

# Test Anxiety as Predictor of Academic Performance in Biological Science Examination among Secondary School Students

Binan Evans Dami<sup>1</sup>, Captain Abel James<sup>2</sup>, Paradang Clement Gogwim<sup>3</sup>

<sup>1</sup>Clinical Psychologist/Researcher/Writer, Nigeria, <sup>2</sup>Military/Clinical Psychologist, Nigerian Army, <sup>3</sup>Clinical Psychologist, Nigeria

## ABSTRACT

Study examined the relationship between test anxiety and academic performance in biology science among senior secondary school science students. Participants were within the ages of 14–18 drawn through a convenient sampling technique. The correlation statistic was used, and a factorial ANOVA was used to further examine the data. It was hypothesized that test anxiety will significantly predict academic performance among students in biology examination. Results obtained were not significant with  $P > 0.05$  at  $P, 1 (0.072)$  while the nature of the relationship is a positive relationship. Additionally, it was hypothesized that there will be a significant interaction effect of gender and class on test performance among participants. Analysis of between subjects' effects revealed no significant effect of gender and class on student's academic performance at  $P, 1(.443) = 0.509$ . It was recommended that teaching/learning environment should be good enough to help provide students with the grounds for improved performance.

**Key words:** Test anxiety, academic performance, secondary school students

## INTRODUCTION

Anxiety as a variable has been explored over the years by many scholars to say especially in the field of psychology, psychology, and education. Anxiety may serve to motivate as well as have its greatest adverse effects on the process of thinking and problem solving that the educator is trying to enhance.<sup>[1]</sup>

Students who are part of the general population are no exception to phases of anxiety. The fear faced by students when approaching a task or an examination may be viewed as anxiety. Students are faced with fear ranging from fear of failure, fear of being identified as failure, fear factors that make them tense, nervous and even takes away their ability to make good use of their time. Test anxiety, like other forms of anxiety, is one of the most pervasive reactions that individuals have to stress.<sup>[19]</sup>

Science anxiety is a fear of aversion toward science concepts; in other words, it is a debilitating interaction of emotions

(fear) and cognition (science learning) (Maclow, 1986) because there is a correlation between students feelings and their ability to understand the subject matter.<sup>[24]</sup> Test anxiety reflects in students' performance at a different point in time, especially when undertaking a test, or an examination.

Biology as a science subject has a lot of complexities that put a lot of students on constant fear, mostly on how to approach biology and other biological sciences subject in examination. Be it in the school or other academic institutions; many students would most likely study hard to approach any academic task. Over the years, the Nigerian educational institution has witnessed a great decline in students' academic performances; this may be due to several factors such as political interference, quality of teaching time, deplorable state of facilities and others; however, this may also speak about the students themselves and maybe beyond the institutions. This problem has posed a major threat to the teaching/learning environment and so decline in academic performance has always been witnessed a year in year out.

**Address for correspondence:** Binan Evans Dami, Clinical Psychologist/Researcher/Writer, Nigeria.  
Phone: +2347035578447. E-mail: evansbinan@gmail.com.

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Educational administrators, teachers, parents keep asking questions as to why student's academic performance has been on a constant decline despite what parents have claimed to have invested in the children education, what teachers have been doing and policies administrators have formulated and implemented to foster educational efficiency. Test anxiety is a new field of exploration in Nigeria and may likely account to predict part of the reason for this drop in academic performance as many students' approach test and other examination with great anxiety/fear of either failure or so anxious about knowing all or fear of the unknown. Test anxiety refers to the persistent or irrational fear exhibited by

students in the presence of a task, test or an examination while academic performance refers to the degree of achievement or scores, scored by a student in a subject activity.

Spielberger and Sarason<sup>[23]</sup> define test anxiety as a situation-specific trait that refers to anxiety states experienced during examinations.

### Examination

An activity or an event conducted with the aim of assessing an individual's performance and knowledge of a subject area.

The academic environment appears to possess several of these qualities. In a test-conscious environment, such as the one that is so pervasive in the academic environment, individuals are affected greatly by their test performance<sup>[11]</sup> research on test anxiety, however, has been hampered. "The measurement of anxiety is no simple problem."<sup>[5]</sup> Furthermore, highly test-anxious individuals more readily generalize from a single test failure. Namely, test failure is equated with personal failure. Such individuals can be expected to have difficulty recuperating from an initial failure to meet personal or social expectations. Instead of focusing on succeeding on subsequent exams, they often possess more negative exam related thoughts regarding their previous failure;<sup>[7]</sup> these thoughts likely will impair their performance on subsequent exams. Lower grades on midterm exams, therefore, appear to be likely to increase test anxiety about the final.

Udo *et al.*<sup>[24]</sup> conducted a study to investigate the factors affecting science anxiety (as a follow-up study to Mallow's work (1994) and the exposure to one semester of physics as a factor affecting anxiety. The result of their study shows that non-science and gender were found as the main contributors to science anxiety. Udo *et al.*<sup>[25]</sup> investigated science anxiety of a cohort consisting mostly of non-science majors taking a variety of science courses. They used sciences anxiety questionnaire as an instrument. The result of multiple regression analysis indicates that non-science anxiety is the best predictor of science anxiety; gender is the second predictor of science. They also found statistically levels of science anxiety in humanities and social science students of both males and females, and gender difference in science had science anxiety were higher than the number of males who had sciences anxiety.

McDonald<sup>[13]</sup> reviewed a paper for literature on test anxiety in school children. He put forward the evidence on the association of test anxiety with the test performance. It was found that the

**Table 1: Descriptive statistics (Table showing the mean differences)**

	<i>n</i>	Minimum	Maximum	Mean±Standard deviation
Gender	46	1.00	2.00	1.4783±0.50505
Class	46	2.00	3.00	2.4565±0.50361
Anxiety	46	1.00	2.00	1.7174±0.45524
Test	46	1.00	2.00	1.7826±0.41703
Valid <i>n</i> (list wise)	46			

**Table 2: Statistics (number of participants)**

		Gender	Class	Anxiety	Test
<i>n</i>	Valid	46	46	46	46
	Missing	0	0	0	0

**Table 3: Gender (data segregated by gender)**

	Frequency (%)	Valid percent	Cumulative percent
Male	24 (52.2)	52.2	52.2
Female	22 (47.8)	47.8	100.0
Total	46 (100.0)	100.0	

**Table 4: Class (the class of study of participants)**

		Frequency (%)	Valid percent	Cumulative percent
Valid	SSS2	25 (54.3)	54.3	54.3
	SSS3	21 (45.7)	45.7	100.0
	Total	46 (100.0)	100.0	

**Table 5: Anxiety (different levels of anxiety)**

		Frequency (%)	Valid percent	Cumulative percent
Valid	Low anxiety	13 (28.3)	28.3	28.3
	High anxiety	33 (71.7)	71.7	100.0
	Total	46 (100.0)	100.0	

**Table 6: Examination score (scores obtained in the biological science examination)**

		Frequency (%)	Valid percent	Cumulative percent
Valid	Low performance	10 (21.7)	21.7	21.7
	High performance	36 (78.3)	78.3	100.0
	Total	46 (100.0)	100.0	

relationship between test anxiety and performance was very strong and test anxiety had strong effect on test performance. It was also concluded that fear of examinations and test situations were widely spread and became more prevalent. Kaya<sup>[10]</sup> conducted a research study to find the relationship of levels of test anxiety with academic achievement of fifth-grade Turkish students in elementary school. In the analysis of data, the relationship between test anxiety and academic achievement was  $-0.15$  ( $P < 0.001$ ). It was clear from these results that there was negative effect of test anxiety on academic achievement. The students having high test anxiety had lower achievements and the students having low test anxiety had higher achievements. Chapell *et al.*<sup>[3]</sup> conducted a research study on undergraduate and graduate students for the investigation of the relationship between test anxiety and academic performance. Test anxiety inventory (TAI) was administered to measure the relationship of test anxiety with students' achievement in science 101 students' test anxiety, and their performance was measured from their grade point average (GPA). It was indicated from the results of the study that female graduate students having low test anxiety had higher GPA, and female students having high test anxiety had lower achievement. However, the male graduate students with low and high-test anxiety had no effect on their performance. In the case of female undergraduate students, high test anxiety caused higher GPA, but male undergraduate students had lower test anxiety and lower GPA.

Putwain<sup>[17]</sup> explored the relationship between test anxiety and academic performance by collecting data from 558 students of 11<sup>th</sup> grade. These students were selected from different secondary schools in the UK. The correlational analysis indicated that there was a small but significant negative relationship between test anxiety and academic performance. Worry component of test anxiety scale and academic performance had very strong relationships with each other, but emotionality component of test anxiety scale and academic performance had weaker relationships. Similarly, Putwain<sup>[18]</sup> conducted another study to find out the relationship between examination anxiety and examination grades. The data were collected from a sample of 615 students of secondary level. These students were selected from different secondary schools in the UK. There were negative correlations of worry and emotionality components of test anxiety with the examination grades. The students having higher scores on test anxiety-worry and test anxiety emotionality components got lower examination grades. However, the students with lower

**Table 7: Correlations**

	Anxiety	Test score
Anxiety		
Pearson correlation	1	0.072
Sig. (2-tailed)		0.637
<i>n</i>	46	46
Test score		
Pearson correlation	0.072	1
Sig. (2-tailed)	0.637	
<i>n</i>	46	46

test anxiety scores on both the components got higher examination grades. Nicholson<sup>[16]</sup> determined the effects of test anxiety on students' achievement. The data were collected from 200 eleventh grade students from a high school. These students were administered Test Anxiety Inventory to determine the levels of test anxiety. The results of the study, after analysis of data, indicated that test anxiety had a significant effect on the achievement of students.

Additionally, the following hypotheses were generated:

- Test anxiety will significantly predict academic performance among students in biology examination.
- There will be a significant interaction effect of class and gender on academic performance.

## METHODS

The design of the study is a correlational design. Test anxiety and academic performance are both variables of interest with no directionality to which is dependent or independent. Test anxiety is divided into high and low for the sake of this study. The population of the study was secondary school students from Government Secondary School Tudun Wada. A sample of 46 students was obtained from both senior secondary level 2 (SS 2A) and senior secondary level 3 (SS 3A) were obtained through a convenient sampling technique. Twenty-five among the participants were from SS2A while 21 were from SS3A, 24 of the sample population were males, while 22 were females. Participants were between the age range of 15–22 years. The use of convenient sampling was since researcher at the point of data collection worked with the school as a biology teacher and so had just SS2A and SS3A as the two major science classes which was needed for the research.

**Table 8:** Dependent variable: Examination score

Source	Type III sum of squares	Df	Mean square	F	Sig.
Corrected model	975.934 <sup>a</sup>	3	325.311	4.205	0.011
Intercept	77647.853	1	77,647.853	1003.671	0.000
Gender	963.201	1	963.201	12.450	0.001
Class	18.961	1	18.961	0.245	0.623
Gender* class	34.247	1	34.247	0.443	0.509
Error	3249.283	42	77.364		
Total	84,866.000	46			
Corrected total	4225.217	45			

<sup>a</sup>R<sup>2</sup>=0.231 (adjusted R<sup>2</sup>=0.176)

The Westside test anxiety scale developed by Driscoll (2004) was used for this study. The Westside test anxiety scale is a 10-item scale that measures students' test anxiety on a five-point Likert scale from<sup>[5]</sup> as "extremely or always true" to<sup>[1]</sup> "not at all or never true." The scale was used and was been termed to have high control validity.<sup>[5]</sup> This instrument was adapted and used for this study. The instrument has internal consistency and a Cronbach's alpha of 0.86% and a range of 0.80–0.90 in different studies.

The researcher(s) had to seek the consent of the school, management, and then the students. The researcher stepped into SS 2A first and introduced the idea of the study to the students, then asked for their indulgence, after which the questionnaires were filled before the biology examination. The researchers waited for them to fill the questionnaires within a 10-min period and then retrieved back the questionnaires. The researchers did the same to the SS 3A (science students).

The researcher(s) now gathered the questionnaires from the two classes and used such for the study. A total of 46 respondents responded to the questionnaire, and their responses were used for the study. The Statistical Package for the Social Sciences was used in data analysis. The inferential statistic was equally used for this study, the Pearson moment correlation was used. In addition, the factorial ANOVA was used to examine the second hypothesis generated by the researcher.

## RESULTS

### Descriptive statistics

The descriptive statistical table above shows the various descriptive characteristics of the study population.

The test table shows the boundaries in the examination performance ranging from low performance to high performance.

### Inferential statistics

Mean deviation table.

#### Hypothesis one

It was hypothesized that test anxiety will significantly predict academic performance among students in biology examination. Results obtained were not significant with  $P > 0.05$  at  $P, 1 (0.072)$  while the nature of the relationship is a positive relationship. In addition, the strength of the correlation is a moderate relationship.

#### Tests of between-subjects effects

Mean deviation table.

#### Hypothesis two

It was hypothesized that there will be a significant interaction effect of gender and class on test performance among participants. Analysis of between subjects' effects revealed no significant effect of gender and class on student's academic performance at  $P, 1(.443) = 0.509$ .

## DISCUSSION

#### Hypothesis one

It was hypothesized that test anxiety will significantly predict academic performance among students in biology examination. Results obtained were not significant with  $P > 0.05$  at  $P, 1 (0.072)$  while the nature of the relationship is a positive relationship. In addition, the strength of the correlation is moderate relationship indicating that both variables predict each other moderately with no question of directionality. Furthermore, as indicated by the findings, test anxiety does not affect academic performance and academic performance does not affect test anxiety equally.

#### Hypothesis two

It was hypothesized that there will be a significant interaction effect of gender and class on test performance among participants. Analysis of between subjects' effects revealed no

significant effect of gender and class on student's academic performance at  $P, 1 (.443) = 0.509$ . The study revealed no significant interaction of class and gender on academic performance, meaning that academic performance does not vary with class rather its a continuous and open skill.

Test Anxiety is a complex and multidimensional construct, embodying distinct individual perceptions, and physiologic and behavioral responses<sup>[27]</sup> While the mechanistic relationship between anxiety and student test performance is not well understood, it is widely accepted that emotionality and worry constitute the two primary dimensions of test anxiety.<sup>[2,8,12]</sup> Emotionality is manifested physiologically during exams (eg, increased galvanic skin conductance, increased heart rate, dizziness, and nausea) and by feelings of panic.<sup>[2,4,8]</sup> It has been proposed that emotionality reflects the individual's subjective awareness of heightened autonomic arousal rather than the arousal itself.<sup>[20]</sup> Worry, also called cognitive test anxiety, compromises the range of cognitive reactions to test situations, including associated internal dialogue before, during, and after tests<sup>[2]</sup> The worry component of test anxiety most consistently correlates with declines in academic test performance.<sup>[8,22]</sup> Meta-analyses and path analyses suggest that worry is the stronger influence on test performance.<sup>[6,8,9,22]</sup>

This expectation of getting low grades from the exams results in psychological reactions such as sweating, shaking, sadness, crying, and fast heartbeats. Teachers can use alternative methods of assessment to deal with students' fear of test. Open-book or open-note tests, projects, learning logs, journals, and science portfolios may be helpful to control students' science anxiety because these focuses on students' higher order thinking skills rather than memorization.<sup>[26]</sup>

Two widely discussed models explaining the observation that test anxiety and test performance have an inverse relationship are the Cognitive Interference Model and the Additive Model of Test Anxiety. Research supporting the Cognitive Interference Model suggests that during tests a high level of anxiety creates intrusive thoughts that conflict with the student's ability to concentrate<sup>[9,15]</sup> The Additive Model of Test Anxiety, describes test anxiety as an additive function of an individual's trait test anxiety and situation-specific variables, such as low self-confidence for the specific task, perception of the exam as posing a high level of threat, or an awareness of being underprepared for the exam.<sup>[2,28]</sup>

Proponents of the Additive Model of Test Anxiety assert that individuals with high levels of test anxiety will experience severe performance declines only in situations that also activate the state test anxiety factor. It is helpful to appreciate that these two models are not mutually exclusive.

It is widely believed by academicians that studying the various dimensions of test anxiety can lead to effective

strategies for test preparation, test taking, and test administration. Conflicting studies examining test anxiety and test performance may simply reflect differences in the rigor of the academic programs in which the studies were conducted (eg, nursing, medical school, technical, and liberal arts) and the level of study (undergraduate versus graduate)

### Implications

Despite the study not been significant in its findings, it is also relevant in ways it should be. This study will be significant in diverse ways especially to the stakeholders in the teaching/learning environment, including the teachers, students, parents, the educational psychologist, the school counselors, educational administrators and other relevant stakeholders. The teachers will benefit through its findings and will work more in reducing anxiety among students through improved teaching/learning techniques. Teachers will also be aware of the existence of test anxiety among their students.

The educational psychologist will help to develop, monitor, and supervise school educational activities with the aim of improving performance with an optimal level of test anxiety on the students, especially during or before an academic activity. The school counselors will stand into counsel and guide students who are evident of higher anxiety on how to overcome such anxiety in the presence of major academic activity. School counselors will try to give some great degree of attention to ensure that students at distress are taken care of. Parents get aware of the fact that their children are often faced with persistent fear, which may be irrational or induced from home and interferes with their academic performance. Parents should know this to help address the roots of their children anxiety.

The government and other stakeholders such as the educational administrators may use the findings of this study to frame up policies and intervention schemes to help bring out the best of the students positively, keeping in mind that the teaching/learning environment should be nurturing. Lastly, this study will add up to the existing literature in this field and so subsequent research studies may find data to dwell on, especially that indigenous studies in this area are quite scarce.

Furthermore, teachers should be highly trained in taking note of the body language, and other non-verbal cues of their students especially in and outside the classroom setting as this will go a long way to help in augmenting the student's academic performance. Although test anxiety was found not to be significant to academic performance, it will be wise for students to be carried through relaxation techniques before a major examination as this will go a long way in calming students down preparatory to the task or examination at hand. Additionally, students should be taught practically by their teachers practical ways to approach exams and other task confidently and with less fear of failure, as this will buffer their performances.

### Limitations of the study

The study has not been able to find more recent literature in this area of research, especially local literature, as most of literature obtained comes from western studies. This is likely to postulate that the attention of research has shifted from this area to other evolving areas in the field of psychology and education. The sample size was not large enough, however, its the size for the available science students in the school where the study was conducted. Further studies may improve the sample size to see if there will be a different outcome.

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