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Influence of Test Anxiety and Test-Taking Skills on Secondary School Students' Academic Achievement in Mathematics in Anambra State: A Multiple Regression Study

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ABSTRACT

Educators must seek strategies to minimize test anxiety while enhancing test-taking skills to promote learning and improve academic achievement among secondary school students. This study examined test anxiety and test-taking skills as predictors of secondary school students' academic achievement in Mathematics in Anambra State. Five research questions guided the study and five hypotheses were tested. The study adopted a corelational research design. The population consisted of 4,767 (1,729 males and 3,038 females) Senior Secondary School Two (SS2) students from all the 44 public secondary (33 Co-educational and 16 single sex) schools in Nnewi Education Zone of Anambra State in 2023/2024 academic session. A sample of 400 Senior Secondary School Students (SS2) offering Mathematics in 16 out of the 44 Government owned secondary schools in the zone was selected purposively. Test anxiety Scale (TAS) and Test Taking Skills Scale (TTSS) were used for data collection. These instruments were validated by three experts and tested for reliability. Cronbach alpha was used to establish the reliability of TAS and TTSS which yielded reliability indices of 0.86 and 0.71 respectively. Ordinary Least Square simple and multiple regressions using Statistical Package for Social Sciences (SPSS) version 26 were used to answer the research questions and test the hypotheses at 0.05 level of significance. The findings of the study revealed among others that there was a positive prediction between test anxiety and secondary school students' poor academic achievement in Mathematics. Also, there was a low prediction of male and female students' high academic achievement by their test anxiety in Mathematics. The study recommended among others that Mathematics teachers and school guidance counselors should make concerted efforts to reduce test anxiety and improve test-taking skills among students through proper teaching and conditioning and modeling the behaviour for better Mathematics performance.

Keywords: Test anxiety, Test-taking skills, Academic achievement, Gender, and Mathematics

INTRODUCTION

Mathematics is the study of numbers, quantities, structures, space, and change. It involves logical reasoning, problem-solving, and abstract thinking to analyze patterns and relationships. Mathematics is broadly classified into pure Mathematics, which focuses on theoretical concepts, and applied Mathematics, which is used in real-world problem-solving. The importance of Mathematics cannot be under-estimated as it is essential in physics, engineering, computer science, and data science; develops analytical reasoning and structured thinking among students; used in banking, actuarial science, and risk analysis; and helps in budgeting, measurements, and logical decision-making (Ashcraft & Krause, 2022). Despite the significance of Mathematics for students, the persistent low achievement in external examinations like the West African Senior School Certificate Examination (WASSCE) remains a concern for the students, teachers and educators. According to the Chief Examiner's Report (2024), the percentage of students who attained a credit level in Mathematics ranged from 33.37% to 35.66% between 2013 and 2016. However, there was a notable improvement between 2017 and 2019, with pass rates increasing to between 37.6% and 40.5%. In 2020, performance declined to 38.2%, largely due to disruptions in schooling caused by the COVID-19 pandemic. Nevertheless, student achievement improved in 2021 and 2022, reaching 42.13% and 47.19%, respectively. However, in 2023, performance dropped again to 43.7%, highlighting an issue that requires urgent attention.

Mathematics is widely regarded as the most challenging subject among secondary school subjects. Many Nigerian students struggle with understanding its various concepts, memorizing formulas, solving problems, and applying mathematical principles in real-life situations. It appears that students tend to perform better in other science subjects compared to Mathematics. According to the WAEC Chief Examiner's Report (2024), the percentage of students who obtained a credit pass was 85% in Biology, 93.3% in Chemistry, 89.5% in Physics, and 50.9% in Mathematics. This persistent, inconsistent, and unsatisfactory performance in Mathematics has raised concerns among researchers, yet efforts to pinpoint and address the underlying causes have largely been unsuccessful (Ayodele & Adeola, 2020).

Several studies have identified various reasons for students' poor performance in Mathematics compared to other subjects, including the abstract nature of certain mathematical concepts, students' lack of comprehension, and the ambiguity of some mathematical terminologies (Esomonu & Okeaba, 2021; Okoi & Esomonu, 2021). Additionally, student-related factors may contribute to this underachievement. As highlighted by Anikpe, Agu, and Ikeanumba (2024), factors such as poor study habits, students' attitudes, test anxiety, academic self-concept, achievement motivation, learned helplessness, achievement goal orientation, academic motivation, academic self-resilience, academic self-confidence, and test-taking skills, among others, can influence performance. However, the current study will specifically examine test anxiety and test-taking skills, assessing their predictive influence on students' academic achievement in Mathematics.

Test anxiety is a subjective feeling of tension, apprehension, nervousness, fear and worry when faced with a test/examination. Mathematics Test Anxiety, according to Nandhini and Subramanian (2021), is defined as feeling of anxiousness that one cannot perform efficiently in situations that involve the use of Mathematics. Test anxiety is a psychological concern that could motivate cheating in academic engagements, including examinations, presentations, and debates in subjects such as Mathematics (Nnaji, 2022). Research suggests that examination anxiety increases at the thought of the examination (Lotz and Sparfeld, 2017), thus divulging most students to sharp practices to cope with the outcomes. Because, many students experience some degree of stress and anxiety before and during examination, test anxiety can actually impair learning and affect Mathematics examination achievement negatively. Test anxiety is a situation of uneasiness, worry or feeling of

uncertainty about impending or on-going evaluation programme, like examination. It is an undesirable reaction toward examination or evaluation. In situations where the pressure is on and a good performance count, students can become so anxious that they are actually unable to do their best (Morin, 2023). Anikpe, Agu and Ikeanumba (2024) opined that the fear of examination or test can become so intense that it actually interferes with students' abilities to perform well. Students with high level of test anxiety have high possibility or tendency to achieve poor academically which could also affect their test-taking skills in examination in Mathematics unlike students with low level of test anxiety. Students who have little or no form of anxiety in Mathematics can reduce their feelings of anxiousness and increase their test-taking skills to excel in examinations.

Test-taking skills are skills employed by a test-taker in responding to test questions. This occurs in the test halls and when the test has commenced. Test-taking skills refer to techniques adopted by test-takers to meaningfully respond to test items. Ogene and Agu (2023) opined that test-taking skills are the processes consciously adopted to aid a test-taker in producing a correct answer responsibly. Ayodele and Adeola (2020) added that these skills include: time management, investigating questions before responding, starting with easy questions, checking and reviewing answers, taking note of keywords and concepts in questions, ruling out wrong options. If educators are really interested in improving the quality of education, proper attention should be paid to test anxiety and test-taking skills as these variables under study play critical roles in students' academic achievement.

Academic achievement according to Berkley and Chang (2022) refers to the extent to which a student, teacher or institution has attained the short or long-term educational goals. It describes academic outcomes that indicate the extent to which a student has achieved their learning objectives (Inyang, 2022). Achievement is often measured through a standardized or teacher made test and often denote a students' grade in an examination or test. To improve students' achievement, there is a general agreement among researchers and authors that teacher must adopt innovative teaching methods that centre instruction on the students. Nwuba (2021) defined it as the gain in knowledge of a student which occurs as a result of taking part in a learning activity or programme. Hence, academic achievement maybe defined as a statistic report of a student's achievement in an engaged educational (academic) programme. Most studies carried out in Nigeria have asserted that academic achievement of learners depend mostly on learners' hard work and interaction between other personal (psychological) and environmental variables involved in the learning process. Academic achievement as explained by Okafor, Obi and Oguzie (2018), is how well an individual has done in his cognitive tasks. The authors further explained that it is the general ability of students regarding their performance in school subjects compared to a specified standard called 'pass mark'. In addition, academic achievement refers to the observed and measured aspects of a student's mastery of skills and subject contents as measured with valid and reliable tests (Mbaegbu, 2017). Academic achievement is usually employed to describe an individual's achievement in subjects taught and tested in schools. It also refers to the level of education ultimately attained by an individual. Esomonu and Ikeanumba (2021) observed that students with high academic achievement are predisposed to feel more convinced and satisfied than those with poor academic achievement. Also students who obtain higher academic achievement tend to feel more confident, whereas those who lack confidence in themselves record low academic achievement. The differences in academic achievements of students can be attributed to various factors like intelligence, creativity, self-esteem, cognitive style, achievement motivation, instructional strategy, self-efficacy, gender, personality and many others (Sharma and Pooja, 2018). In this study therefore, the prediction of academic achievement as regards to students' personal variables such as test anxiety and test-taking skills in Mathematics as it relates to gender were studied.

Gender refers to social construct regarding culture-bond conventions, roles and behaviours as well as relations between and among women and men, boys and girls (Okoli and Osuafor, 2020). Gender is defined as the behavioural, cultural, or psychological traits typically associated with one sex (Galle, Audi and Egya, 2024). Gender is a socially constructed term depicting the system of relations between males and females, and designates behaviours, attitudes, roles, status and other processes that govern relationship among sexes in a given educational, socio-economic and political context (Esomonu and Ikeanumba, 2021). It is a social construct that differentiates male and female in the society. Nwuba, Egwu and Osuafor (2022) defined gender as simply an attribute ascribed to male and female based on biological characteristics. In the context of Education, gender issues are referred to as the difference, both real and perceived, between boys and girls in opportunities and the direction of achievement for either males or females (Mbaegbu, Ikeanumba and Anazodo, 2023). Apart from gender, the interaction of the identified variables may also predict the academic achievement of students in Mathematics.

These psychological characteristics or variables of students (test anxiety and test-taking skills) may also interact in a number of ways to influence students' achievement. Studies have been conducted showing how these variables separately predict students' academic achievement. Ayodele and Adeola (2020) carried out a research on test-taking strategies used before and during test and the academic performance of Secondary School Students in Chemistry tests and also the relationship between test-taking strategies before test and students' academic performance in Chemistry; Shafiq, Erum and Muhammad (2021) conducted a research to explore the effects of test anxiety on student's academic achievement at secondary school level in Lahore. Most of these studies were done based on correlation or simple linear regressions. These approaches are not capable of determining prediction of the students' achievement by the independent variables in Mathematics as it involves more than one independent variable and one dependent variable. As a result of limited number of studies exploring how the combined effects of psychological factors such as test anxiety and test-taking skills may influence academic achievement in Mathematics, the researchers investigated the predictive relationship between secondary school students' personal variables of test anxiety and test-taking skills and their academic achievement in Mathematics using multiple regressions within the Nnewi Education Zone, Anambra State. The main purpose of this study was to examine test anxiety and test-taking skills as predictors of secondary school students' academic achievement in Mathematics in Anambra State.

Research Questions

The following research questions guided the study

1. What is the predictive power of test anxiety on secondary school students' academic achievement in Mathematics?
2. To what extent does test anxiety predict male and female secondary school students' academic achievement in Mathematics respectively?
3. What is the predictive power of test-taking skills on secondary school students' academic achievement in Mathematics?
4. To what extent do test-taking skills predict male and female secondary school students' academic achievement in Mathematics respectively?
5. Do test anxiety and test-taking skills jointly predict secondary school students' academic achievement?

Hypotheses

The following hypotheses were tested at 0.05 level of significance

1. The predictive power of test anxiety on secondary school students' academic achievement in Mathematics is not significant.
2. Test anxiety does not significantly predict male and female secondary school students' academic achievement respectively.
3. The predictive power of test-taking skills on secondary school students' academic achievement in Mathematics is not significant.
4. Test-taking skills do not significantly predict male and female secondary school students' academic achievement in Mathematics respectively.
5. Test anxiety and test-taking skills do not jointly predict secondary school students' academic achievement significantly.

RESEARCH METHOD

The study adopted a corelational research design. The population consisted of 4,767 (1,729 males and 3,038 females) Senior Secondary School Two (SS2) students from all the 44 public secondary (33 Co-educational and 16 single sex) schools in Nnewi Education Zone of Anambra State in 2023/2024 academic session. A sample of 400 Senior Secondary School Students (SS2) offering Mathematics in 16 out of the 44 Government owned secondary schools in the zone was selected purposively. Test anxiety Scale (TAS) and Test Taking Skills Scale (TTSS) were used for data collection. These instruments were validated by three experts and tested for reliability. Cronbach alpha was used to establish the reliability of TAS and TTSS which yielded reliability indices of 0.86 and 0.71 respectively. Ordinary Least Square simple and multiple regressions using Statistical Package for Social Sciences (SPSS) version 26 were used to answer the research questions and test the hypotheses at 0.05 level of significance.

RESULTS AND DISCUSSION

Research Question 1: What is the predictive power of test anxiety on secondary school students' academic achievement in Mathematics?

Table 1: *Linear Regression Analysis on the Predictive Value of Test Anxiety on Academic Achievement of Secondary School Students in Mathematics*

Model	R	R Squared	Adjusted R Squared
1	.424	.847	.845

Data in Table 1 indicated a positive relationship between test anxiety and secondary school students' poor academic achievement in Mathematics. This is shown by the calculated r of .424 and the calculated R^2 of .847 indicating that 85% of the variance observed on the secondary school students' academic achievement in Mathematics was accounted for by their test anxiety. This means that an increase in test anxiety predicted low academic achievement of secondary school students in Mathematics in Nnewi Education Zone of Anambra State.

Research Question 2: To what extent does test anxiety predict male and female students' academic achievement in Mathematics respectively?

Table 2: *Linear Regression Analysis on the Predictive Power of Test Anxiety on Academic Achievement of Male and Female Secondary School Students in Mathematics*

Gender	Model	R	R Squared	Adjusted R Squared	Fchange	Std. Error of the Estimate
Male	1	0.26[a]	.510	.512	.420	6.64204
Female	1	0.24[a]	.472	.637	.822	6.37861

a. Predictor: (Constant), Test Anxiety in Mathematics

The regression analysis presented in Table 2 examined the relationship between the test anxiety of male and female students and their achievement in Mathematics. The table displayed the linear regression model of Mathematics acquired for 127 male and 273 female Mathematics students. The data demonstrated that there is a low positive correlation of 0.26 between the test anxiety of male students and their achievement in Mathematics. This indicated a relatively low positive prediction, with a coefficient of determination (r^2) of 0.510 indicating that 51.0% of the variance observed on male students' academic achievement was predicted by their test anxiety. Furthermore, there exists a low positive correlation of 0.24 between the test anxiety of female students and their achievement in Mathematics. This correlation suggested a somewhat low prediction, with a coefficient of determination (r^2) of 0.472 indicating that 47.2% of the variance observed on female students' academic achievement was predicted by their test anxiety. These findings suggested that male students' test anxiety is not a significant predictor of high academic achievement compared to female students in Nnewi Education Zone of Anambra State.

Research Question 3: What is the predictive power of test-taking skills on students' academic achievement in Mathematics?

Table 3: *Linear Regression Analysis on the Predictive Value of Test-Taking Skills on Academic Achievement of Secondary School Students in Mathematics*

Model	R	R Squared	Adjusted R Squared
1	.820	.6724	.670

Data in Table 3 indicated a positive high prediction between test-taking skills and secondary school students' academic achievement in Mathematics. This is shown by the calculated r of .820 and the calculated R^2 of .6724 indicating that 67.24% of the variance observed on the secondary school students' academic achievement in Mathematics was accounted for by their test-taking skills. This means that an increase in test-taking skills predicted better academic achievement of secondary school students in Mathematics in Nnewi Education Zone of Anambra State.

Research Question 4: To what extent do test-taking skills predict male and female students' academic achievement in Mathematics respectively?

Table 4: *Linear Regression Analysis on the Predictive Power of Test-taking Skills on Academic Achievement of Male and Female Secondary School Students in Mathematics*

Gender	Model	R	R Squared	Adjusted R Squared	Fchange	Std. Error of the Estimate
Male	1	.539[a]	.291	.292	.311	20.001
Female	1	.519[a]	.269	.255	.391	17.932

a. Predictor: (Constant), Test-Taking Skills in Mathematics

The regression analysis presented in Table 4 examined the relationship between the test-taking skills of male and female students and their achievement in Mathematics. The table displayed the linear regression model of Mathematics acquired for 127 male and 273 female Mathematics students. The data demonstrated that there is a positive moderate prediction of 0.539 between the test-taking skills of male students and their achievement in Mathematics. This indicated a relatively good prediction, with a coefficient of determination (r^2) of 0.291 indicating that 29.1% of the variance observed on male students' academic achievement was predicted by their test-taking skills. Furthermore, there exists a moderate positive prediction of 0.519 between the test-taking skills of female students and their achievement in Mathematics. This suggested a somewhat good prediction, with a coefficient

of determination (r^2) of 0.269 indicating that 27.0% of the variance observed on female students' academic achievement was accounted for by their test-taking skills. These findings suggested that male students' test-taking skill is a significant predictor of high academic achievement compared to female students in Nnewi Education Zone of Anambra State.

Research Question 5: Do test anxiety and test-taking skills jointly predict students' academic achievement?

Table 5: *Linear Regression Analysis on the Joint Predictive Power of Test Anxiety, and Test-Taking Skills on Academic Achievement of Male and Female Secondary School Students in Mathematics*

Model	R	R Squared	Adjusted R Squared
1	.493	.243	.241

Data presented in Table 5 indicated a positive relationship test anxiety and test-taking skills on secondary school students' academic achievement in Mathematics. This is shown by the calculated r of .493. The calculated R^2 of .243 also indicates that 24% of the variance observed on the academic achievement of students in Mathematics was accounted for by the combined effect of their test anxiety and test-taking skills in Nnewi Education Zone of Anambra State.

Hypothesis 1: The predictive power of test anxiety on secondary students' academic achievement in Mathematics is not significant.

Table 6: *Multiple Regression Analysis on the Significant Prediction of Test Anxiety on Secondary School Students' Academic Achievement in Mathematics*

Model	Sum of Squares	df	Mean Square	F	t-cal	Sig.
Regression	16.463	1	16.463			
				44.427	-6.665	.000
Residual	333.878	399	.371			
Total	350.341	400				

Data in Table 6 revealed that test anxiety significantly predict secondary school students' low academic achievement in Mathematics. This is shown by the F- value of 44.427 which is significant at 0.000 level and also significant at 0.05 level of probability. This is further shown by the calculated t value of -6.665 which is also significant at .000 and at 0.05 level. Therefore, the null hypothesis that the predictive power of test anxiety on secondary students' academic achievement in Mathematics is not significant was rejected and the alternate hypothesis retained. Thus, test anxiety is a significant predictor of secondary school students' negative academic achievement in Mathematics in Nnewi Education Zone of Anambra State.

Hypothesis 2: Test anxiety does not significantly predict male and female students' academic achievement respectively.

Table 7: *Regression Analysis of the Prediction of Male and Female Students' Test Anxiety on Academic Achievement in Mathematics*

Gender	Model	Unstandardized Coefficients	Standardized Coefficients		t	Sig
		B	Std. Error	Beta		
Male	Test Anxiety	.314	.484	.0708	.518	-.644

Female	Test Anxiety	.330	.340	.0610	.333	-.341

Table 7 shows the result of the regression analysis of the prediction of male and female students' test anxiety on academic achievement in Mathematics. The analysis shows a significant prediction for male and female students respectively F(1, 126) = .420, P > 0.05, Adj. R^2 = .003, R^2 change = .003; F(1, 272) = .941, P > 0.05, Adj. R^2 = .005, R^2 change .005. The analysis shows that male (β = 0.26, t = .518, P > 0.05) and female (β = 0.24, t = .333, P > 0.05) in Mathematics, hence, hypothesis 2 was not rejected. This implies that male and female secondary students' academic achievements in Mathematics were not significantly predicted by test anxiety in Nnewi Education Zone of Anambra State.

Hypothesis 3: The predictive power of test-taking skills on secondary students' academic achievement in Mathematics is not significant.

Table 8: *Multiple Regression Analysis on the Significant Prediction of Test-Taking Skills on Secondary School Students' Academic Achievement in Mathematics*

Model	Sum of Squares	df	Mean Square	F	t-cal	Sig.
Regression	54.003	1	54.003	164.193	12.814	.000
Residual	296.338	399	.329			
Total	350.341	400				

Data in Table 8 revealed that test-taking skills significantly predicted secondary school students' high academic achievement in Mathematics. This is shown by the F- value of 164.193 which is significant at 0.000 level and also significant at 0.05 level of probability. This is further shown by the calculated t value of 12.814 which is also significant at .000 and at 0.05 level. Therefore, the null hypothesis that the predictive power of test-taking skills on secondary students' academic achievement in Mathematics is not significant is rejected and the alternate hypothesis upheld. Thus, test-taking skill is a significant predictor of secondary school students' high academic achievement in Mathematics in Nnewi Education Zone of Anambra State.

Hypothesis 4: Test-taking skills do not significantly predict male and female students' academic achievement respectively.

Table 9: *Regression Analysis of the Prediction of Male and Female Students'* Test-Taking Skills *on Academic Achievement in Mathematics*

Gender	Model	Unstandardized Coefficients	Standardized Coefficients		t	Sig
		B	Std. Error	Beta		
Male	Test-Taking Skills	.355	.477	.573	.081	-.234
Female	Test-Taking Skills	.331	.412	.671	.111	-.227

Table 9 shows the result of the regression analysis of the prediction of male and female students' test-taking skills on academic achievement in Mathematics. The analysis shows a significant model summary for male and female students respectively F(1, 126) = .311, P < 0.05, Adj. R^2 = .003, R^2 change = .003; F(1, 272) = .391, P < 0.05, Adj. R^2 = .005, R^2 change .005. The analysis shows that male (β = .539, t = .081, P > 0.05) and female (β = .519, t = .111, P < 0.05), hence, hypothesis 4 was rejected. This implies that male and female

secondary students' academic achievements in Mathematics were significantly predicted by test-taking skills in Nnewi Education Zone of Anambra State.

Hypothesis 5: Test anxiety and test-taking skills do not jointly predict students' academic achievement significantly.

Table 10: *Multiple Regression Analysis on the Significant Joint Prediction of Test Anxiety and Test-Taking Skills on Secondary School Students' Academic Achievement in Mathematics*

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	85.308	1	17.362	96.456	.000
Residual	265.033	399	.295		
Total	350.341	400			

Data in Table 10 showed that test anxiety and test-taking skills significantly predict academic achievement jointly in Mathematics. This is shown by the F- value of 96.456 which is significant at 0.000 level and also significant at 0.05 level of probability. Therefore, the null hypothesis which states that test anxiety and test-taking skills do not significantly predict academic achievement of secondary school students in Mathematics is rejected in Nnewi Education Zone of Anambra State.

Discussion of Findings

Findings from research question one indicated a positive low prediction between test anxiety and secondary school students' academic achievement in Mathematics. The findings also revealed that 85% of the variance observed on the secondary school students' poor academic achievement in Mathematics was accounted for by their test anxiety. This could be as a result of their anxiety or anxiousness before and during Mathematics examination. The finding of the study was in agreement with the findings of Okigbo and Onoshakpokaiye (2023) who revealed a low prediction between test anxiety and academic achievement in Mathematics. In addition, the study of Merzaq, *et al.,* (2023) agreed with the findings of the current study as their findings revealed a low prediction between test anxiety and high academic achievement. The findings of Nwafor, Eke and Ibe (2023) and Wale, Ijale and Samson (2023) were in conformity with the current study as their findings revealed a negative correlation between academic performance and test anxiety. In addition, there was no correlation between test anxiety and academic performance of students in Chemistry. More so, the findings of research question two revealed a low positive prediction of male and female students' academic achievement by their test anxiety in Mathematics. This means that test anxiety of male and female students did not predict their academic achievement in Mathematics. The findings of Okigbo and Onoshakpokaiye (2023) agreed to this as their result revealed a low prediction of students' academic achievement by their test anxiety in Mathematics. The findings of this study was also in consonant with the findings of Fullido (2023); Hameed, et al (2023); Okobia and Oji (2021) and Rehman, Javed and Abiodullah (2021) whose studies revealed a low or negative prediction between male and female students' academic achievement and their test anxiety in different subjects. Findings from hypothesis one revealed that test anxiety significantly predict secondary school students' poor academic achievement in Mathematics. The null hypothesis that the predictive power of test anxiety on secondary students' academic achievement in Mathematics is not significant is rejected and the alternate hypothesis accepted. Thus, test anxiety is not a significant predictor of secondary school students' high academic achievement in Mathematics. This result conforms to the findings of Merzaq, *et al* (2023) who revealed a significant prediction of students' poor academic achievement by their test anxiety. This was also in agreement with

the findings of Rehman, et al., (2021), Apiah, *et al*., (2021), and Mittu and Nandana (2020) whose studies revealed a negative prediction between test anxiety and high academic achievement of students. Findings from hypothesis two revealed that male and female secondary students' academic achievements in Mathematics were not significantly predicted by their test anxiety. The findings of this study is in line with Okigbo and Onoshakpokaiye (2023), who posited from the findings of their study that gender is insignificant in moderating the relationship between students' test anxiety and their academic achievement in Mathematics. Again, the findings of Fullido (2023); Hameed, et al (2023); Okobia and Oji (2021) and Rehman, Javed and Abiodullah (2021) revealed a significant prediction between male and female students' test anxiety and their poor academic achievement. The findings of Obioma and Ogbu (2019) also agreed with the findings of the current study. This could be because as test anxiety increases, students' high academic achievement in Mathematics reduces, vice versa.

Findings from research question three revealed a positive relationship between test-taking skills and secondary school students' academic achievement in Mathematics. This is shown by the calculated r of .820 and the calculated R^2 of .048 indicating that 5% of the variance observed on the secondary school students' academic achievement in Mathematics was accounted for by their test-taking skills. The result of the current study agreed with the findings of Adeosun and Okonkwo (2024) which revealed a positive relationship between test-taking skills and academic performance of students in Mathematics. The findings of Fasoranti (2022) and Dixon and Erinosho (2020) also revealed a positive relationship between test-taking skills and students' academic achievement which conforms to the result of the current study. In addition, the findings of the current study agreed with the result of Okolo and Kolawola (2021) which revealed a positive relationship between students' test-taking skills and their academic achievement. More so, findings from research question four revealed that male and female students' academic achievement in Mathematics were predicted by their test-taking skills. This conforms to the findings of Adeosun and Okonkwo (2024), and Ayodele and Adeola (2020) that gender is significant in moderating the relationship between students' test-taking skills and their academic achievement in school subjects. Findings from hypothesis three revealed that test-taking skills significantly predicts secondary school students' academic achievement in Mathematics. This is shown by the F-value of 164.193 which is significant at 0.000 level and also significant at 0.05 level of probability. This is further shown by the calculated t value of 12.814 which is also significant at .000 and at 0.05 level. Therefore, the null hypothesis that the predictive power of test-taking skills on secondary students' academic achievement in Mathematics is not significant is rejected and the alternate hypothesis upheld. Thus, test-taking skill is a significant predictor of secondary school students' academic achievement in Mathematics. This finding is in agreement with the results of Adeosun and Okokwo (2024) and Dixon and Erinosho (2021) whose studies revealed a positive significant relationship between test-taking skills and academic achievement of students. Result from hypothesis four also revealed that male and female secondary students' academic achievements in Mathematics were significantly predicted by their test-taking skills. This agreed with the findings of Okolo and Kolawola (2021) whose findings revealed that gender is significant in moderating the relationship between students' test-taking skills and their academic achievement in Mathematics.

Findings from research question five revealed a positive relationship test anxiety and test-taking skills on secondary school students' academic achievement in Mathematics. This is shown by the calculated r of .493. The calculated R^2 of .244 also indicates that 24% of the variance observed on the academic achievement of students in Mathematics was accounted for by the combined effect of their test anxiety and test-taking. Also, findings from hypothesis five revealed that test anxiety and test-taking skills significantly predict academic

achievement jointly in Mathematics. These are in consonance with the findings of Okigbo and Onoshakpokaiye (2023), Hameed, et al., (2023), Okonkwo, Ekweoba and Okemmiri (2023) and Adeosun and Okonkwo (2024) who revealed a positive joint prediction between test anxiety and test-taking skills on students' academic achievement. Their findings also revealed a significant positive joint prediction between test anxiety and test-taking skills on students' academic achievement.

CONCLUSION

This study established the predictive power of academic achievement in Mathematics by students' test anxiety and test-taking skills separately and jointly. Based on the findings from the result, it can be concluded that the investigated test anxiety predicted students' poor academic achievements in Mathematics while test-taking skills predicted students' high academic achievement. However, the prediction for test-taking skills on high academic achievement of secondary school students was significant except for test anxiety. The study further concluded that gender influence was not significant in the prediction of achievement by test anxiety except for test-taking skills in Mathematics. These findings indicated that students' test anxiety negatively affected their academic achievement while test-taking skills positively affects their academic achievement in Mathematics in Nnewi Education Zone of Anambra State.

RECOMMENDATIONS

The following recommendations were made for the study;

1. Mathematics teachers, school guidance counselors should make concerted efforts to reduce test anxiety and improve test-taking skills among students through proper teaching and conditioning and modeling the behaviour for better Mathematics performance.
2. Interventions and support systems targeting the issue of test anxiety should be implemented as well as provide support to enhance students' overall well-being so as to improve their academic achievement.
3. Students should be given adequate orientations through workshops to update them on the use of test-taking skills before and during examinations.
4. Government and education stakeholders should organize workshops, seminars and conferences for teachers to educate them on the need to help students reduce test anxiety and improve their test-taking skills by engaging them actively in class activities.
5. Mathematics teachers should integrate the teaching of testing skills as part of classroom instructional activities in order to support the students, especially weak ones, through constant practice and regular engagement with learning materials.

REFERENCES

Adeosun, P. K. and Okonkwo, N. O. (2024). Cognitive load and test-taking skills as correlates of academic performance in Mathematics of Joint Universities Preliminary Examinations Board science students, University of Benin. *NIU Journal of Social Sciences*, 10(2), 107-113

Anikpe, K.L., Agu, N.N. & Ikeanumba, C.B. (2024). Influence of personal variables on examinations cheating tendencies among secondary school students in Anambra State: A path analytical study. *Unizik Journal of Educational Research and Policy Studies*, 17 (3), 182-195

Ashcraft, M. H., & Krause, J. A. (2022). *Mathematical cognition and learning: Understanding numerical abilities*. Academic Press.

Ayodele, C.S. & Adeola, A.M. (2020). Test-taking strategies and secondary school students' academic performance in Chemistry in Ekiti State, Nigeria. *IOSR Journal of Research and Method in Education (IOSR-JRME),* 10 (1), 10-16.

Berkley, C. & Chang, L (2022). *Is your memory norm*al? WEB MD website. Retrieved from http://www.webmd.com/alzheimers/features/is-your-memory normal. on 2/2/2022.

Dixon, O.O. & Erinosho, S.Y (2020). How do test type and test-taking skills affect Mathematics performance among high school students: A Nigerian Example. *International Journal for Cross-Disciplinary Subjects in Education (IJCDSE),* 11(2), 4286-4293

Esomonu, N. P. M., & Okeaba, J. U. (2021). Estimating measurement error and score dependability of the Inventory for Students' Integration into the University Academic Culture (ISIUAC) Using Generalizability Theory. *Rivers State University Journal of Education*, *24*(1), 35-46.

Esomonu, N.P.M & Ikeanumba, C.B. (2021). Effect of formative assessment on academic achievement of postgraduate students in advanced educational statistics in public universities in southeast, Nigeria. *International Journal of Advanced Education and Research,* 6(4), 05-11

Fullido, I.D. (2023). Understanding the influence of test anxiety on the academic performance of public high school learners: A convergent parallel approach. *Southeast Asian Journal of Multidisciplinary Studies,* 3(1), 1-24

Galle, S. A, Audi, A. A., & Egya, U. S. (2024). Effect of Realia Material on achievement of social studies Upper Basic II students in Nyanya-Abuja FCT. *International Journal of Innovation Research and Advanced Studies*, 4(2), 43-53.

Hameed, K. H., Channa, T. A., Khan, A. A., Khan, S. ., Sarwar Rana, M. ., Gayantri , G. ., Arif, T. ., & Timmer, I. . (2023). Assessment of test anxiety and its correlation with academic performance among undergraduate students: Assessment of test anxiety. *Pakistan Journal of Health Sciences*, *4*(08), 38-42.

Inyang, H. (2022). *School location and students' academic performance in Biology.* Retrieved from https://projectkings.com.ng/2022/03/21/school-location-and students-academic- performance-in-Biology.

Lotz, C. & Sparfeldt, J. (2017). Does test anxiety increase as the exam draws near? – Students' state test anxiety recorded over the course of one semester. *Personality and Individual Differences.* 104, 397-400

Mbaegbu, C.S. (2017). *Effects of sequential usage of three teaching methods on achievement and retention of senior secondary school students in Biology*. (Unpublished Master Thesis), Nnamdi Azikiwe University, Awka.

Mbaegbu, C.S., Ikeanumba, C.B. & Anazodo, O.S. (2023). Emotional intelligence as a predictor of academic achievement of secondary school students in Biology in Awka Education Zone, Anambra State. *AJSTME,*9, (3), 130-135.

Merzaq, G., El Ouardi, R., Alaoui, S., Lahmar, A., Aladwir, A. A. N., & Zarhbouch, B. (2023). The effect of test anxiety on academic achievement of adolescents in educational practices: The effect of test anxiety on academic achievement. *The Journal of Quality in Education*, *13*(21), 179-190.

Nandhini, M. & Subramanian, A. (2021). Anxiety as a predictor of academic achievement in Mathematics among higher secondary school students. *Journal of Physical Medicine Rehabilitation Studies and Reports*, 3(4), 1-4.

Nnaji, T. C. (2022). Relationship between exam anxiety and cheating behaviour: A quantitative study of undergraduates in Enugu State, Nigeria. *Journal of Advance Research in Social Science and Humanities,* 8 (5), 22-28.

Nwafor, S. C., Eke, J. A., & Ibe, F. N. (2023). Correlation between test anxiety and students' Chemistry achievement. *Journal of Research in Instructional*, 3(1), 31-40.

Nwuba, I.S. (2021). Effect of experiential learning approach on secondary school students' critical thinking ability and academic achievement in Biology in Awka Education Zone. An unpublished thesis submitted to the Department of Science Education, Nnamdi Azikiwe University, Awka.

Nwuba, I.S., Egwu, S.O., & Osuafor, A.M. (2022). Enhancing academic achievement of secondary school students in Biology using mnemonic integrated instruction. *Journal Plus Education,* 30(1), 254- 265.

Ogene, I.O. & Agu, N.N. (2023). Relationship between test-taking skills of undergraduate students and their examination misconduct tendencies in Anambra State. *South Eastern Journal of Research and Sustainable Development*, 11(2). 164-182.

Okafor, E. O., Obi, J. S. & Oguzie, A. E. (2018). Relationship between students' self-esteem and their academic achievement in Imo state. *African Journal of Multidisciplinary Research HAJMR*, 1(1), 24-32.

Okigbo, E. C. & Onoshakpokaiye, O. E.. (2023). Relationship between test anxiety and academic performance of secondary school students in Mathematics. *Mathematics Education Journal*, 7(2), 178-189.

Okobia, D.O. & Oji, J.O. (2021). Test anxiety and academic achievement among undergraduate students in College of Education, Agbor, Nigeria. *International Journal of Innovative Research and Development*, 10(11), 172-178.

Okoi, O.A. & Esomonu, N.P.M. (2021). Centralized secondary school examination, basic education certificate examination and test anxiety as predictors of students' achievement in Mathematics. *Int J Educ Res Rev*, 6(3):235-239

Okoli, C. C. & Osuafor, A. M. (2020). Availability of e-learning facilities for science education programme in federal universities in South East Nigeria. *UNIZIK Journal of STM Education*, *3*(1), 128-140.

Okolo, P.U. & Kolawole, S.U. (2021). Effects of test taking strategies on Mathematics test anxiety and performance among junior secondary school students in Bukuru, Nigeria. *Unizik Journal of Educational Research and Policy Studies*, 5, 1-15.

Okonkwo, I.G., Ekweoba, C.C. & Okemmiri, P.C. (2023) Influence of self-esteem and learned helplessness on academic achievement of Chemistry students in Awka Education Zone of Anambra State. *Unizik Journal of Education Graduate*, 8, 18-25.

Shafiq, R., Erum, J. & Muhammad, A. (2021). Effects of test anxiety on academic achievement at secondary school level in Lahore. *Bulletin of Education and Research*, 43(3). 67-80.

Sharma, H.L. & Pooja, (2018). Effect of cognitive styles and achievement motivation of 9th grade students through multi-media and traditional instructional strategies: An experimental study. *International Journal of Management, IT and Engineering,* 8(12), 342-356.

Wale, Y.A., Ijale, M. & Samson, J.(2023). Test anxiety, social anxiety and academic achievement among university students in North-West Zone, Nigeria. *Journal of Education and Applied Psychology (JOEAP),* 9(1), 55-61.