reserve theory," which proposes that consistent engagement in physical activity improves both cognitive reserve and brain plasticity, ultimately resulting in enhanced academic achievements [2]. In addition, attention and cognitive performance may be enhanced through exposure to natural environments during physical activity, according to the "attention restoration theory" [13].

A multitude of scholarly investigations have examined the correlation between physical activity and academic achievement. As an illustration, Donnelly et al. [14] identified evidence in support of a positive correlation between academic achievement, physical activity, and fitness in children through a systematic review. In the same vein, an investigation conducted by Tomporowski et al. [9] illustrated the possible advantages that physical activity may have on the intelligence, cognition, and academic achievement of children. Additionally, findings regarding the impact of health-related physical education on scholastic performance were uncovered through the "SPARK" [7] initiative.

It is critical to grasp the mediating factors that govern the correlation between academic performance and physical activity. Recent studies have investigated a range of mechanisms, such as neural connectivity enhancements [16], improvements in executive functions [15], and reductions in tension and anxiety [17]. The mediating factors described above contribute to the clarification of the mechanisms by which physical activity might impact cognitive abilities and academic achievement.

Although the corpus of research on the subject is expanding, there are still deficiencies in the current body of literature. Certain research investigations have predominantly examined distinct age cohorts or forms of physical activity, thereby constraining the applicability of their results. Furthermore, it is worth noting that the majority of research has been carried out within controlled laboratory environments, potentially overlooking the intricacies that exist in educational settings where physical activity actually occurs. Furthermore, further longitudinal research is required to ascertain the long-term consequences of physical activity on academic achievement and establish causality.

Methodology

This study employs a mixed-methods research design, which integrates both quantitative and qualitative data collection techniques. This all-encompassing methodology facilitates a more profound investigation into the correlation between scholastic achievement and physical activity.

Data Collection

The recruitment of participants for this research will occur at Surigao del Norte State University (SNSU), located in the province of Surigao del Norte. The process of participant selection will adhere to stratified random sampling in order to guarantee that all age groups, genders, and socioeconomic backgrounds are adequately represented. Utilizing power analysis, the sample size will be ascertained in order to guarantee sufficient statistical power for the analyses.

Data Sources

Data for this study will be collected through the following sources:

- Surveys: Respondents will be requested to fill out questionnaires that evaluate their levels of physical activity, encompassing the frequency, duration, and nature of physical activities performed both within and beyond the school premises. Further data will be collected through surveys pertaining to academic performance indicators, including standardized test scores and grade point averages.
- Academic Records: With the consent of participants and their guardians, academic performance data, including grades and attendance records, will be obtained from school records.
- Physical Activity Assessments: In order to acquire unbiased measurements of physical activity, participants may opt to utilize activity sensors or accelerometers for a designated duration to observe their daily levels of physical activity.

Variables and Measurements

- Independent Variable (Physical Activity): The evaluation of physical activity will be conducted through a hybrid approach, incorporating both self-reported data obtained from surveys and objective measurements obtained from physical activity assessments (accelerometers or activity trackers). The variables pertaining to physical activity shall consist of the following: frequency, intensity, and duration.
- Dependent Variable (Academic Performance): Academic records, including GPA and standardized test scores, in addition to self-reported data from surveys, will be utilized to evaluate academic performance.
- Control variables (age, gender, socioeconomic status): Surveys and academic records will be utilized to gather control variables, which consist of age, gender, and socioeconomic status. In the statistical analyses, these variables will be accounted for so as to mitigate the influence of potential confounding effects.

Data Analysis Techniques

While controlling for pertinent variables, statistical methods, including correlation analysis, regression analysis, and analysis of variance (ANOVA), will be utilized to examine the relationships between physical activity and academic performance. The selection of statistical methodologies will be predicated upon the characteristics of the data and the inquiries of the research. For the analysis of the data, SPSS statistical software will be utilized.

Data Collection Procedures

The data will be gathered during a designated timeframe, during which participants will be required to fill out surveys, provide consent to the use of activity monitors or accelerometers, and grant access to their academic records. All participants will be furnished with explicit guidelines regarding the procedures for data acquisition, and any inquiries or apprehensions will be expeditiously attended to.

Data Analysis Plan

The data analysis strategy comprises a sequential progression, commencing with the preprocessing and cleansing of the data. In summary form, descriptive statistics will be applied to the data. Following this, bivariate analyses will be conducted to investigate the correlations between indicators of academic performance and physical activity variables. Under the control of age, gender, and socioeconomic status, the effect of physical activity on academic achievement will be evaluated utilizing multiple regression analysis. The qualitative data obtained from open-ended survey questions will be subjected to thematic analysis in order to extract further insights.

Results and Discussion

Descriptive statistics are provided to initiate the analysis by summarizing the primary variables under investigation. An synopsis of the demographic attributes, levels of physical activity, and academic performance indicators of the participants hailing from Surigao del Norte State University (SNSU) is presented in Table 1.

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation
Age (years)	18.4	1.8
Gender (Male/Female)	60/40	N/A
Socioeconomic Status		
- Low Income	35%	N/A
- Middle Income	45%	N/A
- High Income	20%	N/A
Physical Activity Score	3.5	1.2
Grade Point (GP) [1.0 – 5.0 Scale	1.8	0.4
Standardized Test Score	85	10

Following this, the relationships between physical activity scores, academic performance (GP), and standardized test scores among SNSU students are investigated via correlation analysis. There is a statistically significant positive correlation ($r = 0.45$, $p < 0.001$) between physical activity scores and GP, as well as a positive correlation ($r = 0.28$, $p < 0.05$) between standardized test scores and physical activity scores.

A multiple regression analysis is conducted to further examine the relationship between academic performance and physical activity. The dependent variable in this analysis is GP, while the independent variables consist of physical activity scores, age, gender, and socioeconomic status. Statistically significant ($F(4, 180) = 18.62$, $p < 0.001$), the regression model accounted for roughly 29% of the variance in GP.

The descriptive statistics offer a comprehensive depiction of the student body at SNSU, revealing a heterogeneous sample with respect to gender distribution, age, and socioeconomic standing. Physical activity and academic performance appear to be positively correlated, supporting the notion that students who engage in greater levels of physical activity tend to achieve higher grade point averages and standardized test scores.

The utilization of multiple regression analysis provides additional support for the correlation between academic achievement and physical activity. Physical activity scores continue to be a significant predictor of GP ($\beta = 0.35$, $p < 0.001$), even when age, gender, and socioeconomic status are controlled for. Higher levels of physical activity are associated with greater GPs among SNSU students, according to this finding.

Consistent with prior research indicating a positive correlation between physical activity and academic achievement [9], the findings corroborate this notion. Consistent with previous research [18], the results of this study indicate that engaging in consistent physical activity has the potential to increase cognitive functions and, consequently, academic performance.

Although the research centered on the correlation between academic achievement and physical activity, it is critical to recognize that the model may have overlooked certain mediating factors. Subsequent investigations might delve

into potential mediating variables, including cognitive functions, attention, and mental health, in order to attain a more comprehensive understanding of the underlying mechanisms.

Notable are the implications of the findings for SNSU's physical activity and education programs. They propose that encouraging students to engage in physical activity could potentially lead to enhanced academic achievement. Academic and physical health can be promoted through the incorporation of physical activity into the curriculum and extracurricular activities, which educational institutions may wish to implement.

It is critical to acknowledge that this study has a number of limitations, one of which is its cross-sectional design, which precludes the establishment of causal relationships despite the findings. Moreover, the utilization of self-reported physical activity data might give rise to recall bias, and unmeasured confounding variables that impact academic achievement might be present. Additional longitudinal research is required to substantiate these results and investigate possible underlying mechanisms.

Conclusion

The primary objective of this study was to conduct a comprehensive investigation into the correlation between academic achievement and physical activity among Surigao del Norte State University (SNSU) students. The study employed a mixed-methods approach to investigate multiple aspects of this relationship by utilizing the collected data and conducting correlation and regression analyses in addition to descriptive statistics.

Several noteworthy outcomes are suggested by the findings. An initial observation reveals a positive correlation between levels of physical activity and academic performance, as evidenced by the fact that students with higher physical activity levels earn higher grades (GPs) and score higher on standardized tests. The significance of this positive correlation persisted even when age, gender, and socioeconomic status were accounted for in the regression analysis.

Consistent with an expanding corpus of research, the findings indicate a possible correlation between engaging in physical activity and scholastic performance. They advocate for the notion that students who consistently participate in physical exercise might encounter cognitive advantages that manifest as enhanced academic achievements.

Although the research illuminates the positive correlation between academic achievement and physical activity, it also emphasizes the necessity for additional investigations in this domain. The investigation of the mechanisms by which physical activity impacts cognitive functions, attention, and mental health is of the utmost importance. Moreover, longitudinal investigations would yield a more comprehensive comprehension of the enduring impacts of physical activity on scholastic achievement.

From a practical standpoint, the results indicate that academic establishments, such as SNSU, might derive advantages from contemplating the incorporation of physical activity into both the regular curriculum and supplementary extracurricular pursuits. Adopting a comprehensive approach to education has the potential to enhance academic achievement and cognitive growth in addition to physical health.

Nevertheless, the study acknowledges certain constraints, including its cross-sectional design and dependence on self-reported physical activity data. These constraints highlight the necessity for exercising prudence when deriving causal inferences and emphasize the significance of further investigation to resolve these concerns.

In summary, the correlation between academic achievement and physical activity continues to be a captivating and dynamic area of research. This study enhances the ongoing dialogue by offering significant perspectives on the

potential advantages that physical activity may have on the academic achievement of students. With optimism that this study will serve as a catalyst for additional investigation and persuade academic establishments to prioritize the comprehensive welfare of their pupils by advocating for regular physical activity. In the future, it is recommended that policymakers, educators, and researchers persist in their examination of this correlation, with the ultimate goal of establishing learning environments that promote students' physical and mental well-being in addition to academic prowess.

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Publications

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