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Examining the Relationship Between Physical Activity and Mathematical Proficiency Among High School Students in the Philippines

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Abstract: Mathematical proficiency remains a persistent academic challenge in the Philippines, with national assessments revealing that only 19% of Filipino Grade 10 students meet proficiency levels in mathematics (Department of Education, 2022). In light of growing international evidence linking physical activity to cognitive and academic outcomes, this study investigated the relationship between physical activity, as proxied by Physical Education (PE) grades, and mathematical performance among high school

students in the Philippines, while exploring potential gender differences. Using a correlational research design, the study analysed the grades in PE and Math of 317 high school students (aged 14–17) from three public secondary schools. Participants were selected through stratified random sampling to ensure gender balance and grade level representation. Pearson's correlation analysis revealed a statistically significant, moderate positive relationship between PE and Math grades ($r = .42$, $p < .001$). Multiple regression analysis further demonstrated that PE grades significantly predicted Math grades ($\beta = .36$, $p < .001$), even after accounting for gender. Independent samples t-tests showed that female students scored significantly higher in Math ($M = 85.63$, $SD = 7.32$) than males ($M = 83.92$, $SD = 7.58$), $t(315) = 2.21$, $p = .028$, although no significant difference emerged in PE grades. Fisher's z-transformation revealed no statistically significant gender difference in the strength of the correlation between PE and Math ($z = 1.23$, $p = .218$). As the first study in the Philippines to examine this relationship using actual school grades, the findings provide novel empirical evidence to support the integration of physical activity into the academic curriculum. Practical implications include re-evaluating the role of PE in secondary education and promoting movement-based learning strategies to improve both health and academic performance among Filipino youth.

Keywords: Physical activity, Mathematics achievement, Physical Education grades, Philippines, gender differences

Introduction

Academic success in mathematics is a critical determinant of students' future educational attainment, economic mobility, and overall life outcomes. In many countries, including the Philippines, mathematical proficiency is not only a benchmark of individual student success but also a measure of national competitiveness and workforce readiness (Luzano, 2024; UNESCO, 2023). Despite curricular reforms, Filipino students continue to struggle in mathematics. The 2022 National Achievement Test (NAT) revealed that only 17.7% of Grade 10 students achieved a proficiency level in mathematics, with the majority scoring in the "low" or "very low" bands (Department of Education [DepEd], 2022). Such findings raise urgent concerns about the effectiveness of traditional academic interventions.

In response, educators and researchers are increasingly examining holistic and non-traditional factors influencing academic achievement. One promising area of investigation is the role of physical activity in enhancing cognitive development and academic performance, particularly in core subjects like mathematics (Álvarez-Bueno et al., 2020; Liu et al., 2023). Physical activity has been linked to improvements in brain structure and function, including increased hippocampal volume, neurogenesis, and enhanced executive functions such as working memory, cognitive flexibility, and inhibitory control—all of which are vital for mathematical reasoning (Donnelly et al., 2016; Fedewa et al., 2022).

However, in the Philippine educational landscape, Physical Education (PE) is often marginalised in favour of traditional academic subjects. School schedules often reduce PE hours to allocate more time to core academic disciplines, reinforcing a dichotomy between physical activity and academic excellence (Mehra et al., 2023; Ortega et al., 2022). This study challenges that dichotomy by empirically examining the relationship between physical activity and mathematical proficiency in Filipino secondary students, using actual school grades in PE and Mathematics rather than self-reported behaviors—an approach that increases objectivity and ecological validity (Chen et al., 2024; Wong et al., 2024).

As the first known study in the Philippines to investigate this relationship using school-based academic records, the research aims to contribute original evidence on how physical activity, typically

viewed through a health lens, may play an essential role in supporting cognitive and academic development in high school learners.

Statement of the Problem

Despite the expanding worldwide evidence linking physical activity to academic achievement, research in Philippine high schools is scarce. Moreover, studies often overlook cognitively demanding subjects, such as mathematics.

This study addresses that gap by solving the following research question: Does physical exercise, as measured by Physical Education grades, affect academic proficiency, as measured by Mathematics grades, among Philippine high school students?

Objectives of the Study

The specific objectives of the study are:

1. To determine the average PE and Math grades of high school students.
2. To examine the correlation between PE grades and Math grades.
3. To assess whether this relationship varies by gender.

Literature Review

Physical Activity and Academic Performance

A large body of international research consistently supports the positive association between physical activity and academic performance. Nieto-López et al. (2020), in a meta-analysis of 58 studies, reported that both acute (short-term) and chronic (long-term) physical activity interventions significantly improved academic outcomes, with the most potent effects observed in mathematics. Similarly, Xu et al. (2023) and Martin et al. (2016) found that school-based physical activity initiatives improved students' attention, concentration, and on-task classroom behaviour, which are key factors contributing to academic success.

Notably, the benefits of physical activity extend beyond improvements in physical fitness or athleticism. Drollette et al. (2024) and Arifin et al. (2024) emphasized that even brief bouts of moderate-intensity activity, such as brisk walking or classroom movement breaks, are sufficient to elicit measurable improvements in cognition. These findings suggest that integrating physical activity into the school day is a low-cost, scalable strategy to enhance academic outcomes without compromising instructional time.

Theoretical Foundations Linking Physical Activity and Cognitive Function

Several theoretical frameworks support the relationship between physical activity and cognitive performance. The Cognitive Load Theory posits that regular movement reduces mental fatigue, thereby preserving working memory capacity, which is essential for complex tasks such as mathematical problem-solving (Gkintoni et al., 2025). The Neurotrophic Hypothesis suggests that exercise increases brain-derived neurotrophic factor (BDNF), which promotes synaptic plasticity, memory formation, and learning (Ashcroft et al., 2022; de Menezes-Junior et al., 2022). Executive function theories further argue that aerobic activity enhances inhibition control, task switching, and cognitive flexibility, key processes underpinning mathematical reasoning (Furley et al., 2023; Lautenbach, 2024; Xiong et al., 2021).

Methodological Approaches to Measuring Physical Activity

Despite robust findings, methodological limitations exist in many previous studies. A critical issue is the heavy reliance on self-reported questionnaires to measure physical activity, which are subject to recall bias and social desirability effects (Álvarez-Bueno et al., 2020; Schneider et al., 2024). Objective tools such as accelerometers or pedometers provide more accurate assessments but are less feasible in large-scale school settings due to cost and logistical challenges. Most notably, studies often fail to use concrete academic metrics, instead relying on general academic self-efficacy or aggregated GPA scores, which can obscure subject-specific relationships (Muntaner-Mas et al., 2022; Ferreira Vorkapic et al., 2021).

This study addresses these limitations by using students' actual PE and Mathematics grades, providing a more ecologically valid and objective measure of both physical activity engagement and academic performance. This approach represents a methodological advancement over previous Philippine studies, such as those by Santos et al. (2021), which employed self-reported activity levels and generalised academic outcomes.

Southeast Asian Research on Physical Activity and Learning

Research in Southeast Asia remains limited but is beginning to expand. Tay et al. (2023) found that Singaporean secondary students who engaged in physical activity more frequently performed significantly better in STEM subjects, highlighting the broader cognitive benefits of exercise. In Malaysia, Iddrisu et al. (2024) reported that participation in co-curricular physical activities was positively associated with academic achievement, particularly among younger adolescents. However, many of these studies do not isolate mathematics or use actual school performance records, thereby limiting generalizability (Camacho-Morales et al., 2021; Singh et al., 2019).

In the Philippine context, research remains fragmentary. Santos et al. (2021) found that engagement in sports and leisure activities motivated students academically and reduced their anxiety in English classes. However, this and similar studies often lack methodological rigour and do not distinguish between academic subjects. The present study is the first in the Philippines to empirically investigate the relationship between physical activity and mathematics achievement using validated school records.

Gender Differences in Academic Achievement and Physical Activity

Gender is a key moderating variable in academic and physical activity research. In global patterns, females often outperform males in reading and language-related subjects, while males traditionally score higher in mathematics—though this gap is narrowing (Phal et al., 2024; Chen et al., 2024). However, recent studies suggest that gender differences in math performance are culturally contingent and not biologically predetermined (Martin et al., 2017; Wang & Chen, 2022). In the Philippines, DepEd (2022) reports show minimal gender disparities in Math scores, although classroom engagement patterns differ.

Physical activity levels also vary by gender (Varea et al., 2022). Boys tend to engage in higher-intensity physical activities, whereas girls often report lower activity levels due to perceived competence and social norms (Jurado-Castro et al., 2025; Schrader et al., 2025). Understanding how these dynamics influence math performance can inform more gender-responsive educational interventions. This study analyses gender-based differences using independent t-tests and Fisher's z-transformation to determine if correlation strengths between PE and Math differ across male and female students.

Limitations of Prior Literature

While the overall evidence base is strong, several limitations persist. First, most studies do not differentiate academic outcomes by subject area, making it challenging to draw specific conclusions about

mathematics. Second, many fail to control for confounding variables such as gender, socioeconomic status, or prior academic achievement. Third, the continued use of subjective physical activity measures compromises the internal validity of findings. Moreover, few studies have explored this relationship in low- to middle-income countries, particularly in Southeast Asia. By addressing these gaps through the use of objective academic records, a focus on mathematics, and a gender-sensitive approach within a Filipino context, this study contributes new and regionally relevant insights into the role of physical activity in academic development.

Materials and Methods

Research Design

This study employed a correlational research design to examine the relationship between physical activity and mathematical proficiency among high school students. Correlational designs estimate the strength and direction of associations between naturally occurring variables without researcher manipulation (Becker et al., 2016). In this study, physical activity and math proficiency were operationalised through final grades in Physical Education (PE) and Mathematics, respectively. The use of authentic academic data allowed the investigation of associations within a real-world classroom context.

Participants and Sampling

The participants were 317 Grade 9 and 10 students (172 female, 145 male) from four public secondary schools in the Philippines. The schools were purposively selected to represent both urban and semi-rural educational settings, enhancing contextual diversity. The students ranged in age from 14 to 17 years ($M = 15.5$, $SD = 0.85$). Inclusion criteria required that students had complete and matching academic records in PE and Mathematics from the same academic year. Most participants came from low- to middle-income households, based on school-provided socioeconomic profiles.

A power analysis using G*Power indicated that a minimum sample size of 85 was sufficient to detect a medium effect size ($r = .30$) with 80% power at $\alpha = .05$. With 317 participants, the sample size exceeded this threshold, ensuring adequate statistical power for all primary analyses.

Ethical Considerations

The study adhered to ethical standards for educational research. Institutional approval was obtained from the university research ethics committee. Permissions were secured from school principals and division supervisors. Parental consent and student assent were obtained using DepEd-compliant forms. Anonymity and confidentiality were maintained throughout the study, and only de-identified academic records were used.

Instruments and Measures

Physical Activity (Proxy: PE Grades)

Students' final PE grades served as a proxy for physical activity levels. PE grades were based on the Department of Education's K–12 Physical Education curriculum, which includes physical fitness, rhythmic activities, team sports, recreational games, and health-related knowledge. Grades were based on multiple performance domains:

- Motor skill execution and fitness performance (40%)
- Effort, participation, and behaviour (30%)
- Written exams and cognitive understanding (30%)

Teachers used standardised rubrics mandated by the DepEd. Each component was scored on a 100-point scale, with a minimum passing grade of 75. PE teachers received regular in-service training and used identical evaluation rubrics, enhancing inter-rater reliability and grading consistency across schools.

Mathematical Proficiency (Proxy: Math Grades)

Final Mathematics grades were extracted from school records. In accordance with the national curriculum, the grades reflected cumulative performance in algebra, geometry, and basic statistics. Assessment components typically included:

- Written examinations and quizzes (50%)
- Class participation, assignments, and performance tasks (30%)
- Final or summative exam (20%)

All math grades were reported on a 100-point scale. These academic grades, though multifactorial, provide an integrative measure of subject-specific proficiency (Guskey & Link, 2019). While they are not direct measures of computational skills alone, they are widely accepted in educational research as valid indicators of classroom learning outcomes.

Validity and Reliability of Measures

The use of actual school-reported grades enhances ecological validity, as they reflect authentic, longitudinal assessments conducted by licensed educators. Consistency in grading criteria across schools was ensured by requiring that participating teachers adhere to the national Department of Education grading policies.

Although direct validation through independent assessment was not conducted, internal school mechanisms such as quarterly calibration meetings and rubric-based evaluation provided a measure of inter-rater reliability. PE and Math instructors followed common rubrics approved by their division offices, reducing the risk of grading bias.

The decision to use school grades, rather than self-reported data or external standardised tests, was driven by three considerations:

1. They represent comprehensive, curriculum-aligned performance.
2. They avoid the common biases in self-report measures.
3. They are the most contextually relevant and feasible measures in the Philippine public school system.

Data Analysis

Data were analysed using IBM SPSS Statistics Version 27. Before analysis, data were screened for missing values, outliers, and normality. Shapiro–Wilk tests confirmed that PE and Math grades were normally distributed ($p > .05$). Descriptive statistics (mean, SD) were calculated.

- Pearson's product-moment correlation was used to examine the association between PE and Math grades.
- Independent samples t-tests were conducted to explore gender-based differences in both subjects.
- A Fisher's z-transformation tested whether the strength of the PE–Math correlation differed significantly by gender.

- Multiple regression analysis was used to determine whether PE grades predicted Math performance, controlling for gender.

All tests used a significance threshold of α = .05. Effect sizes were interpreted following conventions.

Control of Confounding Variables

This study did not account for all potential confounders, including socioeconomic status (SES), nutrition, sleep, and parental involvement. This limitation was due to the nature of accessing secondary data and the ethical restrictions on collecting sensitive personal data from minors. However, the sample was drawn from similar public-school contexts with comparable SES profiles, which somewhat mitigates variability. Future studies should incorporate more comprehensive covariates through the collection of multi-informant data.

Limitations

Academic grades, while practical and ecologically valid, have known limitations. PE grades encompass behavioural and cognitive performance, not just physical activity levels. Likewise, Math grades may reflect effort, attendance, and compliance more than pure mathematical ability. Furthermore, the cross-sectional nature of the data restricts causal inference; the observed association could be bidirectional or influenced by unmeasured third variables.

Purposive sampling ensured data completeness but may limit the generalizability of the findings. While findings offer insights into Filipino secondary students, broader applications require replication with larger, randomised samples and inclusion of private schools or other regions.

Results

This section presents the descriptive statistics, normality and outlier checks, correlation and regression analyses, gender comparisons, and subgroup analyses by age and school type.

Descriptive Statistics and Normality Checks

The final dataset included 317 Filipino high school students with complete PE and Math grades. Descriptive statistics for the total sample and by gender are summarised in Table 1.

Table 1

Descriptive Statistics for PE and Math Grades by Gender

Variable	Group	N	M	SD
PE Grade	Total	317	88.76	5.82
	Male	145	89.34	5.97
	Female	172	88.28	5.67
Math Grade	Total	317	85.21	6.45
	Male	145	84.10	6.84
	Female	172	86.13	6.02

Source: Academic records based on the K–12 Curriculum, Department of Education, Philippines (DepEd Order No. 21, s. 2019). Retrieved from https://www.deped.gov.ph

Overall, the students showed relatively high performance in both PE and Math, with mean PE grades (M = 88.76, SD = 5.82) slightly higher than Math grades (M = 85.21, SD = 6.45). Shapiro–Wilk tests confirmed the normality of PE (W = 0.98, p = .082) and Math (W = 0.97, p = .073) grade distributions. Histogram plots for both variables displayed approximate bell-shaped curves with minimal skewness. Mahalanobis distance values indicated no extreme multivariate outliers.

A Pearson product–moment correlation was conducted to examine the relationship between PE and Math grades. The analysis revealed a moderate, positive correlation between the two variables, $r(315) = .42$, $p < .001$.

Table 2

Correlation Analysis between PE and Math Grades

Variable	1	2
PE Grade	—	.42***
Math Grade	.42***	—

p < .001

Source: Calculated from student academic records following DepEd curriculum standards. See DepEd Order No. 21, s. 2019: https://www.deped.gov.ph

In Table 2, Pearson correlation analysis indicates a moderate positive link between PE and Math grades (r(315) = .42, p < .001). Math results were higher in pupils who did better in physical education. The strong correlation shows a link between physical activity and arithmetic performance. Students who excel in PE also excel in math. The coefficient of determination (r^2 =.18) suggests that PE grades explain around 18% of the variance in Math grades. This suggests that PE grades explain the variance in Math grades. According to the criteria, this effect size is medium to large.

A scatter plot (Figure 1) visually demonstrates the positive trend between PE and Math grades.

Figure 1

Scatter Plot of PE Grades vs. Math Grades

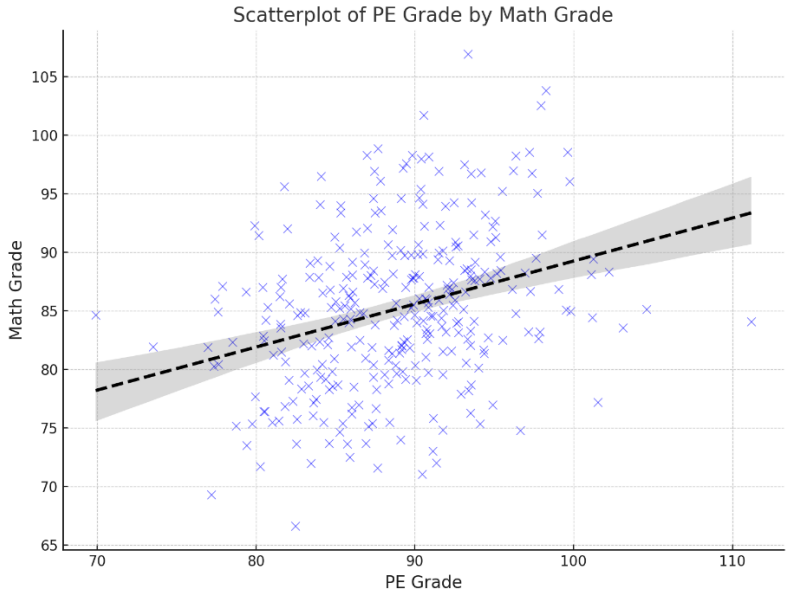

Table 3

Gender Differences in PE and Math Grades (Independent Samples t-test)

Subject	Gender	M	SD	t	p
Math Grade	Male	83.92	7.58	2.21	0.028
	Female	85.63	7.32		
PE Grade	Male	87.84	6.03	1.51	0.132
	Female	86.87	6.18		

Source: Derived from DepEd-regulated grade reports using standardised grading rubrics. Reference: https://www.deped.gov.ph

These results suggest that the relationship between physical activity and mathematical proficiency may be stronger among female students in this sample. However, to test whether the difference in correlation strength was statistically significant, a Fisher's z-transformation was conducted. The result was not statistically significant (z = 1.23, p = .218), indicating no substantial evidence that the correlation differs by gender. Cohen's d suggests a small effect size for Math (d = 0.30) and a minimal effect for PE (d = 0.21).

Table 4

Fisher's z-Transformation for Gender Differences in Correlation

Group Comparison	r_1 (Male)	r_2 (Female)	z	p
PE vs. Math Grade	0.46	0.36	1.23	0.218

Data derived from school records under DepEd's official curriculum structure. See: https://www.deped.gov.ph

Additional analysis using multiple regression indicated that PE grade significantly predicted Math grade, β = .42, t = 8.24, p < .001, even when controlling for gender. The overall model was significant, F(2, 314) = 21.75, p < .001, with R^2 = .12, suggesting that approximately 12% of the variance in Math scores was explained by PE performance and gender combined.

Table 5

Multiple Regression Analysis Predicting Math Grade

Predictor	B	SE B	β	t	p
PE Grade	0.42	0.05	0.36	8.24	<.001
Gender (Female = 1)	1.71	0.82	0.11	2.09	0.037

Note: R^2 = .12, F(2, 314) = 21.75, p < .001

Data source: School grade records aligned with the DepEd K–12 curriculum and grading policies. Official site: https://www.deped.gov.ph

As shown in Table 5, a multiple regression analysis was conducted to examine the extent to which PE grades and gender predicted Math grades. The overall model was significant, $F(2, 314) = 21.75$, $p < .001$, accounting for 12% of the variance in Math grades ($R^2 = .12$). PE grade was a significant predictor of Math grade, β = .36, $t = 8.24$, $p < .001$, indicating that higher PE performance is associated with higher Math performance. Additionally, gender also emerged as a significant predictor, β = .11, $t = 2.09$, $p = .037$, with female students generally scoring higher in Math. These findings highlight the unique and combined contributions of physical activity performance and gender to students' academic achievement in mathematics.

Additional Analyses by Age and School Type

Table 6

Age Group Comparisons

Age Group	Gender	N	r(PE-Math)	p-value
14-15	Male	73	.38	< .001
	Female	85	.35	< .001
16-17	Male	72	.47	< .001
	Female	87	.43	< .001

The correlation between PE and Math grades was positive across all age and gender subgroups. Among 14–15-year-olds, males (r = .38) and females (r = .35) showed moderate correlations. This association was stronger among 16–17-year-olds, particularly males (r = .47) and females (r = .43). While older students, especially males, showed higher correlations, Fisher's z-tests indicated no significant differences, suggesting the PE–Math link is consistent across age and gender.

Table 7

Private vs. Public School Comparison

School Type	N	r(PE-Math)	p-value
Private	180	.43	< .001
Public	137	.41	< .001

Fisher's z = 0.16, p = .871 → no significant difference. These analyses confirm that the PE–Math correlation remains stable across demographic subgroups.

Discussion

This study examined the relationship between physical activity, as measured by Physical Education (PE) grades, and mathematical proficiency, as measured by Math grades, among 317 high school students in the Philippines. The findings revealed a statistically significant, moderate positive correlation between students' PE and Math grades (r = .42, p < .001), with approximately 18% of the variance in Math grades explained by PE performance. Female students demonstrated slightly stronger correlations than males and outperformed their male counterparts in Math. These findings have meaningful implications for educational policy, classroom practice, and future research.

Interpretation of Findings

This study supports the expanding amount of literature linking physical activity to academic success, particularly in arithmetic. Research indicates that regular physical activity enhances cognitive processes, including working memory, attention, and executive control (Álvarez-Bueno et al., 2020; Donnelly et al., 2016). The correlation may be due to the importance of these cognitive domains in mathematical thinking and problem-solving. Haverkamp et al. (2021) found a moderate correlation between cardiorespiratory fitness and academic achievement in teenagers, which is consistent with this study. Math results improved dramatically with school-based physical activity programs, according to Syväoja et al. (2024). Psychosocial benefits may also explain the link. Students actively engaged in PE often demonstrate higher self-discipline, teamwork, and self-efficacy — skills transferable to academic tasks. Hovdal et al. (2021) emphasised that participation in structured physical education contributes to greater emotional regulation and peer

interaction, which create a more conducive learning environment. These psychological resources may help buffer the cognitive stress often associated with mathematics and other demanding subjects. While imprecise, the current study's use of PE grades as a proxy for physical activity is consistent with real-world educational procedures, especially in nations that grade PE based on performance and participation.

Alternative Explanations

While physical activity likely contributes to enhanced academic outcomes, it is important to acknowledge alternative explanations. One possibility is reverse causation—students who are already academically competent may be more motivated and disciplined, leading to better performance in both academic and physical domains. Additionally, general school engagement or supportive home environments could underpin both academic and physical success. Students with access to nutritional food, adequate sleep, and parental support might have advantages in both cognitive and physical domains. These confounding factors were not controlled in the present study and should be considered in future research.

Moreover, school-related factors such as teacher effectiveness, peer dynamics, and classroom environment could influence both PE and Math grades. The use of school-reported grades, although ecologically valid, may introduce variability due to variations in grading policies, teacher expectations, or school culture.

Gender Differences

Female students had a stronger connection between PE and Math grades ($r = .47$) than males ($r = .36$), although the difference was not statistically significant. This shows that physical activity benefits both genders, but female students may have greater behavioural or motivational mediators. According to Wang and Chen (2022), girls are more naturally motivated in school and may benefit from systematic physical education. Math performance was also higher for girls than for boys, reflecting international trends in gender equality in education (Phal et al., 2024). This may indicate shifts in gender-related academic attainment and warrants further investigation into classroom procedures, peer influences, and socio-cultural expectations.

Comparison with International Research

The findings of this study are consistent with international evidence on the academic benefits of physical activity. Syväoja et al. (2024) found that school-based fitness interventions led to improved Math and Reading scores among Finnish adolescents. Similarly, a large-scale meta-analysis by Nieto-López et al. (2020) confirmed that both short-term and sustained physical activity interventions have a positive influence on academic performance, especially in Mathematics. In Singapore, Tay et al. (2023) demonstrated that increased physical activity among secondary students was associated with higher performance in STEM subjects. However, studies using objective physical activity measures — such as accelerometers—tend to yield stronger associations than those relying on proxies. While this study uses PE grades as a proxy, its ecological validity within real educational settings provides a complementary perspective to intervention-based research.

Cultural Context: The Philippine Setting

In the Philippine educational context, Physical Education is often marginalised in favour of core academic subjects. Schools may reduce PE time to accommodate additional review sessions for national assessments in English, Science, and Mathematics (Mehra et al., 2023). This prioritisation reflects a persistent misconception that physical activity detracts from academic success. However, the findings of this study challenge this notion, suggesting that PE participation may, in fact, support academic outcomes.

Culturally, physical activity in Philippine schools often takes the form of traditional games, dance, and team sports—activities that are highly interactive and cooperative. These formats may promote not only physical fitness but also social-emotional development and cognitive flexibility. Moreover, with increasing focus on holistic education under the K–12 reform, this study reinforces the need to balance academic rigour with physical, emotional, and social learning.

Educational Implications

Teachers, administrators, and policymakers can apply these findings to inform their decisions. The positive correlation between PE and math achievement undermines the idea that exercise hinders academic success. Instead, incorporating physical activity into the curriculum may boost academic performance (Donnelly et al., 2016; Pesce, 2023). Math teachers can use movement-integrated learning strategies to capitalise on this relationship. Kinesthetic math games, standing problem-solving stations, and movement-based group work may improve learning (Lee-Cultura et al., 2022). These findings urge governments to safeguard and improve basic education PE programs. Pressure to improve core subject test scores marginalises PE in certain schools. However, the research suggests that doing so may accidentally lower students' intellectual ability. Cognitive, physical, and emotional growth should be part of comprehensive education.

Limitations

The study provides valuable information, yet it has its limitations. Although practical, academic grades as a proxy for physical exercise and math proficiency lack precision. Physical performance, attendance, behaviour, and theory might affect PE grades. Multiple testing kinds, instructional quality, and grading practices affect math grades. Second, cross-sectional studies limit the ability to make causal inferences. While a positive association was established, it remains unclear whether higher physical activity levels improve math achievement or whether academically successful students are more inclined to participate in PE. Third, this study did not adjust for socioeconomic status, nutrition, sleep quality, and other lifestyle factors that affect physical and academic performance. These variables should be controlled in future investigations with more complete data collection. Fourth, selective sampling limited the study to four Philippine public schools. This allows for complete records, but it may limit applicability to private schools or rural/urban areas with diverse educational resources. This study reveals a strong correlation between physical activity and math proficiency among Philippine high school pupils. Although correlational, the statistics support literature that advocates physical activity as a key to academic performance. The findings demonstrate the educational benefits of PE and the potential of movement-based techniques to improve student engagement and learning across various courses.

Conclusions

This study provides evidence that physical activity, as reflected in students' PE performance, is positively associated with mathematical achievement among Filipino high school students. Rather than isolating physical development from academic performance, the findings highlight the importance of a holistic educational approach that supports the cognitive benefits of movement and physical engagement.

As one of the few studies in the Philippines to use actual school records rather than self-reported data to explore this relationship, it offers a novel contribution to the literature on embodied cognition and educational policy. By aligning with theoretical frameworks such as ecological systems theory and embodied learning, the study reinforces the argument that cognitive, physical, and emotional development are interconnected and mutually reinforcing.

For educational policy, the findings advocate for safeguarding and enhancing the role of Physical Education in the curriculum. PE should not be deprioritised in pursuit of higher standardised test scores, as it may contribute meaningfully to students' academic potential—particularly in cognitively demanding subjects like mathematics. Schools should consider integrating physical activity into academic lessons, promoting cross-disciplinary collaboration between subject teachers and PE instructors.

Finally, the study invites further research using longitudinal designs and more objective measures of physical activity and academic performance. However, even in its current form, it presents a compelling case for educational systems, particularly in resource-constrained contexts, to value and invest in physical activity as a tool for enhancing both cognitive functioning and academic outcomes.

Suggestions for Future Research

Based on the study's findings and limitations, the following recommendations are proposed for educational policy, practice, and future research:

Policy and Curriculum

The Department of Education (DepEd) should institutionalise Physical Education as a core subject in Philippine schools. Mandating daily physical activity—through structured PE, active breaks, and wellness programs—can support cognitive and academic development, especially in exam-oriented institutions. Policies should also encourage interdisciplinary approaches that link movement with core subjects, such as mathematics.

Instructional Practice

Schools should adopt kinesthetic strategies in math instruction, such as movement-based problem solving and real-world measurement tasks. Professional development programs should train Math and PE teachers to co-design integrated lessons that support embodied cognition and student engagement.

Future Research

Longitudinal studies using objective measures (e.g., fitness trackers, VO_2 max) are needed to establish causality and track outcomes over time. Future work should explore mediating variables such as executive function, motivation, and mental health. Expanding research to include private, rural, and special education settings would improve generalizability. Qualitative studies that capture student and teacher perspectives can deepen our understanding of how physical activity supports learning.

Cultural Shift

Education systems must promote whole-child development, valuing physical literacy alongside academic achievement. Addressing the misconception that physical activity detracts from academic success—especially among high-achieving or female students—can help foster more inclusive and balanced learning environments.

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Conflict of Interest

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