

Assessment on the Relationship between Mathematics Anxiety and Performance among Ss2 Students in Zaria Educational Zone, Kaduna State

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ABSTRACT

The study examined the relationship between mathematics anxiety and academic performance of senior secondary students in Zaria education zone, Kaduna State. One-shot survey research design was used for the data collection and analysis. A sample of 365 students involving 273 males and 92 females were randomly selected from a population of 5952 senior secondary students in the zone. A 30-item Mathematics Performance Test (MPT) instrument was developed with evidence of content validity and reliability of 0.62 and a 20-item Mathematics Anxiety Scale (MAS) was adopted with adequate validity and reliability of 0.90. These instruments were used for data collection. Three research questions were formulated and three null hypotheses were formulated and tested at 0.05 level of significance. The results from the quantitative study showed that there was statistically significant negative correlation between mathematics anxiety and academic performance ($r = -.268$, $p < .05$). It was also discovered that non-anxious students performed significantly better than the anxious students ($M = 11.07$, $S.D = 5.36$) $t(363) = 4.89$, $p > .05$, ($M = 8.9$, $S.D = 3.95$), $t(363) = 4.42$, $p < .05$. Lastly, there was no significant difference between male and female ($M = 59.55$, $S.D = 16.36$), ($M = 60.51$, $S.D = 14.69$) students anxiety level. It was recommended that mathematics anxiety should be given more attention by the curriculum planners in Zaria education zone.

Keywords: Relationship, Mathematics Anxiety, Performance, Zaria Education Zone

I. INTRODUCTION

Anxiety as a global phenomena has been operationally defined in various ways by notable scholars. Since effective research must be based upon past knowledge this step helps to eliminate the duplication of what has been done and provides useful hypothesis and helpful suggestions for significant investigations. In the early 1950's, researchers (Dreger and Aiken, 1957; Gough, 1954; Hembree, 1990) suggested that factors of math anxiety were influenced by non-intellectual factors such as math anxiety. Several studies also examined the direct effect math anxiety had on student achievement at the middle school. Ashcraft (2002) described highly math-anxious individuals who avoid math and lower their competency and even

ultimately alter their career path. Mathematics anxiety is creating a discrepancy between the proficiency levels in mathematics achievement (Ashcraft, 2002; Geist, 2010; Hembree, 1990; Scarpello, 2007). As a result of their fears, more and more students are avoiding careers in math related fields. "Individuals with high math anxiety take fewer math courses, earn lower grades in the classes they do take, and demonstrate lower math achievement and aptitude than their counterparts with low math anxiety" (Ashcraft & Kirk, 2001, p. 224). Ashcraft and Kirk (2001) stated before a student is able to feel success in mathematics, they must believe in their ability to understand the subject matter and be able to construct meaning of numbers. These opportunities first take place around adults in

the home environment and then progress in the school environment. Either way, the math learning environments need to be supportive and non-threatening. Differentiated instruction, manipulative, math talk, and meta-cognition techniques, are some of the ways to help students learn complex mathematics. Proficiency and mathematical success is the ultimate outcome for students at a time when math is a priority in our society. However, according to Lou et al. (2009), learning mathematics is about a student's emotional state. Students feeling a high level of anxiety about mathematics will lower their success in the subject. Ashcraft and Kirk (2001) found substantial evidence that math anxiety affects student performance. They found "substantial evidence for performance differences as a function of math anxiety. These differences typically are not observed on the basic whole number facts of simple addition or multiplication (e.g., $7 + 9$, 6×8) but are prominent when somewhat more difficult arithmetic problems are tested." (Ashcraft & Kirk, 2001, p. 224). Few researchers have explored instruments to determine the levels of mathematics anxiety in elementary students. Baloglu and Balgalmis (2010) conducted a study that converted the Mathematics Anxiety Rating Scale into an elementary version for Turkish students. The scale was administered to 336 elementary students. The instrument included 26 5-point Likert type items. A total of 104 points were possible with higher scores indicating a higher level of mathematics anxiety. It was concluded that the Turkish MARSE is a valid and reliable instrument in measuring mathematics anxiety levels at the elementary level. Unfortunately, the math anxiety scores of the elementary students were never published. Sharing the results could have sparked a higher interest in exploring math anxiety levels in students in elementary school. Lou et al. (2009) conducted a study at a university in west China involving 311 students from a middle school. The correlation between mathematics performance and mathematics anxiety was statistically significant

negative, and the correlative coefficient was -0.411 . The correlative coefficient between the cognitive elements of mathematics anxiety and mathematics performance was -0.339 . The results showed the better a student's mathematics performance was, the less mathematics anxiety they experienced. The worse a student's performance was the more mathematics anxiety they exhibited. This confirmed that mathematics anxiety usually happened among low performing students in west China. The participants in this study were only children from middle income families. Although the Lou et al. study contained pertinent and valuable information for the understanding of math anxiety in middle school students, the study did not involve sixth graders and showed ninth graders having the highest level of math anxiety. The research did not cover the factors leading to math anxiety. The Mathematics Anxiety Rating Scale developed by Richardson and Suinn (1972) to measure levels of mathematics anxiety was used. The results indicated that social comparisons effect level on mathematics anxiety is large and students with negative self-esteem experience more mathematics anxiety compared to students with positive self-esteem. Secondly, the results showed that mathematics anxiety of students possessing high achievement motivation was significantly higher than those students possessing low achievement motivation. Hembree (1990) conducted a meta-analysis to scrutinize the construct mathematics anxiety in 151 studies in grade of sixth to twelfth. Five tasks were defined to explore the nature of mathematics anxiety and the difference between females and males. The results were simple: higher achieving students had less mathematics anxiety and as grade levels increased, so did the level of math anxiety in students. Math anxiety peaked between 9th and 10th grade and started to decrease in 11th and 12th grade. Furthermore, Hembree stated math anxiety was related to poor performance on mathematics achievement tests. In middle school, students experienced different levels of success. High

levels of math anxiety appeared in remedial mathematics classes and declined with more advanced classes. Lastly, across all grade levels, female students had a higher level of math anxiety compared to males. Richardson and Suinn (1972) explained that manipulating numbers in a wide variety of ordinary life and solving math problems in the academic setting were reasons for math anxiety. Math anxiety may prevent a student from passing fundamental mathematics courses or prevent the pursuit of advanced courses in mathematics. Ashcraft (2002) expressed that math anxiety interferes with math performance. Students with high levels of math anxiety took fewer math courses in high school and college. As an individual in the educational profession, opening the doors of success for students in mathematics is important and imperative. Mathematics anxiety has never been a topic of discussion in schools. I hope this research will start discussions around the barriers of mathematics anxiety and help students achieve their hopes and dreams. The issue is real. Being a parent of a teenager who struggles with mathematics is a helpless feeling. Schools need to explore research around this topic and open their mind to the notion that teachers, parents, government, and classroom environments are partially responsible for developing mathematics anxiety in the youth of tomorrow.

II. RESEARCH HYPOTHESIS

H_{0i} There is no significant relationship between mathematics anxiety and performance in mathematics among SS2 students in Zaria Education Zone.

H_{0ii} There is no significant difference in the mean performance in mathematics among SS2 students at different anxiety levels.

H_{0iii} There is no significant difference in the mean anxiety level in mathematics among SS2 male and female students

III. MATERIALS AND METHODS

Descriptive survey method was adopted to find out the relationship between mathematics anxiety and performance among SS2 Students in Zaria educational zone. The population for the study comprised all Zaria education zone with 49 public secondary schools, that are categorized into three (3), namely (1) Rearticulated Public Secondary Schools (RPSS), (2) Public senior Secondary Schools (PSSS) and (3) Public Junior Secondary Schools (PJSS) Which cut across 4 local government areas; Zaria (Z), Sabon – Gari (SG), Soba (S) and part of Suba- Kuwa (SK) local government.. However, a random sample of 365 respondents from some selected schools and only S.S 2 students were assess for the study. The non-probability sampling procedures (the purposive and the stratified sampling techniques) were adopted to select the respondents across the variables of gender. A self-developed questionnaire was used to collect the data. The research instrument used for the study has two sections (A and B). Section A contains items on demographic characteristics while section B sought the perception of respondents on the relationship between mathematics anxiety and performance among SS2 Students in Zaria educational zone. The data collected will be analyzed using the statistical package for the social sciences (SPSS) version 20.0 computer program for windows. The alpha level was set at .05 for tests of significance. Hypothesis 1 will be tested using Pearson Product Moment Correlation while hypothesis 2 will tested using independent t-test .

IV. RESULTS AND DISCUSSION

Socio-demographic Data

Table 1. Distribution of Respondents by Gender

Variable	Percentage	Percentage
Male	Female	Total
Group		

School 1	41.8	51	55.4	
114			165	
School 2	31.5	41	44.6	127
86				
School 3	26.7	-	0.00	73
73	100	92	100	
Total			365	
273				

*Source: Zaria education zone (2017)

H01: There is no significant relationship between mathematics anxiety and performance in mathematics among SS2 students in Zaria education zone.

Table 2. PPMC of Mathematics Anxiety and Performance Scores

N	Means (SD)	Rank	p
Math performance score 365	9.95 4,8000	1 st	
		-.268**	
		.0001	
Math anxiety score 365	59.78	15.970	

**Significant, $p < .05$

The results in table 1 revealed that school (1) and (2) has more females (55.4%),(44.6%) Respondents than Males (41.8%),(31.5%) While School (3) has (26.7%) Respondents with no female Respondents. The results in table shows the Pearson correlation of mathematics anxiety and performance scores of the students From the table it shows that the mean of the mathematics performance score is less than the mathematics anxiety scores. The correlation also show that the p-value is .0001 with r of -.268** and .05 for probability which shows that the higher anxiety in the student, the lower their performances

H02: There is no significant difference in the mean performance in mathematics among SS2 students at different anxiety levels

Table 3. t-test independent between anxious and non-anxious performance

Anxiety level	N (SD)	M	DF	T
Non anxious below average	174 11.07 5.359		363	
		8.90		
Anxious above average	189 3.050		363	
		4.42		
				.0001

**Significant, $p < .05$

Table 3 shows that there is statistically significant difference between the performances of the student from the level of mathematics anxiety in the student. From the table, it shows that the mean of Non anxious below average is higher than the Anxious above average mean. The test indicated the p-value is 0 .0001 with degree of freedom of 363 and 0.05 for probability.

H03: There is no significant difference in the mean anxiety level in mathematics among SS2 male and female students

Table 4. t-test independent between male and female anxiety scores

Gender	N (SD)	Means DF	T	p
Male	279 16.362	59.55 363		.625
Mathematics Anxiety			4.89	.0001
Female	86 14.694	60.51		

*Not Significant, $p < .05$

Table 4 shows the level of mathematics anxiety in the gender which affect there mathematics performance. The test indicated the p-value is .625 with degree of freedom of 363 and .05 for probability. From the mean (male= 59.55 and female= 60.51), the result show that the level of anxiety in the female is greater than the male.

V. DISCUSSION

The overall purpose of this quantitative study was to determine if there was a relationship between mathematics anxiety and mathematics performance in Zarial educational zone, Kaduna state. The researcher was interested in finding out the barriers standing in the way of learning mathematics at senior secondary school. A math questionnaire measuring mathematics anxiety was used to determine the level at which secondary school students felt about mathematics and multiple test choice were used to test the performance of the student. One-shot survey research design was used for the data collection and analysis of data. Findings show that Low mathematics anxiety students scored higher on mathematics performance and high mathematics anxiety students scored lower on mathematics performance. Also the scores from hypothesis three show that the level of anxiety in female student is greater than the male students.

VI. RECOMMENDATIONS

A qualitative study such as interviews with teachers, principals, counselors, parents, and with participants may lead to better understanding of the relationship between mathematics anxiety and mathematics performance.

VII. REFERENCES

- [1]. Ashcraft, Mark H.; Kirk, Elizabeth P. (2001), "The Relationships Among Working Memory, Math Anxiety, and Performance", *Journal of Experimental Psychology: General*, 130 (2): 224–237, doi:10.1037/0096-3445.130.2.224
- [2]. Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences.
- [3]. *Current Directions in Psychological Science*, 11(5) 181-185.
- [4]. Baloğlu, M., & Balgalmış, E. (2010). The adaptation of the mathematics anxiety rating scale-elementary form into Turkish, language validity, and preliminary psychometric investigation. *Educational Sciences: Theory & Practice*, 10(1), 101-110.
- [5]. Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21, 33-46.
- [6]. Richardson, F.C.; Suinn, R.M. (1972). "The mathematics anxiety rating scale: Psychometric data". *Journal of Counseling Psychology*. 19 (6): 553