Gender, Test Anxiety and Academic Performance in Mathematics Among SS3 Students in Calabar Education Zone, Cross River State, Nigeria

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Abstract
The study investigated the influence of students' gender and test anxiety on academic performance in mathematics among SS3 students in Calabar Education Zone of Cross River State, Nigeria. The study adopted ex post facto research design. The sample for the study comprised 456 SS3 students selected from nine schools in the zone. The instruments used for data collection were a 30-item achievement test in mathematics and a 10-item test anxiety scale designed by the researchers. The instruments were duly validated, and their reliability estimate established. The data were collected and collated and the two null hypotheses tested at .05 alpha level using an independent t-test and simple regression analysis statistical tools. The result showed that male and female differ significantly in their academic performance in mathematics in favour of males. And that test anxiety had a significant negative influence on students' academic performance in mathematics. It was recommended among others, that male and female students should be advised to change their perception that school mathematics is very difficult, most especially the females. The school authority should put in place professional counsellors that will counsel and guide the students on the need to reduce the high cost of test anxiety among them when the mathematics test is being presented before them.

Keywords: *Gender, Test anxiety, Academic performance in mathematics, SS3 students, Nigeria.*

Introduction

Irrespective of how rudimentary it might be, every man needs mathematics to survive. There is no doubting the fact that an individual can get on sometimes without knowing how to read and write, but can never push on smoothly without knowing how to count, measure, add, and subtract (Owan, Bassey, & Ini, 2020; Owan, Bassey, Omorobi, & Esuong, 2020). Mathematics equips an individual with knowledge and skill to handle daily life challenges with rationality, solve wide-range of difficult task organize difficult problems into logical and simple forms. The importance of mathematics has made almost all human endeavours to incorporate it into their different academic curricula. Mathematics is a subject that has a direct relationship with other subjects particularly science-related subjects(Owan et al., 2019). It is the subject that is offered virtually at all levels of

education and considered as the bedrock for all scientific and technological development of any nation that must attain any envisaged technological height.

There is nothing in the world that mathematics thinking is of no relevance. Mathematics foster creative thinking enhances abstract thinking and improves an individual's numeric and analytic skills. The multifaceted use of mathematics in business, industries, at home, in schools, offices and other innumerate dimensions make mathematics an important subject for students to learn and acquire the skills not just for admission and examination purpose, but also for daily living(Bassey et al., 2020).In spite of this huge wholesome importance of mathematics, it is unfortunate to see many students fail in this subject. What has continued to perplex the hearts of allthose interested in the education of a child is the question of what would have been the cause of this failure? (Owan, 2012). Factors identified for this poor performance in mathematics are enormous ranging from personality, political, economic, school environment, home and psycho-social factors (Adeyemi & Adeyemi, 2014, Moyosola, 2014).

Other researchers have suggested a number of factors ranging from students' phobic attitude, teachers' teaching style, students' interest in the subject, poor teacher-student interpersonal relationship, lack of teachers' supervision of students' work, poor attitude to assessment procedures, inadequate classroom management skills and a lot more(Bassey et al., 2020; Owan et al., 2018; Robert & Owan, 2019).. These researchers are asking whether students' gender and their test anxiety could influence academic performance in mathematics.Gender is seen as a state of being either male or female. While test anxiety is a combination of psychological over-arousal tension and somatic symptoms, along with worry, dread, fear of failure, that occur before or during test situations(Owan et al., 2019). This was measured in this study by the sum of respondents' responses on the test anxiety scale. Test anxiety involves situation like thinking about an up-coming test one day before and being a homework, assignment of many difficult problems which is due to the next class meeting. \

Test anxiety exists when one feels incapable of solving a potential situation.Education practitioners, psychometricians, academic and policy makers in Nigeria have created a lot of concern about gender as a single variable that has gained attention in performance variability. Gender has been showed by various researchers to have a significant influence on performance variability among students. Essien (2009) sees gender bias as the display of inequality behaviours often subtle, which occurs when men and women act differently, are treated differently, or are responded differently based solely on their gender. The study of Unodiaku (2013) found in general, that boys were significantly readier than girls in mathematics test. The study also showed that gender and ability level influenced the mathematics readiness of male students (Unodiaku, 2013).Adeleke (2007) examined the problem-solving performance of male and female students using conceptual learning strategy (PLS). The result emerging from the study showed that there is an insignificant statistical difference in the problem-solvingperformance of male and female students in simultaneous linear equations across the three categories of students with (Adeleke, 2007). There is a significant difference ($t = 5.47$, $p = .000$) of academic achievement between male and female adolescents whereby

females scored higher in their academic achievement ((Yousefi, Talib, Mansor, Juhari&Redzuan, 2010).

Studies on test anxiety and performance in Mathematics have indicated that there is an inverse relationship between the test anxiety state of students and their performance in Mathematics (Karjanto &Yong, 2015;Owan et al., 2019; Owan, Bassey, & Ini, 2020; Owan, Bassey, Omorobi, et al., 2020). Specifically, the study of Vogel and Collins (2002) examined the effect of the anxiety on academic performance. In their study, students with high test anxiety as well as those with moderate anxiety showed lower academic performance. Moreover, those students with low levels of test anxiety performed the best in mathematics.Furthermore, the result of Syokwaa, Aloka, and Ndunge (2014) showed a presence of high personality anxiety levels at 79%, while the test anxiety indicated a relatively low-normal anxiety level of 27%. The study found that there was a correlation between anxiety levels and academic achievement and that high anxiety had a negative impact on the quality of academic result recorded by students (Syokwaa, Aloka& Ndunge, 2014).

It is also established that students encountered some high anxiety causing challenges which affect their ability to perform effectively, and girls were found to be more prone to high anxiety levels as compared to boys (Syokwaa et al, 2014).The result of another study showed that there is a significant correlation ($r = .23$, $p= .000$) between test anxiety and academic achievement among adolescents (Yousefi et al., 2010).In another study, Owan (2020) used a quasi-experimental approach to examine the nexus between gender, test anxiety and test items scrambling on performance in Mathematics. It was discovered that there was no significant gender difference on performance; tests anxiety and items scrambling had significant effects on performance in Mathematics respectively; low students' performance in Mathematics was associated with high test anxiety and test items arrangement from complex to simple; there was a significant interaction of test anxiety worry, emotion and total on performance in Mathematics (Owan, 2020).Having explored the literature, it was deduced that few attempts have been made in Nigeria to understand the partial effects of gender and test anxiety on performance in Mathematics. This study was designed to contribute to the existing literature by providing new insights from the Nigerian perspective.

Purpose of the study

The study was designed to determine:

1. If male SS3 students in Calabar Education Zone differ fromtheir female counterparts in their academic performance in mathematics.
2. The influence of test-anxiety on academic performance in Mathematics among SS3 students in Calabar Education Zone.

Statement of hypotheses

The following hypotheses were formulated to guide the study:

1. Male SS3 students in Calabar Education Zone do not significantly differ from their female counterparts in their academic performance in Mathematics.

2. There is no significant influence of test-anxiety on academic performance in Mathematics among SS3 students in Calabar Education Zone.

Method

This study adopted the ex-post facto research design. The design, ex-post facto is suited for this study where nature and magnitude of relationships among psychological variables are being investigated. It is economical for measurement of several of these variables and their relationship simultaneously. More so, the researchers have no control over the psychological variables (students' gender and test-anxiety) since they have already occurred in the population. The design covers the analysis of data using appropriate statistical tools.

The study covered the Calabar Education Zone of Cross River State. Calabar Education Zone comprises seven local government areas, namely: Akamkpa, Akpabuyo, Bakassi, Biase Calabar South, Calabar Municipality and Odukpani with a total of 85 public secondary schools. The zone is in Cross River State, and the state is located in the rain forest zone of West Africa. It lies between latitudes $20^{0}18^{1}$and $30^{0}25^{1}$ North of the Equator and Longitudes $40^{0}30^{1}$ and $50^{0}16^{1}$ East of the Greenwich Meridian, covers a land mass of 13,074km^{2}(National Population Commission 2006).

The population of the study comprised all senior secondary three (SS3) students in public secondary schools in the Calabar Education Zone of Cross River State, numbered 8,549 in 2016/2017 academic session, according to the State Secondary Education Board, Calabar (2017).The study adopted a stratified random sampling technique in selecting 456 SS3 students (212 males 244 females) from nine public secondary schools in Calabar Education Zone for data analyses.

The instrument used for data collection in this study were Achievement test in Mathematics and test-anxiety scale. The mathematics achievement test comprised a 30-item multiple choice objective test with four options, while the test anxiety scale with an item on gender had five items. The reliability method to determine the internal consistency which gave a coefficient of .76.The mathematics test was administered to all the students selected for the study immediately after responding to the test anxiety scale, which was attached to each of their answer sheets. All the copies of the instruments distributed were retrieved immediately from the students after distributed the exercise. The data collected and collated were analysed using an independent t-test and simple regression analyses and tested at .05 alpha level.

Results

The two null hypotheses in this study were restated and tested at .05 level of significance, thus:

Hypothesis one

Male SS3 students in Calabar Education Zone do not significantly differ from their female counterparts in their academic performance in Mathematics.The independent variable in this hypothesis is gender, while the dependent variable is academic performance

in mathematics among SS3 students in Calabar Education Zone. To test this hypothesis at, 05 alpha level, independent t-test statistical tool used, as shown in Table 1

Table 1: Independent t-test analysis of students' gender and their academic performance in mathematics (N = 456)

Gender	N	Mean	SD	t-value	p-level
Male	212	15.35	5.63		
				6.85*	.000
Female	244	12.14	4.14		

*Significant at .05 level; p< .05

The result in Table 1 revealed that the mean score obtains by the 212 male students as regards their academic performance in mathematics was 15.35 with a standard deviation of 5.63 is greater than the mean score of 12.14 with a standard deviation of 4.14 by the female students. The mean difference was statistically significant since the t-value of .000 met the criteria for significant at .05 level. This implied that the males SS3 students significantly performed better than females SS3 students in their academic performance in Mathematics. Based on these results, the hypothesis which states that male SS3 students in Calabar Education Zone do not significantly differ from their female counterparts in their academic performance in Mathematics was rejected. Therefore, male students in Calabar Education Zone significantly differ from the female students in their academic performance in mathematics.

Hypothesis 2

There is no significant influence of test-anxiety on academic performance in Mathematics among SS3 students in Calabar Education Zone.The independent variable in this hypothesis is test anxiety, while the dependent variable is academic performance in Mathematics among SS3 students. To test this null hypothesis, simple linear regression analysis statistical too was used, and the result is presented in Table 2.

Table 2: Summary of simple linear regression analysis for the influence of anxiety on academic performance in Mathematics among SS3 students in Calabar Education Zone

Regression statistics					
Multiple R	.716				
R Square	.513				
Adjusted R square	.512				
Observation	456				
Source of variance	SS	df	S	F-ratio	p-value
Regression	6171.879	1	6171.879	478.286*	.000
Residual	5858.487	454	12.904		
Total	12030.366	455			

*Significant at .05 level; β = -.716

The result of the analysis in Table 2 showed that the analysis of variance in the regression output produced an F-ratio of 478.286 with a p-value of .000, which was statistically significant at .05 alpha level. On the basis of this result, the hypothesis was rejected, which means that test anxiety significantly influences academic performance in mathematics among SS3 students in Calabar Education Zone.The results showed adjusted multiple coefficients of determination R^2 (i.e. $.716^2$) of .513 which implies that 51.3% of the variance in academic performance in mathematics among SS3 students in Calabar Education Zone was accounted for by test anxiety. Thus, about 48.7% of the variance in academic performance in mathematics among SS3 students in Calabar Education Zone may be explained by independent variables extraneous to the study.Also, the negative beta weight (-.716) indicated that test anxiety contributed negatively to academic performance in mathematics. That is, the more the test anxiety, the lower the academic performance in mathematics among SS3 students in Calabar Education Zone**.**

Discussion of findings

The first result of this study revealed that the male students significantly performed better than the female students in mathematics achievement test. This result is not surprising that male students were better because it has been observed over time that male have more interest in logical reasoning and thinking than females. The females do not always have a positive interest in calculation rather they like reading stories than disturbing themselves in critical thinking and most of the females thought that mathematics is basically for the males.The finding is in consonance with Unodiaku (2013) which found that generally, boys were readier than girls in the mathematics test and that the mean difference found between boys and girls was statistically significant with the boys performing better than the girls.However, the finding of this study is contrary to the finding of the study by Adeleke (2007) which revealed a non-statistically significant difference in the performance of male and female students in problem-solving in simultaneous equation across the three groups of students.The finding also is not in agreement with that of Karjanto and Yong (2015); Owan (2020) which revealed that there is no gender variation on performance in mathematics among students.

The second result of this study revealed that test anxiety had a significant negative influence on students' academic performance in mathematics. This was observed in the negative beta weight (-.716) which indicated that testy anxiety contributed negatively to academic performance in mathematics in such a way that the more the test anxiety, the lower the academic performance of in mathematics among SS3 students in Calabar Education Zone. The result is also not surprising that students with more test anxiety performed significantly lower than those who had lesser test anxiety after attempting the different items-arranged test.The result of this study is also in agreement with the findings of the study by Kassim, Hanafi and Hancock (2008) which revealed that there was an inverse relationship between anxiety levels and academic achievement and that high anxiety levels had a negative impact on the quality of academic results recorded by students. The study also established that students encountered some high anxiety causing

challenges which affect their ability to perform effectively. The finding also tallies with results from previous studies (e.g., Karjanto&Yong, 2015; Owan et al., 2019; Owan, Bassey, & Ini, 2020; Owan, Bassey, Omorobi, et al., 2020) which found that the students who had a lower score expectation were more anxious than those who had a higher score expectation, but that the obtained a better score than the expected score. The results of these studies also showed that an inverse relationship exist between test anxiety and performance in Mathematics.

Conclusion and Recommendations

Based on the findings of this study, it was concluded that student gender has a role to play on their academic performance in mathematics. It was also concluded that test anxiety had a significant negative influence on students' academic performance in mathematics as a school subject.Based on the conclusion of the study, it was recommended that:

1. Both male and female students should be advised to change their perception that mathematics is very difficult, most especially the females.
2. Efforts should be made by the teachers to ensure that gender does not hinder the learning of mathematics among students by encouraging females.
3. The school authority should put in place professional counsellors that will counsel the students on the need to reduce the high rate of test anxiety among them when mathematics test is being presented before them.

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