

Gender Difference in Math Anxiety and Mathematics Performance of Secondary Schools students in Bauchi State Nigeria

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Abstract

Math anxiety is a feeling of tension or fear that impairs the performance of students in mathematics. This study examined gender difference in math anxiety and mathematics performance of secondary schools students. The study employed descriptive survey method. The target population involved secondary school students in Bauchi State, and 80 students were randomly selected from the population. Math anxiety questionnaire was designed and administered with 72 Cranach Alpha internal consistencies. The data was analyzed by using t- test of independent sample. Finding revealed that there was significant difference between math anxiety and math performance and there was no significant gender difference in student's performance in mathematics. Some recommendations were made.

Introduction

Mathematics anxiety (MA) is defined as feeling of tension, apprehension, or fear that impairs the ability to manipulate numbers and solve mathematical problems. It is associated with panic, helplessness, paralysis, and mental disorganization that arise among some people when they are required to solve a mathematical problem (Tobias & Weissbrod, 1993). Individuals with MA become confused and unable to focus on the task at hand or keep thinking about how poor they are in math (Ashcraft & Kirk, 1999). MA is an online reduction in the available working-memory capacity as a result of paying attention to or preoccupation with intrusive thought or worry. High level of MA causes difficulties in a person's normal life as it interferes with academic activities and social life. Students who experience anxiety disorder exhibit a passive attitude in their studies such as lacking interest in learning, poor performance in exams, and assignments.

Poor math performance has been reported as an indicator of math avoidance (Hambree 1990) as a result of having poor competency, exposure, and math practice leaving students more anxious and mathematically unprepared to achieve. MA is likely to impact the achievement of many students, regardless of cultural and economic background they dislike and fear mathematics (Burn, 1998) and report negative experiences in math which may greatly affect their ability to perform well and jeopardize interest in learning mathematics. Study shows that MA is not simply about being bad at math, scholars after using brain scan confirmed that anticipation of thought of solving math actually causes MA. The brain scan indicate that the area of brain that triggers when someone has anxiety overlap with the same area of the brain where bodily harm is register (Schar and Kirk, 2001). The cause of MA is associated to the teacher who teaches math. It has been shown that student tend to internalizes their instructor interest in an enthusiasm for teaching math (Jackson and Leffinwell 1991). If the teacher has bad attitude about math ,for example, math is difficult, his students most likely will be affected as well, however, the teacher can take many steps to reduce math anxiety including

reviewing basic mathematic skill by making sure that students understand mathematical language, and by providing a support system for students (Shwartz, 2006). The more the teacher understands the effect of math anxiety the more he/the more likely she would prevent it and help students overcome it.

MA could be adversely related to students' performance in mathematics; studies suggested that strong relation among MA, performance and working memory (Cates and Rhymer, 2003, Ashcraft and Kirk, 2001) interfere with student's performance through blocks of memory, concentration, attention resources or cognitive interference from the worries and fears during math periods. Soler (2005) observed that students who felt satisfied and had low level of anxiety achieved higher academic performance. MA specifically affects the value students place on math and their personal efficacies which are used in generating confidence that they can do well in math.

Doing well in math may involve absent of non-intrusive thoughts and worries which unavoidably interfere with working memory (Esyensk, and Calvo1992; ashcraft and kirk, 2001). Connelly Hasher and zacks, (1991) opined that failure to inhibit task-irrelevant information leads to consumption of working memory processes. Math anxiety poses as a destructor and failure to inhibit such destructive tendencies poses academic show-down especially in math. Individuals with MA have been characterized with unwillingness to attempt mathematical problem, repeated failure in math, avoidance of class and home works, unfavorable attitude towards math, feeling nervous during math period, poor, social skills, panicking, going blank during math test, feeling helpless while doing assignment, sweaty palms, cold fast pace of breathing, racing heartbeat or an upset stomach. (Ruffin 2007)

Vitasari, Wahab, Othman, Herawan, and Sinnadura (2010) suggested that, both teachers and students have acknowledge the prevalence of math anxiety among secondary students and that it is the major predictor of students' performance in math. Studies demonstrated the prevalence of MA especially in the US; (Burns, 1998) reported that 2/3 of Americans fear and loath math, Jackson and Leffingwell found that only 7% of Americans have had a positive math experience. In a study of over 9000 students, Janes (2001) found that only 25.9% have a moderate to high need of help with math anxiety. Although anxiety has been extensively studied, little is known about the emergence of math anxiety in secondary schools students. Most studies of MA have focused young children (Ramirez, Gunderson, Levine & Bielock, 2013; Chiu & Henry, 1990).The current study examines whether gender variation exists between MA and math performance. The literature indicated that few studies reported the prevalence of math anxiety in Nigeria; however, frequency of math failure among students in senior secondary school examination is enough to account for such evidence

Various studies have linked MA to increased worries about math failure (Ramirez et al , 2013) and it has been recognized to play effective role in mathematics achievement of secondary school students (Lyon and beilock, 2010). The negative feelings toward math may greatly affect student ability to perform well. Esynck and calvo (1993) stressed that anxiety hinders task efficiency by inhibiting effectiveness of working memory as a result of intrusive thought which eventually pre-empts task processing resources. Failure to inhibit irrelevant information leads to disruption of memory processes involving cognitive resources beginning from mental rehearsals to speed and level of processing information. A related approach in the literature examining the impact of MA on math performance of students had explored individual difference in working memory (Engle 2002). The higher the capacity of working memory the better their performance on academic task such as, problem solving and

reasoning and the better they regulate their emotional experiences (schmeichel and Demaree, 2010). Thus individuals with higher capacity of working memory would be in the position to deal with difficulties associated with math anxiety. On the other hand research indicated that individual with low memory capacity are expected to have limited ability for computation, by shrinking the capacity in working memory below the level needed for solving difficult math problem successfully (Ramirez, et al, 2013).

Mathematics is often labeled as a masculine ability; as a result girls often have low confidence in their math capabilities. Gender stereotype can reinforce low confidence in girls and can cause math anxiety. Study indicated that performance on standardized math test is affected by one's confidence (Dar-nim and Heine 2006), it is expected that female are more anxious in mathematics as a group than men. (Joel and Kimberley 2003) it was suggested that if female students have an anxious female math teacher, they are more likely to confirm the anxiety as a gender stereotype. Girls are more likely than boys to take notice of their female teacher's emotion which will negatively influence their future pursuit of the subject (bielock et al, 2010).

Similarly, Walsh, Crystal and Jim (1994) explained that difference in math performance between male and female is not biological but more of social effect. The researcher doing the experiment believed that gender stereotype threat could be a key factor in explaining male and female difference in performance on math exams. The gender stereotype according to them would be gender references on the exams and that these could affect how a male or female answers a question, and if they get it correct or not. For instance in the question they use for the experiment "There are 12 car pools in the plant where Mr. Holst works, half of them contain 4 people, while the other half contain 5 people. How many workers at Mr. Holst's plant belong to the car pool? (Walsh, et al, 1994). The way they manipulated the question was to change Mr. Holst to or did not include a name at all to remain neutral. They reported that the ones that performed well did best in male labeled questions; the ones that perform poorly did well on the female labeled questions. This suggests that both math anxiety and gender stereotype can affect math performance indicating a double deficit phenomenon. Based on the result of the experiment, they suggested that gender labeling on exams could cause math anxiety in female and affect their performance on math exams.

Based on these findings, this study examines gender differences in math anxiety, and math performance of secondary school students in Bauchi state.

Objectives of the Study

1. To examine the effect of math anxiety on students' performance in mathematics.
2. to determine gender difference between math anxiety and performance in mathematics

Statement of the problem

Math is one of the two important subjects that determine admission into the Nigerian universities. Although, the principles of mathematics are generally understood at an early age, and can even retrieve answers to mathematical equation from memory, due to social factor, students acquire fear for math which reduces memory capacity to process information as a result of intrusive thought that hinders efficient cognitive abilities leading to poor performance in math. This study investigated gender differences between math anxiety and math performance of secondary school student in Bauchi state.

Hypothesis

The following hypotheses were tested.

3. There is no significant difference between students' math anxiety and their performance in mathematics.
4. There is no significant gender difference between students' math anxiety and their performance.

Methodology

Design

The study used survey design, because it has explored the peculiar characteristics of the population using representative samples of the population. This comprise of all students of secondary schools in Bauchi state. The sample contains 80 students from selected secondary schools in Bauchi state. Mathematics anxiety scale which was developed by researchers was administered to collect students' opinion toward mathematics. The questionnaire was designed into two sections containing personal data of the respondents and items on math anxiety. Cronbach Alpha was applied on the items scores to establish internal consistency of the items and index of .72 was obtained. Data collected was analyzed using t-test.

Results

The results of data analysis of the research hypothesis are presented below.

H01: There is no significant difference between students' math anxiety and their performance in math.

Table 1: result of independent t-test on math anxiety and math performance

Variable	N	Mean	St.d	T	Df	Sig	R
Math anxiety	80	68.	78 4.	75 12.	292	1058	
Math performance	80	49.99	12.82				

The table shows the result of t-test of independent sample on math anxiety and math performance. The mean of math anxiety is 68.78 and the standard deviation is 4.75, while the mean of math performance is 49.99 and the standard deviation is 12.82, the result revealed that there is a significant difference between math anxiety and math performance. The null hypothesis was rejected.

H02: There is no significant gender difference in students' math anxiety.

Table 2: Results of Independent t-test of gender and math anxiety

VARIABLE	N	MEAN	STD	DEVIATION	T	DF	S	R
M/A								
Male	50	68.92	4.183	350	78	727		
Female	30	69.53	5.631	326	48.344	746		

Table shows the t-test of independent sample of math on gender and math anxiety. The mean the of male is 68.92 and the standard deviation is 4.193 while the mean of the female is 68.53 and the standard deviation is 5.631, the results revealed that there is no significant gender

difference in math anxiety of student. Therefore null hypothesis was accepted

Discussion

The result indicated that math anxiety has affected student's performance in math. This is consistent with Tobias and Weissborod (2008) who stressed that math anxiety interferes with students' focus on the task of hand. Ashcraft and Kirk, (2001) presented similar result and suggested that presence of intrusive thought and worries interfere with working memory process and this affects students' performance. Therefore math anxiety affect student's performance in math as it inhibits cognitive process.

The result pertaining to gender difference in math performance revealed that math anxiety has no preference for gender. Both male and female were equally affected. This means both male and female students were preoccupied by worries and tension regarding mathematics

Recommendations

Math teachers should try to make students active and motivated during mathematics classes. School management should see that mathematics is slated and taught in the morning in the time table. Strategies should be put in place to reduce math anxiety. teachers should void gender stereotypes in mathematical problem.

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