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The Influence of Sports and Games on Students' Academic Performance in Mathematics: A Case of Public Primary Schools in Mkuranga District, Tanzania

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Abstract: This study examined the influence of sports and games on students' academic performance in mathematics in selected public primary schools in Mkuranga District, Tanzania. A mixed-method approach was employed, involving 30 pupils, 15 mathematics teachers, and 3 head teachers. Purposive and stratified sampling were employed. Quantitative data were collected using questionnaires and analyzed using frequencies and percentages, while qualitative data from interviews were thematically analyzed. The results indicated that participation in sports positively correlates with improved concentration, memory, problem-solving abilities, and overall engagement in mathematics learning. Pupils reported that active involvement in games enhanced their focus, comprehension, and collaborative skills, while teachers and head teachers observed increased attentiveness, discipline, and academic performance among physically active students. However, integration of sports into mathematics instruction was limited due to inadequate facilities, lack of trained teachers, time constraints, and minimal community support. The study concludes that sports and games have significant potential as pedagogical tools for improving mathematics performance, but their benefits remain underutilized in the studied schools. Recommendations include integrating sports into the curriculum, providing adequate facilities and training, promoting teacher collaboration, and engaging parents and the community to support school sports programs.

Keyword : Sports and games; academic performance; mathematics education; cognitive skills; Pupils.

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INTRODUCTION

The role of sports and games in shaping students' academic performance has gained significant attention in educational research and policy discussions. (Fedewa & Ahn, 2011) Participation in sports and games is widely recognized as an essential component of holistic education, as it promotes physical health and contributes to cognitive and social development (*WHO,*2020). Research in various countries has established a positive correlation between participation in physical activities and academic performance. For instance, a study conducted in the United States by (Sullivan et al., 2017)found that students who engaged in regular physical activities demonstrated improved cognitive skills, including better concentration, memory, and problem-solving abilities, all critical for subjects like mathematics.

In developed countries, integrating sports and academics has become a focal point in educational strategies. Countries like Finland and Australia have implemented policies that mandate sports and games as part of the school curriculum. In Finland, for example, schools allocate time for physical activities daily, emphasizing their role in improving students' cognitive skills and overall academic performance (Blom et al., 2018;Haapala et al., 2017). Similarly, a study in Australia by (Telford et al., 2019);Vetter et al., 2020) revealed that students who participated in structured sports scored higher in mathematics than their peers who did not engage in such activities.

The relationship between sports participation and academic performance has been explored in African countries, though integrating sports into school programs remains inconsistent. In Kenya, De Greeff et al., (2018) found that participation in sports activities was linked to improved academic performance among primary school students, particularly in mathematics and science. However, the study also noted significant challenges, including inadequate sports facilities, a lack of trained coaches, and limited funding. Similarly, in South Africa, (Lombard, 2018) reported that schools with well-structured sports programs witnessed better academic outcomes.

In Tanzania, the importance of sports and games in education has been recognized, but the level of implementation remains limited in many schools, particularly in rural areas. The Ministry of Education, Science, and Technology emphasizes the role of extracurricular activities, including sports, in fostering holistic education (Anselimus, 2023; Minja et al., 2025; Selcuk Unıversıty et al., 2022). However, studies indicate that public primary schools in Tanzania often face challenges in integrating sports into their curricula (Kombe et al., 2024). For example, research by (Guest et al., 2021;Milambo & Pacho, 2021) revealed that while sports and games were included in the curriculum, many schools lacked the resources and infrastructure to implement these activities effectively.

The Tanzanian government has implemented various strategies to improve students' academic performance in mathematics, recognizing its critical role in fostering cognitive development and future career opportunities(Kombe et al., 2024; Lobo, 2022). Despite these efforts, students' performance in mathematics remains unsatisfactory, particularly in rural areas such as the Mkuranga District (Mazana et al., 2020). Statistics from the National Examination Council of Tanzania (NECTA, 2022) reveal that only 35% of students in Mkuranga District passed mathematics examinations in primary schools, compared to the national average of 50%. This persistent underperformance raises concerns about the adequacy of current strategies in addressing the root causes of low achievement in mathematics

Study Objectives

1. To examine the relationship between participation in sports and games and the academic performance of primary school students in mathematics.
2. To explore how sports and games activities enhance cognitive and problem-solving skills relevant to mathematics.
3. To evaluate challenges and barriers affecting the integration of sports and games into the teaching and learning of mathematics in public primary schools.
4. To identify the perceptions of teachers and students regarding the role of sports and games in improving mathematics learning outcomes.

Literature Review

1. Relationship Between Sports Participation and Academic Performance

The European studies by (Lin et al., 2024; Mazana et al., 2020; Owen et al., 2024; Wang et al., 2024; Zhang et al., 2023; Zurc & Planinšec, 2022)found a significant relationship between sports participation and academic performance, particularly in subjects like mathematics. In Slovenia, students who regularly engaged in physical activities such as team sports showed better academic math outcomes than their less active peers (Zurc & Planinšec, 2022). The study emphasized that sports help develop discipline, time management, and concentration, crucial skills for academic success(Jakiwa et al., 2022). Moreover, sports provide a much-needed break from academic stress, allowing students to return to their studies with a refreshed mind.

In Africa, similar findings have been reported. A study by (Bekomson et al., 2020; Nguri, 2024; Shem & Limukii, 2023a)in Nigeria explored how participation in school sports influenced students' performance in mathematics. The study revealed that students actively involved in sports had higher math scores than those who did not participate (Mathunjwa, 2025;Shem & Limukii, 2023;Apaak & Yawson, 2022). The authors attributed this improvement to the increased cognitive function and better problem-solving skills developed through strategic and cooperative sports like soccer and basketball. These sports require quick thinking and decision-making, skills directly transferable to solving math problems.

Locally, the link between sports and academic performance has also been explored in Tanzania. A recent study by (Kombe et al., 2024) focused on public secondary schools and found that students who participated in sports clubs performed better in mathematics than those who did not. The study highlighted that through sports, students learned critical thinking and perseverance, positively impacting their approach to challenging subjects like mathematics. Teachers reported that students in sports were more attentive and engaged during math lessons, likely due to the enhanced cognitive abilities gained from physical activities(Sember et al., 2020a; Trudeau & Shephard, 2010).

2. Cognitive and Problem-Solving Skills Enhancement

Globally, there is strong evidence that sports activities positively influence cognitive and problem-solving skills, which are critical for mathematics. Giordano et al. (2021) found that regular engagement in sports significantly improved students' cognitive functions such as memory, attention, and executive processing. These enhanced cognitive abilities are directly linked to better mathematical problem-solving skills. Similarly, (Cao et al., 2025; Heilmann et al., 2022)highlighted that participation in team sports like soccer and basketball fosters strategic thinking and logical reasoning, skills that are essential for tackling complex mathematical problems.

In Africa, research has shown similar positive outcomes(Giordano et al., 2021). In South Africa (Fisher & Africa, 2025; Sakala & Roux, 2024)found that traditional games requiring strategic thinking, including morabaraba, significantly enhanced students' logical reasoning and problem-solving skills in mathematics. This study supports that cognitive skills developed through games are transferable to academic subjects, particularly mathematics. Additionally, Shem & Limukii, (2023b) in Kenya observed that students participating in sports such as soccer and athletics demonstrated enhanced concentration and analytical abilities, directly contributing to improved mathematical performance.

In Tanzania, recent studies have begun to explore the relationship between sports and cognitive development. (Sember et al., 2020b; Simwanza & Paul, 2024)researched in Mwanza and found that students involved in regular sports exhibited improved analytical thinking and problem-solving abilities in mathematics. The study suggested that physical activities like volleyball and athletics contribute to better mental agility, which is crucial for mastering complex mathematical concepts. Similarly, (Simwanza & Paul, 2024) in Dodoma highlighted that structured sports programs enhanced students' memory retention and critical thinking skills, positively influencing their mathematical abilities.

3. Challenges to Integration

Globally, several studies have highlighted challenges in integrating sports and games into academic curricula, particularly for subjects like mathematics Sulz et al., (2023) in the USA States identified key barriers, such as insufficient funding for sports programs, lack of trained personnel, and limited time allocated to sports within the school schedule. Similarly, in Germany, (Steckenleiter et al., 2023) reported that logistical challenges, including inadequate sports facilities and the undervaluation of sports by educational stakeholders, hindered the effective incorporation of sports into the academic framework.

In Africa, the challenges of integrating sports and games into education are compounded by resource constraints. A study by Mugweru (2022) in Kenya found that many public schools faced significant barriers, such as a lack of sports equipment

and inadequate infrastructure. The researchers also highlighted cultural attitudes, where sports are often viewed as less important than traditional academic subjects. Similarly, in Nigeria, Adams (2022) observed that overcrowded classrooms and insufficiently trained teachers further impeded the use of sports to enhance cognitive skills in subjects like mathematics.

In Tanzania, the integration of sports into academic learning faces similar challenges. A study by Dawson & Mwila (2023) in Dar es Salaam identified several barriers, including inadequate sports facilities, insufficient teacher training on incorporating sports into academic lessons, and limited time within the school timetable. The study revealed that while teachers recognized the potential benefits of sports for cognitive development and mathematics learning, practical constraints made implementation difficult.

4. Perceptions of Teachers and Students

Globally, research has shown varied perceptions among teachers and students regarding the role of sports and games in enhancing learning outcomes. A systematic literature review by Tendinha et al. (2021) revealed that many teachers view sports as a valuable tool for improving student engagement and motivation. Similarly, a study by Jakiwa et al. (2022Zurc) in Australia and Sakala & Roux, (2024) found that students who participated in structured sports programs were more likely to demonstrate improved concentration and persistence in mathematics classes.

In Africa, perceptions of the role of sports in academic achievement are mixed. The studies (Fisher & Africa, 2025; Sakala & Roux, 2024) found that while some teachers recognized the cognitive benefits of sports, many still perceived them as distractions from academic learning. Conversely, research by Mugweru (2022) in Kenya showed a growing recognition among students that sports could enhance cognitive skills and improve performance in subjects like mathematics.

In Tanzania, the perceptions of teachers and students regarding the role of sports in education are gradually changing. A study by Dawson & Mwila (2023) found that teachers increasingly acknowledge the benefits of integrating sports into the academic curriculum. They reported that sports activities helped students develop critical thinking and problem-solving skills, essential for mathematics success. Additionally, research by Dawson & Mwila (2023) in Temeke District revealed that students generally had positive perceptions of sports, associating them with increased enthusiasm and better performance in mathematics.

Theoretical Frame work.

This study is grounded in Gardner's Multiple Intelligences Theory (1983), developed by Howard Gardner, which proposes that human intelligence is not a single construct but comprises multiple distinct modalities, including bodily-

kinesthetic and logical-mathematical intelligence. The theory posits that learning is enhanced when instruction engages different forms of intelligence, allowing learners to process and apply knowledge through varied experiences. In relation to this study, participation in sports and games stimulates bodily-kinesthetic intelligence, which in turn supports the development of cognitive processes such as reasoning, problem-solving, and logical thinking that are essential in mathematics. Thus, the theory provides a conceptual basis for understanding how physical activities can positively influence students' academic performance in mathematics in public primary schools in Mkuranga District, Tanzania.

METHODOLOGY

This study adopted a mixed-methods research approach, combining both quantitative and qualitative methods. The rationale for choosing this approach lies in its ability to address the research objectives comprehensively.(Chilonga, P., & Mtenzi, F., 2020, 2020; Creswell, 2014; Ngulube, P., 2021) For instance, the first objective, which examines the relationship between participation in sports and games and academic performance in mathematics, requires quantitative data such as students' participation rates and academic scores. In contrast, the fourth objective, which evaluates perceptions of teachers and students regarding the role of sports and games in improving mathematics learning outcomes, necessitates qualitative data to capture subjective opinions and experiences.

The study adopted a descriptive research design. A descriptive design focuses on providing a detailed understanding of the phenomena under investigation, emphasizing the "what" and "how" aspects rather than manipulating variables. It is particularly suitable for studies that describe relationships, behaviors, or conditions as they naturally occur. The study was conducted in Mkuranga District, Tanzania. This region represents the typical characteristics of public primary schools in Tanzania, particularly in terms of access to sports facilities and the academic performance of students. The accessible population consisted of primary school students, mathematics teachers, and school administrators from public primary schools in Mkuranga District. The study employed a combination of purposive sampling and stratified random sampling. Purposive sampling was used to select mathematics teachers and school administrators, while stratified random sampling was applied to select students. The sample size comprised 45 participants: 30 primary school students, 15 mathematics teachers, and 3 head teachers. The study employed three primary research instruments: questionnaires, semi-structured interviews, and observation checklists. Questionnaires were used to gather standardized information from primary school students and mathematics teachers. Semi-structured interviews were conducted with school headteachers to obtain in-depth information about the administrative aspects of integrating sports and games into mathematics education.

Observation checklists were also employed to collect direct, firsthand data on school sports activities. Quantitative data were analyzed using descriptive statistics such as frequencies and percentages. Qualitative data were analyzed using thematic analysis, which involved transcribing interviews, coding recurring ideas, and grouping codes into themes. Triangulation was used to integrate the quantitative and qualitative findings.

FINDINGS AND DISCUSSION

Table 1. Demographic Characteristics of Pupils, Teachers, and Head Teachers

Group	Variable	Category	Frequency	Percentage (%)
Pupils (n = 30)	Gender	Male	17	56.7
Pupils (n = 30)	Gender	Female	13	43.3
Pupils (n = 30)	Age	13–15 years	14	46.7
Pupils (n = 30)	Age	Other age groups	16	53.3
Pupils (n = 30)	Class	Standard Six	15	50
Pupils (n = 30)	Class	Standard Seven	15	50
Teachers (n = 15)	Gender	Female	9	60
Teachers (n = 15)	Gender	Male	6	40
Teachers (n = 15)	Experience	5–10 years	7	46.7
Teachers (n = 15)	Experience	Other levels	8	53.3
Head Teachers (n = 3)	**Experience**	**Over 10 years**	**3**	**100**

The Table 1 analysing the demographic characteristics of pupils, teachers, and head teachers involved in the study, indicating a fairly balanced and appropriate representation of key respondent categories. Among the pupils (n = 30), there is a slightly higher proportion of males (56.7%) compared to females (43.3%), while age distribution shows that most learners fall within the 13–15 years category (46.7%), suggesting that the sample largely reflects upper primary school learners at a developmental stage where academic engagement and cognitive skills are more pronounced. Equal representation of Standard Six and Standard Seven pupils (50% each) strengthens comparability across grade levels. For teachers (n = 15), the majority are female (60%), and most have 5–10 years of teaching experience (46.7%), indicating a moderately experienced teaching workforce likely to provide informed insights on instructional practices. All head teachers (n = 3) have over 10 years of experience in educational management, suggesting that the study benefited from highly experienced administrative perspectives. According to (Mugenda & Mugenda, 2003) Mugenda and Mugenda (2003), an appropriate sample should adequately represent key subgroups of the accessible population to enhance validity and generalizability of

findings, while (Saunders et al. (2007) emphasize that a well-structured sample framework improves the reliability and credibility of research outcomes by ensuring that relevant stakeholder groups are sufficiently included. Therefore, the composition of respondents in this study supports the robustness of the data collected and strengthens the dependability of the conclusions drawn.

Relationship Between Sports and Mathematics Performance

The study found a positive relationship between participation in sports and students' academic performance in mathematics. Pupils who regularly engaged in physical activities reported noticeable improvements in concentration, comprehension, and overall academic outcomes. The majority of pupils (40% strongly agreed and 36.7% agreed) believed that they perform better in mathematics when actively engaging in sports. Teachers corroborated these observations, noting that students who were active in sports demonstrated enhanced attentiveness, engagement, and participation during mathematics lessons.

Head teachers unanimously agreed that students who actively participate in sports tend to perform better academically, with a particularly noticeable improvement in mathematics. One head teacher remarked, "*Pupils who participate in sports show improved focus and discipline, reflecting their math results*." This suggests that sports develop physical fitness and cultivate habits of concentration, strategic thinking, and problem-solving, which are essential for mathematics learning.

These findings align with Gardner's Multiple Intelligences Theory (1983), which suggests that bodily-kinesthetic intelligence, when stimulated through physical activity, can positively influence logical-mathematical reasoning. The results also align with international research by Blom et al., (2018) who found that students involved in regular team sports achieved higher academic outcomes in mathematics. African studies such as Haapala et al. (2017) demonstrated that active participation in sports improved students' cognitive functions and problem-solving skills. In Tanzania, Dawson & Mwila (2023) emphasized that sports participation contributes to holistic student development by enhancing cognitive and physical abilities.

Cognitive and Problem-Solving Skills Enhancement

The study found that participation in sports and games significantly enhances students' cognitive and problem-solving skills, which are critical for mastering mathematics concepts. Pupils reported that regular engagement in physical activities improved their memory, decision-making, and analytical thinking. Quantitative findings revealed that most students strongly agreed (36.7%) or agreed (40%) that sports help them think faster and solve problems more effectively.

Qualitative insights from head teachers indicated that active students develop stronger critical thinking and logical reasoning skills through games that require

strategy, coordination, and teamwork. For instance, cooperative and competitive games teach students to follow logical sequences, anticipate outcomes, and make quick, informed decisions, directly transferable to mathematics problem-solving. One head teacher explained, "*Active students are more alert and ready to tackle difficult mathematics problems after sports sessions*."

These results align with Gardner's Multiple Intelligences Theory (1983), which posits that bodily-kinesthetic intelligence can enhance logical-mathematical intelligence when physical activity stimulates cognitive processes. Research from other scholars supports these findings; Blom et al., (2018) and Mugweru (2022) in Kenya observed that students involved in strategic sports demonstrated enhanced analytical skills, memory, and problem-solving abilities. Within Tanzania, studies by Dawson & Mwila (2023) similarly indicated that structured sports programs improve students' mental agility, concentration, and decision-making, positively influencing mathematics performance.

Challenges to Integration

The study revealed several significant challenges that hinder the effective integration of sports and games into mathematics teaching. One major barrier is the inadequacy of sports facilities and equipment. Quantitative findings showed that 40% of pupils strongly agreed and 36.7% agreed that their schools lack sports facilities and space. Head teachers confirmed this, noting that many schools lack sufficient playgrounds, sports fields, and essential materials such as balls, nets, and athletic gear.

Another critical challenge is the lack of trained teachers linking sports activities to academic lessons. Most teachers are not equipped with the knowledge or pedagogical skills to integrate physical activities into mathematics instruction. One head teacher explained, "*Teachers are not confident in using games to teach mathematics, so sports remain separate from classroom learning*." This finding is consistent with Dawson and Mwila (2023) in Tanzania, who identified limited teacher training as a major obstacle to effective integration.

Time constraints due to heavy academic schedules and exam pressure further limit opportunities for sports integration. Schools often prioritize teaching core subjects to ensure students cover the curriculum, leaving little room for structured physical activities during the school day. The study found that 33.3% of pupils strongly agreed and 43.3% agreed that there is not enough time for both games and mathematics each day.

Minimal parental and community support was also highlighted as a barrier. Parents and community members frequently prioritize direct academic instruction over extracurricular activities, perceiving sports as secondary or non-essential. One head teacher noted, "*Balancing games and academics is a constant struggle because we cannot extend school hours, and teachers are not confident linking sports to lessons*."

These findings are consistent with studies by Mugweru (2022) in Kenya and Steckenleiter et al. (2023)) in Nigeria, which identified infrastructural limitations and lack of professional development as barriers to integrating sports in education. The Tanzania Education and Training Policy (ETP, 2014) advocates for holistic, competence-based education that integrates physical, cognitive, and social development, highlighting the need for schools to address these challenges.

Perceptions of Teachers and Pupils

The study revealed that both pupils and teachers hold positive perceptions regarding the role of sports and games in enhancing mathematics learning. Pupils expressed that regular engagement in physical activities improves their concentration, memory, problem-solving abilities, and overall enjoyment of learning mathematics. Many students reported that participating in games helped them approach mathematical problems more confidently and think critically when solving complex tasks.

Teachers echoed these views, noting that students actively participating in sports tend to be more attentive, disciplined, and engaged during lessons. They observed that such students often demonstrate better teamwork and collaboration, facilitating peer learning and group problem-solving in mathematics. The statement, "Sports improve concentration in math lessons," received 40% strong agreement and 40% agreement from teachers, indicating strong support for the cognitive benefits of physical activity.

However, head teachers also highlighted several structural and institutional limitations that prevent fully realizing these benefits. Inadequate sports facilities, insufficient equipment, lack of teacher training, and limited time within the school timetable were identified as key barriers. One head teacher explained, "*We see the value in sports for learning, but without proper facilities and trained staff, it is difficult to link games to lessons in a meaningful way.*"

These perceptions align with Gardner's Multiple Intelligences Theory (1983) theoretical framework, which emphasizes the connection between bodily-kinesthetic intelligence and logical-mathematical reasoning. By engaging in physical activities, students stimulate cognitive processes that enhance their problem-solving, analytical thinking, and memory retention. Empirical studies from other contexts support these findings; for instance, Sulz et al. (2023) in USA and Mugweru (2022) in Africa found that students who regularly participated in sports demonstrated improved mathematics performance.

CONCLUSION

The study concludes that sports and games positively enhance students' academic performance in mathematics by improving concentration, memory, critical thinking, problem-solving skills, confidence, and learner engagement, while also promoting discipline, perseverance, and social development. However, their integration into mathematics instruction remains limited due to inadequate facilities and equipment, insufficient teacher training, limited instructional time, and weak parental and community support, which restrict their full educational potential. These findings align with Gardner's Multiple Intelligences Theory (1983) and the Tanzania Education and Training Policy (ETP, 2014), both of which support holistic, competence-based education. Overall, the study shows that while sports and games are effective tools for improving mathematics learning, addressing existing constraints is necessary to fully realize their benefits in schools.

Recommendations

The study recommends that policymakers should integrate sports and games into the formal mathematics curriculum, allocate adequate funding for sports facilities and resources in public primary schools, and strengthen teacher training programs to equip educators with the skills to use sports as instructional tools. School administrators should develop clear policies that support the systematic integration of sports into mathematics learning, promote coordination between sports and academic teachers, and actively engage parents and the wider community in supporting sports programs. Teachers are encouraged to incorporate games and physical activities into mathematics lessons, use group-based activities to enhance collaboration and peer learning, and pursue continuous professional development in innovative, sports-linked teaching approaches. Pupils should actively participate in both sports and academic activities, while parents and communities should support school sports programs by encouraging participation, providing necessary resources, and raising awareness of the role of sports in improving academic achievement.

Conflict of Interest

The authors declare that there is no conflict of interest associated with this study. The study was conducted independently, without any financial, institutional, or personal influence from funders, affiliated institutions, supervisors, or the publisher that could have affected the study design, data collection, analysis, interpretation, or reporting of findings. This aligns with standard scholarly ethical requirements as emphasized in research methodology literature, which requires transparency and disclosure to ensure objectivity, credibility, and integrity of research outputs

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