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Relationship Between Test Anxiety and Academic Performance of Secondary School Students in Mathematics

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Abstract

The study looked into i) the relationship that exists between test anxiety and secondary school students' academic performance in Mathematics. ii) Whether there is difference between the academic performances of students with high and low test anxiety levels in mathematics. Two research questions and two hypotheses guided the study. A correlation survey design was adopted. The study population consisted of 42,299 senior secondary two (SS2) students offering mathematics 2021/2022 in Delta State, Nigeria and 1,650 of those students were selected using a multistage sampling procedure. Mathematics Test Anxiety Questionnaire (MTAQ), which was validated by three experts, was used as the instrument for data collection which had Cronbach Alpha coefficient of 0.69. The students' achievement scores in Mathematics in SS1 for 2021/2022 session represent their performance scores in the subject. Pearson product moment correlation was used to analyze the collected data. The study's findings revealed there was a negative correlation and also majority of the students experienced high test anxiety. There was no significant connection between test anxiety and students' academic performance in mathematics. Also, there was a significant difference between students with high and low anxiety, and their academic performance in mathematics. In light of the findings, it was recommended among other things, that mathematics teachers, school guidance counsellors should make a concerted effort to reduce the test anxiety of their students through proper teaching and conditioning and modeling the behavior of the students for better mathematics performance.

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INTRODUCTION

Education is essential for a person's success in life since it equips one with the knowledge and abilities necessary for success, in addition to enhancing the youth of any nation's personality. In Nigeria, it was noted that certain students struggle with different learning issues related to their academic disciplines, which has a negative influence on their performance, particularly in mathematics (Ilo & Unachukwu, 2020). Therefore identifying the root cause and coming up with a

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solution to this issue of low performance critical and of significant interest to educationalists in general and mathematicians in particular.

Since mathematics is the foundation for many other subjects particularly the sciences, learning it is crucial for students as they become ready for their present and future careers. As a result, the mathematics curriculum, according to Dimarakis, Bobis, Way and Anderson (2014) equips students with foundational knowledge and abilities that are necessary and that they can use both within and outside of the classroom. According to Roohi (2012) mathematics is viewed as a discipline of science that works with numbers and their operations including calculation, computation, and solving of problem. Furthermore, according to Roohi, mathematics deal with study of amount, space, and structure. It also uncovers underlying patterns that help us comprehend the world around us. According to Taqiya and Juandi, (2023) as a tool, mathematics becomes crucial in influencing how people will develop in the future. The significance of mathematics was emphasized by Odumosu and Olusesan (2016) who argued that it teaches more than only the science of numbers that is taught in all schools and is either loved or feared by many students; rather, it is an essential nutrient for thought, logical reasoning, and advancement(Lestari, Syahbana & Retta, 2022).

. Despite the importance of mathematics and its inclusion in the Nigerian school curriculum, students' performance in internal and external examinations in the discipline was not encouraging. The academic performance of students in public examinations has decreased mathematics in particular. This is seen in the National Bureau of Statistics (2016–2018) report on the Delta state West African Examination Council (WAEC) results. The students' performance in this important area of study (Mathematics) has to be improved. Numerous factors, including teaching methods and strategies, inadequate primary school preparation, the nature of mathematics, test/examination anxiety, the subject phobia, and attitudes of both students and teachers toward the subject have been identified in the literature as contributing factors to poor mathematics performance in secondary school (Onoshakpokaiye, 2021).

. Test anxiety is one of the feelings that individuals go through in life. It happens when a person feels powerless over their life and experiences too many anxieties. With its physical, emotional, and social expressions, it is therefore seen as a prevalent psychological issue among people. Test anxiety is an illness of the mind that has an emotional impact on individuals and manifests itself in their daily lives as anxiety and restlessness (Olatoye, 2009). According to Barrows, Dunn, and Lloyd (2013), students who do badly may perceive challenging situations as threats and blame the results on their own undesirable internal characteristics. However test anxiety, is the term used to describe the excessive levels of distress that students experience when it negatively impacts their examination performance (Kendra, 2020). Some psychological elements, such as examination anxiety, have an effect on students' academic performance. According to Chapell et al (2005) and Kitsantas, Winsler, and Huie (2008), a tense response to the possibility of failure in formal testing settings on the cognitive, physiological, emotional, and behavioral levels is what defines test anxiety. Test anxiety is characterized by trembling, stress, and worrying over potential failure or poor performance during an examination or test.

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There are many factors that can contribute to students developing test anxiety, such as fright of failure, constant worry about the outcomes of failure, procrastination, past experiences and beliefs, students' poor study habits, inadequate subject knowledge, persistently poor performance, and lack of confidence in one's abilities. Test anxiety might occasionally get so bad that students quit school to get away from the thing they're afraid of (Kendra, 2020). Chapell et al in Myrna & Aida (2015), claim that anxiety in test is a significant factor in academic contexts and that it might have an effect on students' academic performance. When students take an examination or test of any kind, they may feel worried, anxious, apprehensive, or uneasy.

According to Myrna and Aida (2015), students who are less nervous when taking a test are better able to concentrate on the activities that are necessary for them, whereas students who are more worried when taking a test tend to pay more attention to their inner selves and the worry they are experiencing. They went on to say that test-anxious students could not do well since their focus is split between themselves and the test. Consequently, individuals with significant test anxiety can't focus entirely on the examination. Test anxiety is a psychological state when students display feelings of concern, dread, uncertainty, and helplessness before, during, or after a test, according to Olatoye and Afuwape in Chow and Bob (2013). According to Orakwue and Okigbo(2023), Balogun et al (2017) and Myrna and Aida(2015) test anxiety is a mental condition in which students feel intense tension, discomfort, and anxiety before, during, and after a test. These reactions can make it difficult for students to perform effectively, negatively impact their emotional, social, and behavioural growth, and affect how they feel about their school and themselves. According to Cowden in Chow and Bob (2013), students having high anxiety levels frequently exhibit low self-assurance in their capabilities to handle academic demands because they lack the necessary skills to succeed and consequently, lack control over their actions or are losing control over them.

Anxiety is sparked in students when they think that the evaluating situation, like an examination, is above their level of intelligence, drive, and social abilities. According to Myrna and Aida (2015), students with minimal test anxiety can pay more attention to the tasks that are necessary of them throughout the examination. High anxiety students continued to concentrate on their inner selves and their anxiety. Their performance is affected since they are paying attention to both the test and themselves at the same time. Bembenutty, referenced in Kitsantas, Winsler and Huie (2008), discovered that students who had high test anxiety levels performed worse than those who had lower levels of anxiety. They saw less adaptive task values and a decrease in cognitive learning techniques among students who experienced high test anxiety levels. According to Balogun et al. (2017), students who possess high test anxiety levels are more likely to have poor academic achievement. High test anxiety students are less effective at studying. Thus, these students do poorly in class because they are convinced that they would fail while writing a test. Student who exhibits minimal anxiety levels is not encouraged to develop an expectation of failure. Students with high levels of anxiety have this conditioning, in contrast to those with low anxiety levels. They think that they will always fail, regardless of how hard they study.

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Students' academic performance is hindered by test anxiety, and it can be disastrous when it exceeds an ideal level. Test anxiety should not exceed a desirable level for a student to perform well in any subject, but particularly in mathematics, since failure to do so may have an impact. According to Eduwem, Umoinyang and Otu (2017), mathematics anxiety means stress and anxiety that influence one's ability to manipulate numbers and solve mathematical problems in a range of real-world and academic contexts, which can cause one to forget and lose confidence. According to Eduwem et al. (2017), test anxiety develops when students don't adequately prepare for evaluation programmes and is a learned behaviour that may be unlearned.

A research by ILO and Unachukwu (2020) examined test anxiety as a predictor of academic achievement among students in secondary school in Anambra State. Through a multi-stage sampling approach, a sample of 943 SS2 students was chosen. The Test Anxiety Inventory (TAI) and students' performance in English language and mathematics tests were the instruments utilized to collect the data. Their findings showed that test anxiety predicts students' academic performance in English language and mathematics.

Yakubu, Bisandu, and Datiri (2019), used a correlation survey research design with a sample of 420 senior school three students (210 male and 210 female) selected through a simple random sampling procedure to examine the relationship between mathematics test anxiety and achievement of SS3 students in Kafanchan Educational Zone, Kaduna state, Nigeria. The Mathematics Test Anxiety Scale (MTAS) and Mathematics Achievement Scores (MAS) were instruments utilized to gather data. The results revealed that negative relationship exist between test anxiety and students' performance in mathematics.

An investigation of the connection between university students' examination anxiety and academic performance was carried out by Özgan, Karakılıç Binici, Ustaoglu and Ayhan (2019) in Ankara, Turkey. The study design used was a correlation. A random sampling procedure was utilized to choose 150 student samples, 114 of whom were female and 36 of whom were male. The study's findings revealed that there was no connection between test anxiety and performance. Additionally, the results demonstrated that students' high anxiety levels are unrelated to their performance.

Obioma and Obioma (2019) study investigated the correlation between levels of test anxiety and academic performance in secondary schools in the Igbo-Eze South local government area of Enugu, Nigeria. A correlation survey design was adopted. A sample of 320 students drawn from four secondary schools in Igbo-Eze South L.G.A., Enugu state, using a stratified random sampling procedure. The student Test Anxiety Inventory (TAI) and the students' annual cumulative scores in mathematics and English were the instruments utilized to collect the data. Study's findings revealed that test anxiety negatively correlated with students' academic performance, suggesting that as test anxiety rises, so does academic achievement.

Myrna and Aida (2015) conducted a study among students of the College of Education, Arts and Sciences, Lyceum of the Philippines University, Batangas City, Philippines, to ascertain the relationship that exist between test anxiety and students' performance in an aspect of mathematics, specifically in Algebra and Trigonometry. The chosen study design was descriptive correlation. A sample of

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120 students who took trigonometry in the second semester of the same year after taking algebra in the first semester was chosen. The test anxiety questionnaire and the results of the departmental examinations in algebra and trigonometry for the academic year 2013–2014 served as the main instruments. The results showed a significant connection between test anxiety in mathematics and mathematical performance. This suggests that a student's trigonometry ability may have an effect on their examination anxiety for mathematics. The findings indicated that test anxiety interferes with students' capacity to concentrate on their academic work, which has a detrimental impact on their marks.

Chukwu (2014) used a correlation survey research design and with sample of 388 senior students of secondary school two, 200 male and 188 female students selected through a multi-stage sampling procedure, to investigate the relationship between test-anxiety and academic achievement of senior secondary school students in geometry in 17 local government areas of Enugu state, Nigeria. The Mathematics Test Anxiety Scale (MTAS) and the Mathematics Achievement Test (MAT) were the instruments employed in the study. The findings showed a moderately favourable relationship between test anxiety and students' academic achievement in geometry.

Esuong, Uwase, and Udo (2002) quoted a research by Vogel and Collins that looked at the impact of anxiety on academic performance. The results showed that both students with high test anxiety and those with moderate anxiety performed worse academically. Additionally, the results showed that students with lower test anxiety levels did better on mathematics examinations. Additionally, Syokwaa, Aloka, and Ndunge's (2014) research revealed a relationship between anxiety levels and academic achievement as well as that excessive anxiety had a detrimental effect on the standard of academic results reported by students. On the basis of the aforementioned, it is crucial to establish if test anxiety is connected to secondary school students' academic performance in mathematics in Delta State, Nigeria.
The aim of the study was to investigate:

a. The relationship that exists between test anxiety and secondary school students' academic performance in Mathematics.
b. Whether there is difference between the academic performances of students with high and low test anxiety levels in mathematics.

Despite the government's efforts to enhance mathematics instruction and learning, students in secondary schools consistently perform in an inadequate manner. The unacceptable level of students' performance in mathematics has been attributed to a variety of causes, including: a lack of instructional resources, insufficient and unqualified mathematics teachers, student learning capacities, and more. Observations and studies have also revealed that despite much study being done and currently being done to determine how mathematics performance might be improved, a sizable portion of secondary school students continue to do poorly in the subject. According to data from the National Bureau of Statistics' (2016–2018) report on the WAEC results for Delta State, mathematics proficiency among students has not increased. This may be due to students' aversion, fear, or hatred of mathematics. Many secondary school students choose not to study mathematics or attend lessons in it. Some of them engage in examination malpractice while working with WAEC officials, and some parents even assist their children in passing mathematics examinations through unethical means. Due to these factors, students

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do not study for the mathematics examination, which ultimately results in poor mathematics performance. The following research questions were formulated to guide the study:

a. What is the relationship between test anxiety and secondary school students' academic performance in Mathematics?
b. What is the difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics?

RESEARCH METHOD

The correlation survey design was used in this study. According to Nworgu(2015), the study's design is acceptable since it aims to determine the association between two or more variables. All 42,299 senior secondary one (SS 2) students (20,730 males and 21,569 females) taking mathematics in the 466 public secondary schools spread over the 11 education zones in Delta state made up the study's population. 1650 Senior Secondary School students (771 male and 879 female) from 22 Senior Secondary Schools Two (SS2) in the 11 education zones of Delta State made up the study's sample for the 2021–2022 academic year. For the selection, a multi-stage sampling procedure was used.

The Mathematics Test Anxiety Questionnaire (MTAQ) was the instrument utilized to gather the data on students' cognitive test anxiety. (MTAQ) was adapted from the test anxiety scale developed by Dawood, Al Ghadeer, Mitsu, Almutary, and Alenezi (2016). The questionnaire was designed such that respondents may choose from four response options: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Students' mathematics results from the three terms of the academic year 2021–2022 were utilized to determine their academic performance. The validity of the instrument was ascertained by giving the draft to three experts along with the purpose of the study, scope, the research questions and hypotheses. The instrument (MTAQ) was administered to a similar group of 150 students in secondary schools in Delta State that was not part of the study.

Using Cronbach alpha statistics, the internal consistency of the MTAQ items was assessed, and the alpha coefficient value was 0.69. This value was deemed adequate, and the instrument was deemed trustworthy. In order to examine the data, Pearson Moment Correlation coefficient was employed. The significance of the association between the two important variables was determined using the t-test of correlation analysis to test the null hypotheses at 0.05 alpha levels. The interpretations of the correlation coefficient was guided by the criteria stipulated by Nworgu (2015). These are as follows: 0.01 to 0.30(-0.01 to -0.30) low positive (negative) correlation, 0.31 to 0.79(-0.31 to -0.79) moderate positive (negative) correlation and 0.80 to 1.00(-0.80 to -1.00) high positive (negative) correlation.

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

a. There is no significant relationship between test anxiety and secondary school students' academic performance in Mathematics
b. There is no significant difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics

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RESULTS AND DISCUSSION

Research Question 1:

What is the relationship between test anxiety and secondary school students' academic performance in Mathematics?

Table 1. Pearson r on the relationship between Secondary School Students' test anxiety and their academic performance in Mathematics.

Variable	N	R	r^2	r^2%	sig (2-tail)
Test anxiety-performance	1650	-0.064	0.0041	0.41	0.298

Test anxiety and students' academic performance in mathematics are moderately negatively correlated, according to table 1. The analysis of the data in table 1 reveals a bivariate relationship between test anxiety and students' academic performance in mathematics. According to the analysis, the two variables have a -0.064 correlation coefficient. This suggests that there is a moderate inverse association between test anxiety and students' academic performance in mathematics. The Pearson correlation value r of -0.064 suggests that test anxiety has an influence on academic performance that is less than 1%.

Research question 2

What is the difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics?

Table 2. Independent t-test analysis of students' levels of anxiety, percentages and their academic performance in mathematics (N = 1650)

Levels	N	Percentage	t-value	P-value
High test anxiety	1382	83.75		
			5.64	0.000
Low test anxiety	268	16.24		
Total	1650	100		

According to table 2 above, 1650 secondary schools students were sampled out of which 1382 students, or 83.75%, reported high test anxiety in mathematics, whereas 268 students, or 16.24%, had low test anxiety in that subject. This suggests that the majority of the students had major examination anxiety for mathematics.

Hypothesis one: There is no significant relationship between test anxiety and secondary school students' academic performance in Mathematics

Additionally, table 1 reveal that there is no correlation between mathematics students' test anxiety and academic performance since the significant value (Sig.2-tailed) of 0.298 is greater than the significant value of 0.05. The null hypothesis, which states that there is no connection between test anxiety and secondary school students' academic performance in mathematics, is thus accepted.

Hypothesis two: There is no significant difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics.

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The percentages achieved by students with high test anxiety in respect to their academic performance in mathematics were 83.75, which is higher than the percentage of students with low test anxiety (16.24), according to the data in table 2. It appears that there is a significant difference because the p-value (0.000) is smaller than the significant value of 0.05. Since there is significant difference in the academic performances of secondary school students with high and low test anxiety levels in mathematics, the null hypothesis which states that there is no significant difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics is rejected.

Relationship between Secondary school students' test anxiety and their mathematics academic performance

Table 1 revealed that the relationship between test anxiety and academic performance of mathematics students was not significant which implies that the null hypothesis which states that there is no significant relationship between secondary school students' test anxiety and their academic performance in mathematics is accepted. Since the null hypothesis is accepted, it indicates that there was no significant relationship between secondary school students' test anxiety and their academic performance in mathematics.

According to this study finding, it was revealed that there was no correlation between test anxiety and secondary school students' academic performance in mathematics. The findings of Ndirangu, Muola, Kithuka, and Nassiuma (2008) are consistent with the study findings; according to the authors, there was no significant correlation between test anxiety and students' academic performance in mathematics. It follows that students who display low levels of test anxiety may not necessarily do better in mathematics than those with high levels of test anxiety, since there was no significant correlation between secondary school students' test anxiety and their academic performance in mathematics. This implies that secondary school students' academic performance in mathematics may be influenced by other elements including intellect, educational resources, and discipline rather than examination anxiety.

The current study's findings concur with those of Özgan, Karakılıç, Binici, Ustaoglu, and Ayhan (2019), who found no significant relationship between test anxiety and students' academic performance. This suggests that secondary school students test anxiety levels, both high and low, are unrelated to their academic performance in mathematics. Contrary to the current study's findings, which showed no significant relationship between test anxiety and secondary school students' performance in mathematics, Obioma and Obioma (2019), Yakubu, Bisandu and Datiri (2019), and Myrna and Aida (2015) findings all found a relationship between test anxiety and academic performance of students in mathematics. It means that students with low levels of test anxiety may not do better than those with higher levels, and vice versa, for mathematics performance. Since examination anxiety in students does not affect how well they do in mathematics. So both low and high levels of examination anxiety may not have an impact on students' mathematics performance.

Contrary to the findings of the present study, which indicate that there was no significant relationship between secondary school students' test anxiety and

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performance in mathematics, Chukwu (2014), and ILo and Unachukwu(2020) findings revealed that there was a significant relationship between test anxiety and students' mathematics performance. Okorodudu and Ossai (2012) findings supported the study's findings that there was no significant relationship between test anxiety and secondary school students' performance in mathematics, which revealed no relationship between test anxiety and academic performance.

Difference between students with high and low test anxiety levels and their academic performance in mathematics

The null hypothesis, which claims that there is no significant difference between the academic performances of secondary school students with high and low test anxiety levels in mathematics, is rejected because table 2 showed that there was a significant difference between students with high and low test anxiety levels and their academic performance in mathematics. It suggests that there was a significant disparity in the academic performance of secondary school students in mathematics who had high and low test anxiety levels.

The results showed that students with low test anxiety perform better in mathematics than those with high test anxiety, which is consistent with Kitsantas, Winsler, and Huie's (2008) findings which states that students with higher levels of test anxiety performed less well than those with lower levels of anxiety. The results of a study conducted by Özgan, Karakılıç, Binici, Ustaoglu, and Ayhan(2019) to examine the relationship between test anxiety in university students and their academic performance revealed that high levels of anxiety among students are not related to academic performance, which is in disagreement with the findings of the current study.

According to the study by Vogel and Collins (2002) on the impact of anxiety on academic performance in Esuong, Uwase, and Udo (2022), students with high test anxiety as well as those with moderate anxiety demonstrated decreased academic performance. Their results also showed that students with low test anxiety levels scored better on mathematics examinations, which is consistent with the results of the current study.

CONCLUSION

The study's findings led the researcher to draw the conclusion that test anxiety among students in secondary schools and academic performance were related. Additionally, it was shown that there was a significant disparity in academic performance in mathematics between students with high test anxiety and low test anxiety levels.

RECOMMENDATIONS

The following suggestions are offered in light of the study's results and conclusion:

a. To lessen cognitive examination anxiety, mathematics teachers should make sure that test settings are favourable for secondary school students. Since there was no moderate or positive relationship between test anxiety and academic performance, the instructor should look into other possible causes of the students' poor mathematics performance.

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b. In order to reduce examination anxiety in students, which always results in increased anxiety and poor performance in mathematics among secondary school students, parents/guardians and school administration should collaborate. Teachers of mathematics should be given the resources they need through training in order to reduce their students' test anxiety and boost their confidence in the subject, which should enhance their academic performance. For the students' benefit, appropriate workshops and seminars should be planned to assist them cope with their examination anxiety.
c. Since connecting with or dealing with the students would help lessen students' test anxiety for mathematics, teachers, parents, and indeed all stakeholders should make it a point of responsibility to regard the students' test anxiety as being extremely essential.

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