AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.14 (2), January-April, 2025 https://ajemates.org

PLACE OF MATHETICS IN PROMOTING PHYSICAL ACTIVITIES AMONG JUNIOR SECONDARY SCHOOLS IN ABAKALIKI EDUCATION ZONE

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ABSTRACT

This study focuses on place of Mathematics in promoting physical activities among junior secondary schools in Abakaliki education zone. Two research questions corresponding to two null hypotheses guided the study. The population of the study comprised all the 339 physical education Teachers in the Junior Public Secondary Schools in Abakaliki Education Zone of Ebonyi State. The entire sample of 339 Physical Education Teachers in Junior Public Secondary Schools was used. The researcher developed a structured questionnaire titled, place of Mathematics in promoting physical activities among junior secondary schools (PMPPAJSSQ)' which was used as instrument for data collection. The instrument was validated by three experts while the reliability coefficient yielded 0.84 using Cronbach Alpha Method. Data collected were analyzed using mean (x) and standard deviation to answer the research questions and t-test statistics to test the hypothesis at 0.05 level of significance. The study revealed that: mathematical concept and mathematical skills play vital roles in promoting physical activities among junior secondary schools in Abakaliki education zone. Based on the findings, the study recommended that Schools should develop interdisciplinary curricula that combine physical education and mathematics, allowing students to apply mathematical concepts in real-life physical scenarios. For instance, using statistics to track performance improvements, or geometry to understand the optimum space required for sports activities and that Schools should create interactive learning environments where students can engage in physical activities while simultaneously learning mathematical skills. This could include gamification elements that utilize scoring systems based on students' mathematical calculations applied in physical challenges.

Keywords: Mathematics, promotion, physical activities, junior secondary schools, evaluation

Introduction

Mathematics plays a crucial and often underestimated role in promoting physical activities, particularly among junior secondary school students. Mathematics is often regarded as an abstract discipline confined to the classroom, but its practical applications extend far beyond numerical calculations (Harlow, Martinez & Chen, 2022). Among junior secondary school students, mathematical skills play a crucial role in promoting physical activities. The

integrating mathematical concepts into physical education, educators can enhance students' understanding of health, fitness, and sports performance, ultimately fostering a more active lifestyle. The integration of mathematical concepts into physical education can enhance students' understanding of physical fitness, aid in monitoring their progress, and inspire them to engage more actively in various forms of exercise. This study explores how mathematics can be effectively utilized to promote physical activities among this demographic, drawing on current research and examples. One of the primary ways mathematics can promote physical activity is through mathematical concept (Johnson & Smith, 2023). Understanding key performance indicators such as distance, speed, time, and heart rate involves mathematical calculations. For example, when students track their running times or calculate their average speed, they engage with mathematical concepts such as averages, ratios, and unit conversions. According to Bartholomew & Jowers (2021), integrating math into physical activity helps students recognize the relationship between physical effort and outcomes, making the activities more engaging and meaningful.

Mathematics a theoretical subject, confined to calculations and abstract concepts. However, its practical applications can significantly enhance various aspects of life, including physical activities among junior secondary school students. Integrating mathematical concepts into physical activities, educators can foster an environment that promotes not only physical fitness but also critical thinking and collaborative skills (Harlow, Martinez, & Chen, 2022). One-way mathematical concepts play a crucial role in promoting physical activities is through the measurement and analysis of performance. For instance, students can use statistics to track their progress in physical education classes. They can apply basic arithmetic to calculate their average number of laps run during their heart rates before and after exercise to analyze their data can motivate students to set specific fitness goals, encouraging a competitive spirit and a desire for improvement, such as geometry come into play during various sports and physical activities (Thompson, 2018). Understanding angles, distances, and trajectories help students enhance their skills in games like basketball, soccer, and athletics. For example, knowing the optimal angle for shooting a basketball can their shooting technique, making the game more enjoyable and promoting regular participation.

Another significant aspect of mathematics in physical activities is the application of ratios and proportions. When organizing team sports or group activities, students can learn to calculate player ratios, understand team dynamics, and appreciate the importance of balance in team composition (Johnson & Smith, 2023). This experience imparts teamwork and leadership skills, vital for success both in sports and in life beyond school. Moreover, physical activities allows

students to develop a greater appreciation for the importance of health and fitness (Harlow, Martinez, & Chen, 2022). Mathematics can help students understand the relationship between physical activity and their overall health. Educators can introduce concepts such as Body Mass Index (BMI) and caloric expenditure, encouraging students to take an active health.

The intersection of mathematics and physical activity may not be immediately apparent, yet mathematical skills play a pivotal role in promoting and enhancing physical activities among junior secondary school students. Through the application of mathematical principles, students gain valuable insights and skills that contribute to their overall engagement in physical activities, fostering both academic and personal growth (Smith, & Tran, 2024). One fundamental area where mathematical skills enhance physical activities is through the analysis of metrics related to fitness and performance. Students can leverage their knowledge of basic arithmetic and data interpretation to track their exercise routines and outcomes. For example, they might create charts to log their daily running distances or times, allowing them to visualize their progress over time. This practice not only instills a sense of achievement but also encourages goal-setting and perseverance, crucial traits in any endeavour.

Additionally, mathematical skills are essential in understanding concepts such as speed, distance, and time. Students can calculate their average speed during running or swimming by applying simple formulas, which can spark interest and excitement in their physical pursuits. This quantitative approach transforms physical activities into measurable challenges, encouraging students to push their limits and strive for improvement. Furthermore, engaging in these calculations can bolster their confidence in handling math, bridging the gap between theoretical knowledge and practical application. For instance, in soccer, knowledge of angles can assist players in making accurate passes or shots on goal. Knowledge of spatial awareness and positioning can significantly impact their performance on the field, underscoring the practical importance of mathematical skills in sports.

Moreover, working with ratios and proportions is vital for students involved in team sports. They can calculate player ratios to devise effective strategies in team competitions (Chinapaw, 2020). By analyzing these ratios, students learn the importance of fairness, teamwork, and collaboration skills that are invaluable both in sports and in everyday interactions.

Moreover, the use of technology, such as fitness trackers, relies heavily on mathematical algorithms to provide data about physical activity levels. Students can learn to interpret this data, analyze patterns in their activity levels, and set achievable goals based on mathematical analysis. As noted by Chen and Bowers (2023), involving students

in this analytical process not only enhances their mathematical skills but also fosters a sense of ownership over their health and fitness. Setting goals is a fundamental aspect of physical fitness, and mathematics can play a pivotal role in helping students develop effective, measurable goals. For instance, when students are encouraged to set targets for the number of steps taken or calories burned, they must utilize arithmetic to quantify these goals. By employing concepts from algebra and statistics, students can assess their current fitness levels and project their future progress.

Research conducted by Laurson & Coleman (2022) indicates that students who engage in goal setting using quantifiable metrics are more likely to achieve their physical activity objectives. For example, if a student aims to increase their running distance from one mile to two miles within a month, they can use mathematical reasoning to create a weekly plan that gradually increases their distance. This systematic approach helps students develop critical thinking skills while simultaneously enhancing their physical endurance. Analyzing participation rates in various physical activities is another area where mathematics can contribute significantly. Schools can collect data on student participation in sports and physical education classes, then use statistical methods to evaluate trends and draw conclusions. For example, teachers can track how changes in curriculum or the introduction of new activities influence student participation.

Using data visualization tools, such as graphs and charts, can also make the information more accessible to students. Visual representations of data can spur discussions about participation trends and motivate students to increase their involvement in physical activities. According to a study by Tella, (2018) students exposed to data analysis techniques reported a higher interest in participating in physical activities when they saw their peers' engagement reflected in the data.

Mathematics can also foster a spirit of healthy competition among students. Schools can organize physical activity challenges where students compete in teams to achieve specific goals, such as accumulating the most minutes of activity or achieving the highest average score in fitness tests. Points systems that rely on mathematical calculations encourage students to calculate their team's progress and strategize on how to improve performance. A study by Smith et al. (2020) found that incorporating competitive elements, backed by quantitative feedback, significantly increased students' motivation to participate in physical activities. The excitement of competing and the clear metrics provided by mathematics can transform physical education into an enjoyable and engaging experience. Physical activity is crucial for overall human health and well-being, yet many disabled pupils face barriers that prevent them from participating in traditional physical education programs.

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Statement of the Problem

The failure to connect mathematics with physical education holistic education. This disengagement affects students' overall learning experiences and their appreciation of interconnected subjects. The curriculum that integrates mathematics and physical activities encourages critical thinking and problem-solving skills, essential for classroom. Long-term Health ramifications of insufficient emphasis on mathematics in promoting physical activity can extend into adulthood. With lower activity levels during health issues later in life, students who do not develop a mathematical understanding of their physical processes may struggle to maintain healthy lifestyles as they age. The lack of emphasis on mathematics in promoting physical activities among junior secondary school students presents significant disadvantages, including reduced engagement, inadequate preparation for future health initiatives, and long-term health implications. Based on these, the study sort to ascertain the role of Mathematics in promoting physical activities among junior secondary schools in Abakaliki education zone.

Purpose of the Study

The main purpose of the study is to assess the place of Mathematics in promoting physical activities among junior secondary schools in Abakaliki education zone. Specifically, the study sought to:

1. Ascertain the role of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone
2. Determine the role of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone

Research Questions

The following research questions guided the study.

1. What are the roles of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone?
2. What are the roles of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone?

Hypotheses

The below null hypotheses were tested at 0.05 level of significance to further guide the study.

H_{o1}: There is no significant difference in the mean ratings of male and female teachers on the roles of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone

H_{o2}: There is no significant difference in the mean ratings of male and female teachers on roles of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone.

Methodology

A descriptive survey research design was adopted for the study. Descriptive survey

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design consist of studies in which data are collected from a small sample of a large population to enable the researcher describe in a systematic manner and interpret the characteristic features and facts about things that exist. A survey is a descriptive study when it seeks to document and describe what exists or the present status of existence or absence of what is being investigated. The study was carried out in Ebonyi State. The population of the study comprised all the 339 physical education Teachers in the Junior Public Secondary Schools in Abakaliki Education Zone of Ebonyi State. The entire sample of 339 Physical Education Teachers in Junior Public Secondary Schools was used. The instrument for data collection was a structured questionnaire designed by the researcher, titled 'Place of Mathematics in promoting physical activities among junior secondary schools (PMPPAJSSSQ). The instrument was administered to 30 teachers and the data collected was subjected to the test of internal consistency using Cronbach Alpha procedure with reliability coefficient of 0.84. The data collected for this study was analysed using mean and standard deviation to answer the research questions while the null hypothesis was tested using the t- test at 0.05 level of significance. Any item with a mean equal to or greater than 2.50 was accepted, while those below 2.5 were rejected. That is, on a four-point scale of Strongly Agree (SA=4), Agree (A=3), Disagree (D=2) and Strongly Disagree (SD=1).

Results

Research Question One: What are the roles of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone?

Table 1: Mean and standard deviation on the role of mathematical concept in promoting physical activities among junior secondary schools

S/N	Items	N	$\bar{X}$	SD	Decision
1	Measurement concept help students to track physical activity progress suck as measuring of distance	335	3.47	0.57	Agree
2	Mathematical concept like charts help students in collection of data on their physical activities	335	3.27	0.68	Agree
3	Mathematical concept like statistic helps students in analysing of data on their physical activities	335	3.15	0.66	Agree
4	Mathematical concept like geometry helps students understand physical space like field, courts or tracks	335	2.69	0.79	Agree
5	Mathematical concept like help students plan and manage their physical activities routine	335	3.33	0.79	Agree
6	Mathematical concept like goal setting helps students to track their progress toward physical activity	335	3.18	0.66	Agree
	Grand Mean		**3.45**		**Agree**

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Table 1 showed that the respondents agreed on item 1, 2, 3, 4, 5 and 6 with mean score of: 3.47, 3.27, 3.15, 2.69, 3.33 and 3.18 respectively that, mathematical concept play vital roles in promoting physical activities among junior secondary schools with a grand mean score of 3.45.

Research Question Two: What are the roles of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone?

Table 2: Mean and standard deviation on the role of mathematical skills in promoting physical activities among junior secondary schools

S/N	Items	X	SD	Decision
7	Students use mathematical skills to set realistic goals for their physical activity such as running a certain distance	3.28	0.67	Agree
8	mathematical skills help students track their physical activity progress	3.33	0.81	Agree
9	Students apply mathematical skills to analyze data on their physical activity through identifying trends	3.47	0.58	Agree
10	mathematical skills help students make predictions about their physical performance	3.40	0.55	Agree
11	mathematical skills enable students to optimize their physical performance	3.41	0.59	Agree
	Grand Mean	**3.45**		**Agree**

Table 2 showed that the respondents agreed that mathematical skills promote physical activities as it help: to set realistic goals for their physical activity, help students to track their physical activity progress, Students apply mathematical skills to analyze data on their physical activity through identifying trends, mathematical skills help students make predictions about their physical performance and mathematical skills enables students to optimize their physical performance with mean score of 3.45.

Research Hypotheses

Ho_1: There is no significant difference in the mean ratings of male and female teachers on the role of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone

Table 3: t-test on the difference in the mean ratings of male and female teachers on the role of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone

Items	Status	N	Mean	SD	t.	df	P-value	Decision
1	Male	187	3.50	0.57				
				0.58	1.345	334	0.179	NS
	Female	149	3.42					

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2	Male	187	3.27	0.66				
				0.71	0.121	334	0.904	NS
	Female	187	3.28					
3	Male	149	3.12	0.70				
				0.60	0.726	334	0.469	NS
	Female	187	3.18					
4	Male	149	2.67	0.79				
				0.79	0.447	334	0.655	NS
	Female	187	2.71					
5	Male	149	3.40	0.75				
				0.84	1.594	334	0.122	NS
	Female	189	3.26					
6	Male	187	3.16	0.69				
				0.53	0.745	334	0.458	NS
	Female	149	3.46					

Key: NS: Not significant

Result on Table 3 revealed that the mean ratings of male and female teachers on the role of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone was not significant as the P value of 0.05 ($P < 0.05$) was less than the calculated values. This means that the sampled male and female teachers were of same opinion on the role of mathematical concept in promoting physical activities among junior secondary schools in Abakaliki education zone.

Ho_2: There is no significant difference in the mean ratings of male and female teachers on role of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone

Table 4: t-test on the difference in the mean ratings of male and female teachers on role of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone

Items	Status	N	Mean	SD	t.	df	P-value	Decision
7	Male	187	3.58	0.53				
					0.093	334	0.926	NS
	Female	149	3.57	0.52				
8	Male	187	3.51	0.55				
					1.794	334	0.074	NS
	Female	187	3.50	0.56				
9	Male	149	3.71	0.48				
					1.322	334	0.187	NS
	Female	187	3.68	0.50				
10	Male	149	3.44	0.52				
				0.53	0.137	334	0.891	NS
	Female	187	3.43					
11	Male	149	3.44	0.58				
				0.59	0.637	334	0.524	NS

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	Female	189	3.43					
12	Male	187	3.48	0.52				
	Female	149	3.46	0.53	0.609	334	0.109	NS

Key: NS: Not significant

Result on Table 4 revealed that the mean ratings of male and female teachers on role of mathematical skills in promoting physical activities among junior secondary schools in Abakaliki education zone was not significant as the P value of 0.05 ($P < 0.05$) was less than the calculated values. This means that the sampled male and female teachers were of same opinion on role of mathematical skills in promoting physical activities among junior secondary schools.

Discussion

Result of the study as presented in Table 1 showed that the respondents agreed that, Measurement concept help students to track physical activity progress suck as measuring of distance, Mathematical concept like charts help students in collection of data on their physical activities, Mathematical concept like statistic helps students in analysing of data on their physical activities, Mathematical concept like geometry helps students understand physical space like field, courts or tracks, Mathematical concept like help students plan and manage their physical activities routine and that Mathematical concept like goal setting helps students to track their progress toward physical activity. The findings is in line with Chen and Bowers (2023), involving students in this analytical process not only enhances their mathematical skills but also fosters a sense of ownership over their health and fitness. Setting goals is a fundamental aspect of physical fitness, and mathematics can play a pivotal role in helping students develop effective, measurable goals. In line with the finding of Leslie, Sparling and Owen (2020) who observed that innovative tools and devices specifically designed for individuals with disabilities such as adaptive bicycles, virtual reality environments, or motion-sensing games can create opportunities for participation that may not have been accessible otherwise. These technologies cater to various needs, allowing all pupils to engage in physical activities comfortably.

The result on table 2 shows that the respondents agreed that mathematical skills promote physical activities as it help: to set realistic goals for their physical activity, help students to track their physical activity progress, Students apply mathematical skills to analyze data on their physical activity through identifying trends, mathematical skills help students make predictions about their physical performance and mathematical skills enables students to optimize their physical performance.

The finding is consistent with the views of Johnson (2023), that mathematical skills empower students to make informed decisions based on statistical data. For

example, students can analyze averages, ranges, and trends from their performance statistics over time. When students engage with data analytics related to their physical performance, they are more likely to understand the importance of consistent training and recovery periods. By translating their physical experiences into quantifiable data, students learn to appreciate the science behind physical fitness and sports, making them more inclined to participate actively.

Conclusion

The integration of mathematics into physical activities within junior secondary schools has the potential to significantly enhance student engagement and learning outcomes. Understanding mathematical principles can empower students to make better-informed decisions regarding physical health and fitness, thereby fostering a more comprehensive approach to education that values both mental and physical development. Promoting collaborative teaching methods, interactive learning environments, and positive reinforcement, educators can successfully bridge the gap between mathematics and physical education multidisciplinary approach can help cultivate healthier lifestyles among students while simultaneously improving their academic performance in mathematics.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Schools should develop interdisciplinary curricula that combine physical education and mathematics, allowing students to apply mathematical concepts in real-life physical scenarios. For instance, using statistics to track performance improvements, or geometry to understand the optimum space required for sports activities.
2. Schools should create interactive learning environments where students can engage in physical activities while simultaneously learning mathematical skills. This could include gamification elements that utilize scoring systems based on students' mathematical calculations applied in physical challenges

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