

The Impact Of Physical Exercise On Junior Secondary School Students' Performance In Mathematics: Implication For Scientific And Technological Advancement In Nigeria

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Abstract : In schools across Nigeria, physical exercise has been substantially reduced and in some cases completely eliminated. The potential for physical activity and fitness to improve cognitive function, learning and academic achievement in students has received attention by researchers and policy makers. The purpose of this research was to determine the effect of physical exercise (PE) on Junior Secondary students' academic performance in mathematics. Participants were 100 students, purposefully sampled among Junior Secondary two (JSSII) students of Government Science Secondary School Musawa, Katsina in Nigeria. Data collection occurred before and after performing morning Exercises. The activity (exercises) was exercised on Mondays, and Thursdays, 50 minutes per week, in 10 weeks. Two research questions and one research hypotheses were formulated to guide this study. The statistical analysis showed there was a significant difference before and after the exercises in students Performance in Mathematics ($p \leq 0.05$). Based on the findings, it was recommended among the other things that morning physical exercise should be adopted in our school system particularly at junior secondary schools in Nigeria as it will improve students' performance in Mathematic towards sustainable development in Nigeria.

Keywords: Exercises, Mathematics, Science, Technology Academic, Performance.

Introduction

The physical health benefits of participating in regular physical activity and maintaining physical fitness are widely established. It has been clearly demonstrated that physical activity decreases risk of developing cardiovascular disease (CVD), stroke, some cancers, obesity, type 2 diabetes mellitus and is also effective in the treatment of several of these diseases (Thomas, Keeley and Kenneth and Fox, 2009)[7].

Schools and Physical Activity

Today, obesity is one of the most pressing health concerns for children. Nearly one-third of children and teens, more than 23 million kids, are overweight or obese and physical inactivity is a leading contributor to the epidemic (Amirtash, Mozaffi, and Kamelia, 2013)[13]. The Surgeon General recommends children should engage in 60 minutes of moderate activity most days of the week, yet estimates show that only 3.8 percent of elementary schools provide daily physical activity. Schools serve as an excellent venue to provide students with the opportunity for daily physical activity, to teach the importance of regular physical activity for health, and to build skills that support active lifestyles. Unfortunately, most children get little to no regular physical activity while in school (activelivingresearch.org)[8]. The Changes of attitude and human life style, physical, mental and social problems due to mechanical life and sedentary life, the importance of being active is become obvious to every one. Sport as a social factor in controlling and curing a lot of social problems and injuries, is in height of specialist attention. According to scientific researches, healthy and routine physical activities directly or indirectly have important role on prevention and cure of diseases. On the other hand physical activities are of cheap and useful instruments in controlling stress, depression and aggression of present life (Azarbayjani, Nasairi and Peer, 2013) in (Amirtash, Mozaffi, and Kamelia, 2013)[2]. To get these goals, activities which are recreations and can

perform in teams, obviously are effective to every one. According to the fact, routine physical activities are the basic requirements in growing ages for school students. Although, the budget and time are inadequate for physical education in schools, using simple and available kinds of activity with minimum facilities is to the point. In these ages, children like to play with friends, cooperate with others, enjoy playing and interested to learn social rules. Different kinds of games and various situations in sport help them to make themselves ready for future (Lee, Burgeson, and Fulton, 2014)[14]. Exercises as an active, combination of various skills, rhythmical activity can perform single or team working. Nowadays coaches and athletes apply this activity as a complementary in sports such as gymnastic, swimming, cycling, wrestling, football, basketball and volleyball. Besides, low injury potential, make exercises so attractive among children. Study has shown improvements in self-esteem following running activities in girls (Lee, Burgeson, and Fulton, 2014)[14]. Psychosocial and behavioral changes amongst girls participating in two developmentally focused youth sport programs were assessed. Girls in grades three to eight participated in 'Girls on the Run' and 'Girls on Track'. The programs resulted in beneficial increases in global and specific self-esteem, enhanced satisfaction with body image, and increased physical activity frequency and commitment (Rahnema and Noure, 2013, and Mohammed, 2013).

Concept and Relevance Mathematics to National Development

Science and technology have long been recognized as the instrument per excellence for nation building. Every country today craves for science and technological advancement. Science is a way of knowing things about the universe we live. The study of science provides bases for the utilization of facts, theories, laws and principles in technology. Technology can be said to be invention of new things and processes or the improvement of older

ones to the services of humankind. Science and technology have since become very closely linked. The symbiotic existence and its unification have assumed an objective reality. The actual conception of mathematics is quite clear. The subject in which pure and applied mathematics is used for the purpose of solving practical problems in science and technology. This problem-solving system is desirable because natural barriers placed on human by nature are removed by the system, mathematics is a complex field and not really a single subject. It is the study of quantities and relations through the use of numbers and symbols (Aghadiuno, 1992). Science and technology are therefore indispensable components of the development challenge, and mathematics is fundamental. Nations are ranked today, according to their capacity to practice science and technology effectively. A nation that cannot use science and technology to better the lot of its people is not practicing science. The modern emphasis on science, technology and mathematics education is not only beginning to change things but such a change is yet to become pronounced as to modify things drastically for a sustainable national development. Researchers found that academic achievement in Mathematics was not related to enrolment in Physical Exercise in American school children, but interestingly it was associated with the total amount of vigorous activity performed by the children. Subsequent analysis of a 55 minute PE class revealed that only 19 minutes of this time was spent in moderate to vigorous activity and it was suggested that this was sufficient vigorous activity to impact in academic achievement (Sharper, 1997)[15] in (Amirtash, Mozaffi, and kamelia, 2013)[13]. A study conducted with 214 six-grade students in Michigan found that students enrolled in PE had similar grades as students who were not enrolled in PE, despite receiving 55 minutes less of daily classroom instruction time for academic subjects (Coe, Pivarnik, Woemck, Reves and Malina, 2006)[22]. In 2007, 287 fourth- and fifth-grade students from British Columbia were evaluated to determine if introducing daily classroom physical activity sessions affected their academic performance. Students in the intervention group participated in daily 10-minute classroom sessions in addition to their regularly scheduled 80-minute Physical Exercise class (Amirtash, Mozaffi, and Kamelia, 2013)[13]. Despite this trend, no clear evidence indicates that Academic Performance will improve if Physical Exercise classes are cut. Numerous studies have shown positive relationships between AP and both physical activity [Sibley, Etnier, 2003,[16] Sallis, McKenzie, Kolody, 1999,[17] Sherperd, Volle, Lavelle, 1984, Ahmad, 2007,[18] Dwyer, Coonan, Letch, 2010[22], Carlson, Fulton, Lee, 2008[23] and Castelli, Hillman and Buck, 2007[27] and sports participation (Evenson, Ballard, 2007, Chomitz, Slining, 2009, Caterino, Polak, 2007)[28]. In the hypothesis the results showed that Physical exercises performance had significant effects on performance among elementary students in grade four. In 1999 found that spending more time in PE did not harmful effects on academic achievement in Arithmetics when measured using a standardized test in elementary school. The 2-year follow-up of the PE program showed pupils in the experimental group did significantly better in achievement tests when compared to controls (Thomas, Fox and eeley, 2009)[7]. Also studies supported the results (Ahmad, 2007)[1]. It was not supported with the study that found academic achievement was not firmly related to enrolment in Physical Exercise (Coe, Pivarnik,

Woemck, Reves and Malina, 2006)[3]. In a research conducted by Carlson et al. (2008)[10] in USA found that a Third tertile girls (70-300 mins of PE per week) achieved slightly higher academic scores in kindergarten, first grade and fifth grade reading and first grade mathematics compared to first tertile girls (0-35 mins of PE per week). Yu et al. (2006)[9] found that Physical Activity was not associated with academic achievement in either boys in Hong Kong china ($r=-0.067$, non-sig) or girls ($r=0.068$, non-sig). PA negatively associated with school conduct in girls ($r=-0.124$, $p<0.01$). Shepherd (2009) 2 years of 75 min/day of PE focusing either on skill or fitness. Controls maintained three classes of 30 min/week Improvement in performance in English, but not maths in standardized exam. improved teacher ratings. In Nigeria Hamza and Babangida (2015)[12] found significant differences between NCE students who engaged in regular physical exercise and those who not in NCE Mathematics performance. In Nigeria many school systems have downsized or eliminated Physical Exercise under the assumption that more classroom instructional time will improved Academic Performance and increase standardized test scores. The study aims to find out how early morning Physical exercises affect mathematics achievement of junior secondary school students performance in mathematics. Specifically, the study wants to determine if mathematics achievement in Junior secondary schools in Musawa Local Government Area in Katsina will improve as a result of Early Morning Physical Exercise. The significance of this study rests on the fact that once it is ascertained that morning physical exercise improve mathematics achievement at the Junior secondary level, teachers and students will be encouraged to engage in physical exercise early in the morning as one possible means of fighting failure and frustration in mathematics teaching and learning. A more important reason for encouraging to engage in physical exercise early in the morning (if they are found effective enough to improve mathematics achievement) is that the more students pass mathematics, the more mathematics can be use as a bedrock for economic, scientific and technological development of this country.

Purpose of the study

The purpose of this research was to determine the effect of exercises on academic performance on students of Junior secondary schools in Katsina State of Nigeria

Research Question

For the purpose of this research the following question were formulated

1. To what extent does morning physical exercise improve the achievement of students in mathematics?
2. Is there any significant difference between the mathematics achievements of students that engage in morning physical exercise and students that do not engage morning physical exercise at junior secondary school level?

Hypothesis

The following hypothesis was tested:

There is no significant difference between the mathematics achievements of students engage in physical exercise in the morning and students that do not engage morning physical exercise at junior secondary school level.

Research Design

The design of this study is quasi-experimental research design. Precisely, a pre-test and post-test experimental-control group design is adopted for the study. The experimental and control group were pretested before the treatment to determine the in Arithmetics. They were also posttested after the treatment. Intact classes were randomly assigned to experimental group (EG) and control group (CG) by balloting

Population

The Population for this research consists of all students in Junior Secondary schools in Musawa Local Government Area in Katsina State of Nigeria.

Sample

The sample is made up of 100 students in Junior secondary school class two (JS2) of Government Science Secondary School, Musawa in Katsina State of Nigeria. The school (Government Science Secondary School, Musawa) was chosen from 10 secondary schools in Musawa Local Government Area in Katsina by Purposeful sampling. A simple random sampling without replacement was used in selecting a class (JS2) in school among the junior classes (JS1, JS2, JS3). Finally, JS2 was divided into experimental group and control group using the result of a pre-test. This is to ensure equal ability grouping.

Instruments

This study involved the use Mathematics Achievement Test instruments developed by the researchers. Mathematics Achievement Test (MAT) was used before the treatment as pretest and after the treatment as posttest

Validity of the Instrument

The instruments were taken to the mathematics teachers of the concerned schools in the study for face content validity. Then the instruments also were taken to the mathematics educators whose have M.Ed and Ph.D for content validity.

Reliability

The instruments MAT was taken for pilot testing in order to determine the reliability coefficient of the instruments which was found to be 0.75.

Procedure for data Collection

Data collection occurred before after and performing exercises. The exercise was exercised early in the morning in 12 weeks, on Mondays and Thursdays 50 minutes per week. Mathematics Achievement Test (MAT) was used for data collection in both pre-test and post-test analysis. Informed consent was obtained from students prior to the test. Confidentially subject's information and data was addressed

Research Instruments

This study used school result for 2014/2015 academic session. Second term student result was used before the treatment as pretest. And the other after the treatment as posttest was obtained from the school record at the end of third term examination on ability of the experimental and control group.

Results

The results obtained from the study were analyzed using the SPSS 16 package. T-test statistics was used to determine any significant difference. The result obtained is presented in the tables below:

Hypothesis

There is no significant difference between the mean academic achievement of students who engaged in morning physical exercise and those who do not.

Table 1: T-Test Analysis Of Pretest Scores Of Experimental Group And Control Group

Group	Number	Mean	S.d	d.f	t-cal	t-crit	Decision
Experimental	50	26.52	15.42	98	0.37	1.671	Not Significant at .05 level
Control	50	27.58	12.52				

Table 1 show that the experimental group (JSIIA) and control group (JSIIB) were equally matched at the pre-testing stage of the experiment. The different between the pretest mean score (26.52) of the experimental group and the pretest mean score (27.58) of the control group was not significant. The calculated t value (0.37) was below the critical t value (1.9973) at 0.05 level of significant

Table 2: T-Test Analysis Of Post-Test Scores Of Experimental Group And Control Group

Group	Number	Mean	S.d	d.f	t-cal	t-crit	Decision
Experimental	50	35.08	13.23	98	2.23	1.671	Significant at .05 level
Control	50	28.28	15.38				

Table 2 has a different result. The posttest mean score (35.08) of the experimental group was higher than the posttest mean score (28.28) of the control group. The difference in these two mean scores was significant at 0.05 levels since the calculated t value (2.23) was greater than the critical t value (1.671). The hypothesis is therefore rejected in favour of student who engaged themselves in morning physical exercise who were much better in mathematics achievement than others students.

Table 3 Analysis of Variance of Pretest and Posttest Scores of Students

Source	Sum of square	d.f	Mean square	F	Decision
Between	2255.94	3	752.98	1.81	Significant at .05 level
Within	39946.42	96	416.11		
Total	42202.36	99			

The calculated value 1.81 is less than table value $F=8.57$ at 5% level. Therefore, we accept that the null hypothesis that the group come from the same population.

Conclusion

The present study found performing simple and attractive exercise class not only helps students to gain achievements in school lessons but also assists them to become socialize during physical activity and challenges. From the above results, engaging in morning physical exercise improves the mathematics achievements of students to a significant extent. Engaging themselves in morning physical exercise can improve not only achievement in mathematics it can also improve the attitude, and boost the morale, of students in mathematics which is the gateway to scientific and technological advancement in Nigeria.

Recommendations

1. Parents and teachers should ensure that children under their care develop interest in n morning physical exercise
2. Nigerians should be sensitized to embrace morning physical exercise as one effective way of improving Mathematics performance for meeting the challenges of modern technology
3. Additional research is needed to determine the impact of physical activity on academic performance among those children who are at highest risk for obesity in the Nigeria.

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