

**IMPACT OF MATHEMATICS TEST ANXIETY ON STUDENTS' MATHEMATICS ACHIEVEMENT
IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE**

BY

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Abstract

This research investigated the impact of mathematics test anxiety on mathematics achievement among students in Jos North, Plateau State. Three hypotheses were formulated to facilitate the study. The population of the study consisted of 475 SS II students of Airforce secondary schools in Jos. The sample for this study consisted of 285 with 152 students from Airforce Girls Comprehensive Secondary School and 133 students from Airforce Military School drawn through the stratified random sampling technique. Mathematics Test Anxiety and Students' Mathematics Achievement Test were used as instrument for data collection. The validity of the instruments was ascertained through experts' validation. Also, the reliability coefficient for the Mathematics Test Anxiety and Students' Mathematics Achievement Test was determined to be 0.89. The hypotheses were tested using Pearson correlation statistics and t-test statistics. From the analysis of data collected, it was discovered that there is a significant impact of mathematics anxiety on students' achievement in mathematics. Based on the findings of the study, it was recommended mathematics teachers should engage students' full participation during lessons and should use teaching methods that attract students' interest.

Keywords: Mathematics, Anxiety, Test, Academic, Achievement

Introduction

Mathematics is a body of knowledge essential for the achievement of a scientific/technological nation. It is not only a core subject but also a prerequisite for gaining admission into tertiary institutions. The study of mathematics was established to produce a competent person who is able to apply knowledge of mathematics in everyday life effectively and responsibly in solving problems and making decisions. Mathematics is used throughout our daily lives. The importance of Mathematics in the school curriculum, every survival of human kind and life in general cannot be over-emphasized. Mathematics provides the basis for basic every day arithmetic and the very foundation for the development of science and technology. Ale and Lawal (2016) stated that the line of demarcation between the developed and the underdeveloped nations is based on their level of mathematical attainment and ingenuity. According to them, mathematics is an undisputed agent of national development and wealth creation. Confirming this statement, Nosa and Ohenhen (2018) stated that evidence abound to show that nations that embrace mathematics, science and technology enjoy better standard of living and are less dependent on others.

The importance of mathematics in day-to-day activities is no longer news. However, what remains news is the fact that students' achievement in mathematics has not improved significantly despite its importance, not even with the introduction and use of technology in mathematics. Numerous factors were identified by some researchers for the inconsequential achievement by students, some of which included: shortage of qualified mathematics teachers, poor facilities, equipment and instructional materials for effective teaching and large student-to-teacher ratios (Alele-Williams, 2018). Poor students' achievement in mathematics in particular will affect the efforts of various sectors in making Nigeria a fully developed nation by 2020. However, research has shown that mathematics achievement in students is influenced by psychological factors such as Mathematics test anxiety. Mathematics test anxiety is a psychological dimension of learning that is important for educators to identify. Many students who perform poorly in mathematics worry while attempting to use mathematics skills to solve problems (Mohammed and Tarmizi, 2010). Marsh and Tapia (2012) found that students with low levels of

mathematics test anxiety feel more excited, more confident and highly motivated to learn mathematics when compared to students who have high anxiety levels.

Mathematics test anxiety refers to feelings of fear, avoidance and dread when dealing with any situation relating to mathematics test. Tobias (2015) defined Mathematics test anxiety as a feeling of tension and anxiety that appears when someone is engaged in the manipulation of figures to solve mathematical problems in both academic and daily-life situations. It is easy to forget mathematics equations and to lose confidence when one is experiencing high mathematics test anxiety. Mathematics test anxiety is found to be associated with beliefs. Mathematics education in Nigeria has persistently been experiencing one form of problem or the other, particularly in relation to the general poor achievements of students. According to him, such academic problems include students' unparalleled hatred, indifference, anxiety and poor attitude towards mathematics, teachers' dissatisfaction, and poor environment, non-availability of appropriate textbooks and poor method of teaching. Mathematics test anxiety is increasingly being seen as factors underpinning levels of motivation for academic achievement (Adeladun, 2018).

Anxiety as a global construct has been operationally defined in various ways by notable scholars. Adelodun (2018) looked at anxiety as a state of stress and tension, bordering on uneasiness and instability of the mind. Stone (2016) asserted that emotional difficulties caused by school generated anxiety are detrimental to students' learning. Adebule (2014) described anxiety simply as a summary description of a series of overt and covert actions. Tobias (2015) defines anxiety in mathematics as feelings of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situation. According to him, mathematics test anxiety can cause one to forget and lose one's self-confidence. It is very real and it occurs among many students. The question that readily comes to mind then is why students should experience anxiety in mathematics since mathematics is an important school subject which is associated with more academic and/or career opportunities. Okebukola (2017) indicated that anxiety level in mathematics class is high and that this leads to depression in achievement. Similarly, Burton (2013) related the importance of mathematics to the scientific, industrial, technological and social progress of a society. That mathematics is an important subject is undetectable. But it is very sad to note that many students' achievement in the subject in recent time is not encouraging. This however, can be attributed to the fact that majority of students have phobia for mathematics. Positive attitude towards mathematics is inversely related to anxiety in mathematics. Victims of anxiety in mathematics suffer from lack of preparation for a test as indicated by cramming the night before the examination, poor time management, failure to organize text information, poor study habit and worry about past achievement in examinations emanated from how friends and other students are doing and the negative consequences of failure (Penberthy, 2017). Test anxiety can affect the student by causing nervousness in terms of having difficulty in reading and understanding the questions on the examination paper. It also involves having difficulty retrieving key words and concepts when answering essay questions and doing poorly in the examination even though the student knows the material.

Studies by Kolawole (2018) noted that students have high mathematics test anxiety, poor attitude towards learning mathematics as well as poor achievement in mathematics in most secondary schools in Plateau State. The Federal Ministry of Education in conjunction with some organisations such as Cowbell PLC, Nigerian Mathematical Centre, Nigerian Colleges etc have been making efforts to improve students' achievement in mathematics through organizing mathematics competition and Olimpia but however, mathematical achievement still remains abysmally low in Nigerian secondary schools. When students fail mathematics, they become frustrated because they cannot be admitted for higher education. Students that would have been admitted into the university and become gainfully employed and useful to themselves, their parents and the nation in general may not be able to further their education due to poor achievement in mathematics. They cannot be admitted to read mathematics, mathematics related courses or other courses without a credit in mathematics. Since mathematics is a core subject in getting admission into higher institutions of learning, there is a need to device means of

improving students' achievement in the subject. It is on the basis of this research problem that this study is premised.

Research Objectives

The objectives of this study are as follows:

1. To determine the relationship between mathematics test anxiety and achievement of SS II students
2. To ascertain whether there is a significant difference in the mathematics test anxiety mean scores of male and female students
3. To investigate whether there is a significant difference in the mathematics achievement mean scores of male and female students

Hypotheses

The following hypotheses were formulated and were tested at 0.05 level of significance:

1. There is no significant relationship between mathematics test anxiety and achievement of SS II students
2. There is no significant difference in the mathematics test anxiety mean scores of male and female students
3. There is no significant difference in the mathematics achievement mean scores of male and female students

Methodology

The study adopted the correlational ex post facto survey. The study adopted the correlational research design because the study seeks to investigate the relationship between three variables; mathematics test anxiety, mathematics attitude and mathematics achievement among SS II students of Air-Force secondary schools in Jos. The population of this study consisted of all the SS II students in secondary schools in Jos. Presently, there are two Airforce secondary schools in Jos: Airforce Military School and Airforce Girls Comprehensive Secondary School. The Airforce Military School has a population of 221 SS II students while Airforce Girls Comprehensive Secondary School has a population of 254 SS II students. Therefore, the total population of this study consisted of 475 students for 2020/2021 academic session. The sample for this study consisted of 60% of the population, that is 285 with 152 students from Airforce Girls Comprehensive Secondary School and 133 students from Airforce Military School. Stratified proportionate sampling technique was used to select the sample of the students and the study made use of two instruments for data collection; Mathematics Test Anxiety Scale (MTAS) and Students' Mathematics Achievement Test.

The content validity of the instrument was ascertained through experts' validation. The instruments were given to two experts from Educational Psychology Unit and one expert from Research, Measurement and Evaluation unit at the University of Jos, to assess the content validity of the instruments in terms of comprehensiveness, appropriateness of items, clarity of expression and language for easy comprehension of information of the instruments by the respondents. To establish the reliability of internal consistency of the Mathematics Test Anxiety Scale (MTAS) and Students' Mathematics Achievement Test were administered on 50 other students aside the samples of the study. The Cronbach Alpha Correlation method was used to determine the internal consistency of the Mathematics Test Anxiety Scale (MTAS) and Students' Mathematics Achievement Test. The reliability coefficient of internal consistency of the Mathematics Test Anxiety Scale (MTAS) and Students' Mathematics Achievement Test were determined to be 0.81 and 0.89 respectively. This implies that the reliability of the instruments is appropriate for use in carrying out the research. The researcher personally visited the sampled schools and obtained permission from the school administrators of the schools to use their schools for the study. The Mathematics Test Anxiety Scale and Students' Academic Achievement Test were administered on the students and data was collected on the spot. The hypotheses were tested using Pearson Product Moment Correlation (PPMC) statistics and t-test statistics.

Results

Hypothesis One: There is no significant relationship between mathematics test anxiety and mathematics achievement of SS II students

Table 1: Pearson Correlation of Relationship between Mathematics Test Anxiety and Mathematics Achievement of SS II Students (N =285)

Variables		Correlations	
		Mathematics Achievement	Mathematics Test Anxiety
Mathematics Achievement	Pearson	1	-0.391
	Correlation Sig. (2-tailed)		0.00
Mathematics Test Anxiety	Pearson	-0.391	1
	Correlation Sig. (2-tailed)		

Table 1 shows the Pearson’s correlation statistic was calculated, $r = -0.39$, $df = 283$ P- value is 0.00 is less than 0.05, the null hypothesis is rejected because the test is significant. Therefore, there is a significant relationship between mathematics test anxiety and achievement of SS II students.

Hypothesis Two: There is no significant difference in the mathematics test anxiety mean scores of male and female students

Table 2: The Result of t-test for Difference between Mathematics Test Anxiety Mean Scores of Male and Female Students

Groups	N	\bar{X}	SD	Df	t. cal	t. crit.	Sig. Value
Male	133	65.31	8.83	283	1.35	1.66	0.05
Female	152	61.18	9.15				

Data on table 2 shows that the calculated value of t (1.35) is less than the critical value t (1.66) at $df = 283$. The null hypothesis was therefore retained. The conclusion was that there was no significant difference in the mathematics test anxiety level of male and female students.

Hypothesis Three: There is no significant difference in the mathematics achievement mean scores of male and female students

Table 3: The Result of t-test for Difference between Mathematics Achievement Mean Scores of Male and Female Students in Airforce Secondary Schools in Jos

Groups	N	\bar{X}	SD	Df	t. cal	t. crit.	Sig. Value
Male	133	41.27	6.28	283	1.619	1.66	0.05
Female	152	38.73	10.37				

Data on table 3 shows that the calculated value of t (1.62) is less than the critical value t (1.66) at $df = 283$. The null hypothesis was therefore retained. The conclusion is that there was no significant difference in the mathematics performance of students based on gender.

Discussion

The findings of the study revealed that high mathematics test anxiety leads to low academic achievement of students in mathematics. That is due to mathematics test anxiety, students find it difficult to solve mathematical

problems not because they don't know it but because of fear. This finding is in conformity with the findings of Bloom (2011) who discovered that mathematics test anxiety is a prevalent problem among high school students. Most students fail mathematics not because they don't know it but because of fear of mathematics as subject. The findings also corroborates the findings of Nkuuhe (2015) who discovered a significant relationship between mathematics test anxiety and low achievement in mathematics among Kenyan high school students.

It was further discovered from the findings of the study that both male and female students of Airforce secondary schools in Jos have moderate anxiety level. They also have average achievement in mathematics. This finding corroborates the finding of Busari (2011) who discovered an average mathematics test anxiety level among male and female students of secondary schools in Oyo State. The findings was however contradicted by Richardson and Suinn (2015) who discovered a poor mathematics achievement among high school students in Accra, Ghana. In addition, the findings of this study revealed that there was no significant difference in the attitude towards mathematics of male and female students in Airforce Secondary Schools in Jos and that both male and female students have positive attitude to learning mathematics. This finding however, contradicts the findings of Ezeudo (2015) who discovered that female students have negative attitude to learning mathematics in Eze-Igbo South Local Government Area of Enugu State.

The result of this study also revealed that there is a significant relationship between mathematics test anxiety and mathematics achievement of students in Airforce Secondary Schools in Jos. This finding is in conformity with the findings of Edward (2011) who discovered that mathematics test anxiety leads to lower students' achievement in mathematics.

The result of this study also revealed that there is no significant difference in the mathematics test anxiety levels of male and female SS II students. This implies that mathematics test anxiety level among students of Airforce Secondary Schools in Jos does not vary on the basis of gender. This finding contradicts the finding of Collins (2008) who discovered a significant difference in the mathematics test anxiety level of male and female high school students in Houston.

The findings of this study further revealed that there was no significant difference in the mathematics achievement of students based on gender. This finding is consonance with the findings of Nosa and Ohenhen (2008) who discovered that there is no significant relationship between gender and attitude of students towards mathematics. This implies that students' attitude to mathematics does not vary on the basis of gender.

Conclusion

From the findings of this study, it was concluded that mathematics test anxiety influences students' achievement in mathematics. That is, the higher the mathematics test anxiety level, the lower the students' achievement of students in mathematics. Therefore, there is need to devise means of reducing students' mathematics test anxiety level and improve their attitude towards learning mathematics in order to improve their academic achievement in mathematics.

Recommendations

The following recommendations were made in the light of the findings of the study:

1. Teachers and guidance counsellors should counsel students on ways of overcoming mathematics anxiety through high engagement and improved participation in the mathematics classroom
2. Teachers should use teaching strategies that will stimulate students' interest and encourage them to develop positive attitude to learning mathematics. Such teaching strategies should be demonstrative and involve much of the students' participation in the class.
3. Adequate instructional aids such as textbooks, audio-visual aids, abacus and other mathematics instructional materials should be made available in schools to make the teaching and learning of mathematics easier and captivating to students.

4. Only qualified teachers who are trained in mathematics should be recruited to teach the subject in schools. This will help reduce the rate of anxiety in mathematics class because of the competence of the teacher in teaching.

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