

The Relationship between Physical Activity and Academic Achievement

1. Yibeltal Getnet Abebe

(Correspondence author) Department of Sports Science

University of Gondar, department of sport science, Gondar, Amhara, Ethiopia and Federal University of Minas Gerais, Brazil

2. Genet Bisenebit Getahun

edombisenebit@gmail.com

University of Gondar, department of sport science, Gondar, Amhara, Ethiopia

3. Muluken Derar Tesfaye

University of Gondar, department of sport science, Gondar, Amhara, Ethiopia

4. Getasew Abebaw Ayalew

University of Gondar, department of sport science, Gondar, Amhara, Ethiopia

5. Temesgen Ayalneh Birhan

University of Gondar, department of sport science, Gondar, Amhara, Ethiopia

Abstract

Introduction: This study investigates the relationship between physical activity (PA) and academic achievement among Grade 10 students at Boroda Secondary School, Oromia Regional State, Ethiopia. This study highlights several gaps in the existing literature on physical activity and academic achievement in Ethiopia. There is limited empirical data on how PA affects academic performance, particularly among specific student groups. Cultural factors influencing the undervaluation of physical education are acknowledged but not thoroughly explored. The role of teacher training in physical education is noted as a barrier, but solutions are not fully addressed. Additionally, the socioeconomic benefits of PA, especially within the Ethiopian context, remain underexplored, and the reasons for the unsustainability of past PA interventions are not fully understood.

Methods: This study offers new insights by examining the relationship between physical activity (PA) and academic achievement among Grade 10 students in Ethiopia, a context with limited research on this topic. It finds a strong positive correlation between PA and GPA, suggesting that integrating PA into the school curriculum can enhance academic outcomes. A cross-sectional analytical design was employed to assess the relationship between PA and academic achievement. A total of 144 students participated in the study, completing the WHO Global Physical Activity Questionnaire (GPAQ), which was translated into Afan Oromo and validated for use in Ethiopia (CVI = 0.89, IVI = 0.87). Reliability testing showed strong internal consistency (Cronbach's $\alpha = 0.91$) and excellent test-retest reliability ($r = 0.89, p < 0.01$). Academic performance was measured using Grade Point Averages (GPAs) from school records. Regression analysis was used to adjust for potential confounders, including study time and socio-demographic characteristics.

Results: The study found a strong positive correlation between PA and GPA ($r = 0.934, p < 0.01$). Regression analysis indicated that PA and study time together explained 89.5% of the variance in GPA scores. Both physical activity ($\beta = 0.879, p < 0.01$) and study time ($\beta = 0.145, p < 0.01$) were significant predictors of GPA, while socio-demographic factors such as family income and household size had minimal or no significant impact.

Conclusion: The study reveals that physical activity and study time significantly enhance academic achievement among students, particularly in the Ethiopian context.

Recommendation: Further longitudinal research with larger, diverse samples is needed to establish causality and guide effective educational interventions.

Keywords: Physical activity, Academic achievement, Length of study time

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I. Background of the study

Physical activity (PA) is widely recognized as a critical factor in promoting cognitive function, mental health, and physical well-being. Globally, numerous studies have demonstrated its positive impact on academic

performance, highlighting improvements in memory, attention span, and problem-solving skills, all of which are essential for academic success (1; 2). Despite this wealth of evidence, the integration and practice of physical activity within educational systems remain limited in low-resource settings such as Ethiopia. In the Ethiopian context, the extent to which students engage in physical activity, particularly within schools, is not well-documented. Challenges such as the lack of structured physical education programs, limited access to recreational facilities, and cultural undervaluation of physical education have contributed to a general neglect of physical activity in schools (3).

Globally, physical activity is associated with improved academic outcomes, including better grades, enhanced classroom behavior, and increased cognitive performance (4; 5). In developed countries, robust physical education programs have demonstrated significant success in promoting these benefits (6). However, in Ethiopia, there is limited research on the prevalence of physical activity among students and its relationship to academic achievement. Existing evidence suggests that physical activity levels in Ethiopian schools are generally low, which can be attributed to systemic challenges such as resource constraints and limited teacher training in physical education (7).

Furthermore, while the health benefits of physical activity are well-documented globally, its socioeconomic effects, such as enhanced productivity, reduced healthcare costs, and improved educational outcomes, remain underexplored in the Ethiopian context (8; 9). Previous interventions aimed at promoting physical activity in schools have been scarce and often unsustainable due to inadequate funding, infrastructure, and personnel. Barriers such as the prioritization of academic subjects over extracurricular activities and societal undervaluation of physical education further exacerbate the issue (10).

Given these gaps, this study aims to investigate the relationship between physical activity and academic achievement in Ethiopia, with a specific focus on Grade 10 students at Boroda Secondary School in the Oromia Regional State. By addressing these knowledge gaps, the study seeks to provide evidence-based insights that can inform educational policies, advocate for the inclusion of physical activity in school curricula, and highlight its potential to improve both academic outcomes and overall student well-being.

II. Material and Method

Study Design: This study employed a cross-sectional analytical design to assess the relationship between physical activity (PA) levels and academic achievement among Grade 10 students at Boroda Secondary School, Oromia Regional State, Ethiopia.

Measures: **Physical activity** levels were assessed using the World Health Organization's Global Physical Activity Questionnaire (WHO GPAQ), which was translated into Afan Oromo, the primary local language, to ensure cultural and contextual relevance. The validation process involved forward-translation into Afan Oromo and back-translation into English by independent bilingual experts to maintain accuracy and cultural applicability. The tool's content validity was evaluated using a panel of experts, yielding a Content Validity Index (CVI) of 0.89 and an Item Validity Index (IVI) of 0.87, indicating strong agreement on the relevance of the items. Reliability testing demonstrated excellent internal consistency (Cronbach's $\alpha = 0.91$) and test-retest reliability ($r = 0.89$, $p < 0.01$) in a pilot sample of 30 students. Item-to-total correlations ranged from 0.74 to 0.88, further confirming the reliability of the tool. Convergent validity was established by correlating GPAQ scores with observed physical activity levels during selected school activities ($r = 0.81$, $p < 0.01$), while divergent validity was confirmed through low correlations between GPAQ scores and unrelated constructs. Physical activity levels were categorized using metabolic equivalents (METs) based on WHO guidelines: low activity (<3 METs), moderate activity (3–6 METs), and high activity (>6 METs). These categories accounted for physical activities across three domains: work-related, travel, and recreational activities, along with sedentary behavior.

Academic performance was assessed using Grade Point Averages (GPAs) obtained from official school records, which were verified and categorized based on pass/fail thresholds established by the Ethiopian Ministry of Education.

Data Collection Procedures: Trained data collectors, fluent in both Afan Oromo and Amharic, administered the GPAQ. Surveys were conducted at Boroda Secondary School; each survey took approximately 25–30 minutes. The data collectors received three days of training on ethical considerations and standardized administration procedures.

Data Analysis: Data were entered into SPSS (version 23.0) for analysis. Descriptive statistics summarized participant characteristics and PA levels. Pearson correlation analysis was used to identify relationships between PA, study time, and GPA. Multiple regression analysis was performed to adjust for potential confounders, including gender, household income, and study time. Statistical significance was set at $p < 0.05$.

Data Quality Control: Data quality was ensured through several measures: pre-testing of the questionnaire, training of data collectors, and supervision of the data collection process. The researcher provided overall supervision to maintain the integrity and accuracy of the data collection.

Ethical Considerations: Ethical approval was obtained from the University of Gondar Institutional Review Board. Written informed consent was secured from students and their guardians. Data confidentiality was strictly maintained throughout the study.

III. Result

Demographic characteristics of the study participants

The participants were 144 secondary students who took the 10th grade national examination in 2018/19 at the study area. Among the participants, there were 73 (50.7%) males and 71 (49.3%) females, with a mean age of 16.90 years (SD = 1.006; range = 15–21). The majority of the students were 17 years old.

Physical activity levels of the participants

According to figure 1 the result revealed that the majority of participants (63%) engaged in moderate physical activity, while 22% reported low levels, and 15% engaged in high levels of physical activity. The distribution of physical activity levels showed significant variation across gender, with male students tending to report higher levels of physical activity compared to female students ($p < 0.05$).

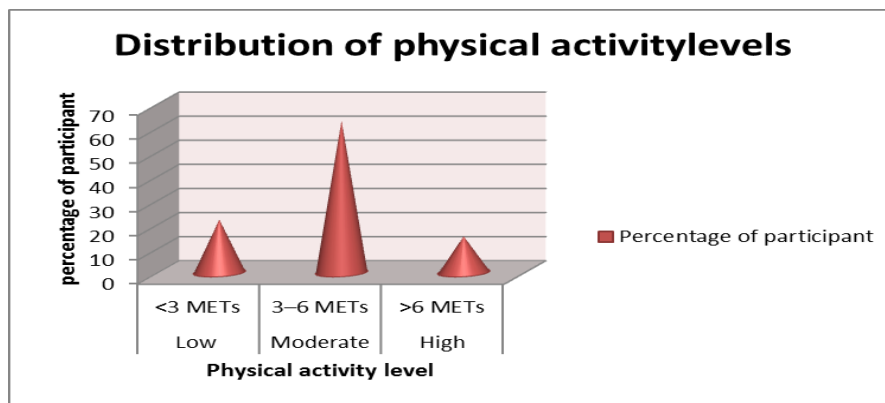


Figure 1: Physical activity levels of the participants

Grade point average by pass fails status

Based on figure 2, the result stated that 31 students (21.53%) passed the exam, with 15 male and 16 female students meeting the required scores. On the other hand, 113 students (78.47%) failed, with 58 male and 55 female students scoring below the passing threshold. The overall average GPA for the participants was 2.1979.

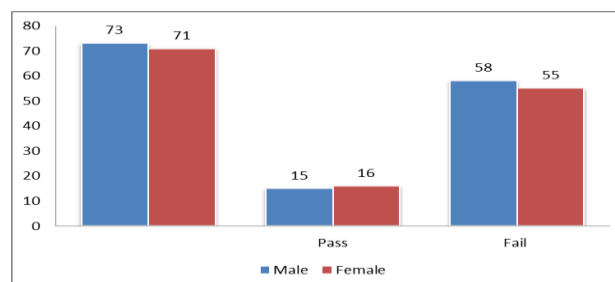


Figure 2: Grade point average by pass fail status

Relationship of GPA, age, family monthly income, household size, physical activity and length of study time

Table 1 Relationship between selected variables using Pearson correlation test

Relationship	r	P-value	Skewness	Kurtosis
GPA and age	.151	0.71	.787 & .448	.164 & 1.347
GPA and family monthly income	.264**	.001	.787 & .831	.164 & 1.283
GPA and household size	-.025	.763	.787 & .847	.164 & 1.022
GPA and physical activity	.934**	.000	.787 & .930	.164 & -.570
GPA and length of study time	.377**	.000	.787 & -.003	.164 & -1.145

**Correlation is significant at the 0.01 level (2-tailed).

Table 1 presents the relationships between Grade Point Average (GPA) and several selected variables, as analyzed using Pearson correlation tests. The variables included in the table are age, family monthly income, household size, physical activity, and length of study time.

The table provides the correlation coefficient (r), p -value, skewness, and kurtosis values for each relationship. Asterisks indicate significant correlations at the 0.01 level (2-tailed). The correlation between GPA and physical activity is highly significant, with a strong positive relationship ($r = 0.934$, $p < 0.01$). A significant positive correlation is also observed between GPA and length of study time ($r = 0.377$, $p < 0.01$), and GPA and family monthly income ($r = 0.264$, $p = 0.001$). On the other hand, the relationships between GPA and age ($r = 0.151$, $p = 0.71$), and GPA and household size ($r = -0.025$, $p = 0.763$) are not statistically significant. Skewness and kurtosis values for all variables are within acceptable ranges for normal distribution.

Table 2 Coefficients on the contribution of socio-demography characteristics and selected variables to grade point average of the participants

Variables	B	SE	Beta	T	P-value
(Constant)	1.064	.324		3.281	.001
Gender of students	.044	.037	.034	1.173	.243
Age of students	.007	.019	.010	.355	.723
Residence of students	.073	.047	.050	1.536	.127
Educational status of Students' father	.009	.038	.007	.225	.822
Educational status of Students' mother	.004	.038	.003	.112	.911
Total monthly income of Students' family	7.466E-6	.000	.039	1.098	.274
Household size	-.024	.018	-.044	-1.378	.171
Total physical activity score	.001	.000	.879	27.135	.000
Length of study time per day	.082	.017	.145	4.874	.000

$R^2=0.895$

F-ratio=126.611(P-value=0.000)

Table 2 presents the coefficients of the regression analysis that examined the contribution of socio-demographic characteristics and selected variables to the Grade Point Average (GPA) of the participants. The table includes the following variables: gender, age, residence, educational status of students' fathers and mothers, total monthly income of students' families, household size, total physical activity score, and length of study time per day.

The analysis indicates the coefficients (B), standard errors (SE), beta values (Beta), t -statistics (T), and p -values for each variable. The regression model explains 89.5% of the variance in GPA, as indicated by the R^2 value of 0.895. The F-ratio is 126.611, with a p -value of 0.000, suggesting that the model as a whole is statistically significant.

Among the variables, total physical activity score and length of study time per day are significantly associated with GPA, with p -values less than 0.01. Other variables, such as gender, age, residence, family educational status, monthly income, and household size, showed no significant contributions to GPA, with p -values greater than 0.05.

IV. Discussion

This study explored the relationship between physical activity (PA) and academic achievement among Grade 10 students at Boroda Secondary School in Ethiopia, revealing key findings that contribute to the understanding of how physical activity influences academic outcomes. A strong positive correlation was found between GPA and physical activity ($r = 0.934$, $p < 0.01$), indicating that students who engage in more physical activity tend to achieve higher academic performance. This supports existing literature, which highlights the cognitive benefits of physical activity, including improved memory, concentration, and problem-solving abilities (4; 1; 11). These findings suggest that integrating physical activity into educational settings may enhance not only physical health but also academic success.

Additionally, the study found a significant positive correlation between GPA and study time ($r = 0.377$, $p < 0.01$), though the impact of study time was weaker than that of physical activity. This reinforces previous research that underscores the importance of dedicated study time for academic performance (12). The results suggest that while study time is important, it may not be as influential as physical activity in improving cognitive function, possibly due to the direct effects of exercise on brain health and mental focus, as shown in other studies (13).

Socio-demographic factors such as family income showed a moderate positive correlation with GPA ($r = 0.264$, $p = 0.001$), highlighting the potential role of socio-economic status in academic outcomes. However, variables like gender, age, and household size had minimal or no significant impact on GPA. These findings suggest that, in this context, socio-economic factors may play a secondary role compared to the more direct

effects of physical activity and study habits. Similar findings have been reported in studies examining the role of socio-economic factors in academic performance (14; 15).

The regression analysis further supported these results, with physical activity and study time together explaining 89.5% of the variance in GPA scores. Physical activity emerged as the most significant predictor of academic performance, with a very high beta value ($\beta = 0.879$, $p < 0.01$), reinforcing the critical role of exercise in enhancing cognitive function and academic success. In contrast, socio-demographic factors had little to no impact, emphasizing the importance of focusing interventions on physical activity and study habits rather than socio-economic factors alone.

Implications for Science, End-Users, and Researchers

For scientists, this study adds to the growing body of evidence that physical activity is a significant predictor of academic performance. It supports the hypothesis that exercise improves cognitive function and should be considered in educational frameworks. For end-users such as educators and policymakers, the study suggests that promoting physical activity within school curricula can be an effective strategy to improve student academic outcomes. Schools should consider integrating regular physical activity sessions and movement-based learning approaches to enhance students' cognitive abilities and performance in academic tasks.

For future researchers, the findings underscore the need for further studies, particularly longitudinal research, to establish causal relationships between physical activity and academic performance. Given the study's cross-sectional nature and small sample size, more extensive research is needed to understand how long-term engagement in physical activity affects academic achievement over time and whether the benefits extend beyond short-term improvements.

Overall, this study provides compelling evidence that physical activity, along with study time, plays a vital role in enhancing academic achievement. The results suggest that educational policies should integrate physical activity into school curricula more effectively. Further research is necessary to deepen understanding and guide the development of evidence-based interventions to optimize both physical health and academic performance.

V. Conclusion

This study provides strong evidence supporting the positive relationship between physical activity and academic achievement among Grade 10 students at Boroda Secondary School in Ethiopia. The findings reveal that students who engage in higher levels of physical activity tend to perform better academically, as reflected in their GPA scores. This supports the growing body of literature on the cognitive benefits of physical exercise, which include improved memory, concentration, and problem-solving abilities. Additionally, while study time also correlates with GPA, its effect is weaker compared to physical activity, suggesting that exercise may directly enhance cognitive function and mental focus.

The study further highlights the minimal influence of socio-demographic factors such as gender, age, and household size on academic performance, with family income showing only a moderate correlation with GPA. Regression analysis confirms that physical activity and study time are the primary predictors of academic success, together explaining 89.5% of the variance in GPA scores. These findings suggest that educational policies and interventions should focus on promoting physical activity and cultivating effective study habits, as these factors have a more significant impact on student outcomes than socio-economic variables alone.

Recommendations

- Schools should adopt movement-based learning and encourage regular physical activity, as it positively impacts academic achievement.
- Educators should emphasize both physical activity and dedicated study time, as study time also positively impacts GPA.
- Interventions for academic improvement should prioritize physical activity and study habits, as they have a greater impact on performance than socio-demographic factors.
- Physical education that is given only for 40 minutes per week is not enough to improve the academic performance of students, so the Minister of Education should make it a policy to have more than four sessions per week and more than one hour per session.
- Further longitudinal research with larger, diverse samples is needed to establish causality and guide effective educational interventions.

Limitation of the study

- Cross-Sectional Design: The study employed a cross-sectional analytical design, which limits the ability to infer causality between physical activity and academic achievement.

➤ **Small Sample Size:** The study was conducted with a relatively small sample of 144 Grade 10 students from a single secondary school, which might limit the generalizability of the findings to other schools or regions.

➤ The study lacks longitudinal data to explore the long-term effects of physical activity on academic achievement.

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Data availability statement: Data are available upon reasonable request.

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