

Relationship of Mathematics Anxiety with High School Students' Achievement

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Abstract

Mathematics anxiety is therefore considered as a hurdle to students' achievement in mathematics. The current research aimed to find the relationship of mathematics anxiety (MA) with mathematics learning of high school students in Lahore, Pakistan. Target population for this study was all male science students of grade 10th of government sector high schools of Lahore district. Quantitative approach was applied in this descriptive research. A sample of three hundred and twenty (320) students was selected using multistage sampling technique. At first stage, thirty two government high schools from district Lahore were selected; and in the next stage, ten secondary class students of science group were selected randomly from each school. For the collection of data regarding student's anxiety for learning mathematics, a standardized tool developed by May (2009) was used. One part of this questionnaire was selected because of its relevancy to the study. Students' responses were collected on a Likert five points rating scale. The data was analyzed applying Pearson " r ". Data analysis reported negative correlation between mathematics anxiety and students' learning in mathematics. It shows that although students have anxiety regarding learning mathematics, however, it is not the cause of their low performance in mathematics. It is recommended to further probe the reasons for the low performance of students in the subject of mathematics.

Keywords: mathematics anxiety, achievement, high school students

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Introduction

In global perspective, due to its uses in the development of societies, nations and countries, mathematics has become a highly demanding study subject. With the help of mathematics, a person become able to solve the problems hence serves the world for social improvement. Young generation is considered best for meaningful changes and for the advancement of whole world. Therefore to be advance in technology and to meet the new challenges, it seems necessary for young generation to strengthen their base by learning secondary school subjects particularly mathematics and science (Saeedullah, 2014). A state of tension, panic or unease faced when solving mathematics tasks in mathematics is termed as mathematics anxiety (Zakaria & Nordin2008). Mathematics anxiety can also be stated as the feeling pressure and fear that disturb learners mentally while executing mathematics operations and hence they may be unable to solve the sums. Mathematics anxiety is therefore considered as a hurdle to students' achievement in mathematics (Bursal, 2006). In the light of above discussion, we can say that if learners feel some sort of fear or uneasiness to solve mathematics problems, they are suffering from mathematics anxiety.

Cognitive factor is a main factor of Mathematics anxiety. Irrespective of this factor, another factor namely emotional factor also causes mathematics anxiety. Hesitations, fear, low mental tendency are related to cognitive factors whereas emotional elements include discomfort, tenseness, and distress (Moore, 2009). Overpowering, losing memory, headache, muscle tension and disturbance of blood pressure are Mental and physical indicators of mathematics anxiety in students (Preis & Biggs 2001).

From last three decades of twenty century to till now, mathematics anxiety has been discussed as a burning issue among researchers and educators. It is needed that to alleviate mathematics anxiety among students, curriculum of mathematics at all levels must be designed in such a way which compel learners for thinking and analyzing mathematically. Progressive teaching strategies such as team teaching, individual guidance, and cooperative study can provide learners opportunities of sharing mathematical ideas. By using these modern techniques, students become able to understand the mathematical processes instead of rote memorization. If these skills of thinking and reasoning mathematically are learned by students at initial levels, then these learned skills will be helpful for entire life to meet the challenges of time (Reyes et al., 2007).

Mathematics anxiety is seemed mostly among elementary as well as secondary school students and it also relates to early experiences of studying mathematics. A number of researches have been investigated that secondary school students' achievement in mathematics is highly related to mathematics anxiety. If students are facing high level mathematics anxiety, their achievement in mathematics is low and if students are facing low level mathematics anxiety, their achievement in mathematics will be possibly at high level. Therefore students' academic achievement in mathematics is significantly affected by mathematics anxiety (Ping et al. 2011). The most relevant factor influencing the students' achievement in mathematics is mathematics anxiety. This factor causes due to several reasons. Some of them are nervousness created by teachers, parents and class fellows and the myths prevailing in the society about mathematics. Myths about mathematics are like. Mathematics is a complicated subject, mathematics is a subject having no practical applicability and that mathematics is a boring, abstract and dry subject. Due to these myths, learners consider themselves unable to study mathematics. Teachers' poor knowledge of learners' individual differences also contributes to learners' mathematics anxiety. This situation can be handled overcoming the reasons which causes mathematics anxiety (Butterworth, 2009).

Statement of Problem

An important aim of secondary education is to prepare students for facing the challenges of modern world by providing them a strong base to higher education. Secondary education also prepares students to earn their livelihood by acquiring necessary skills; among these skills, mathematical skills are of prime importance. Researcher as a mathematics teacher has been experienced that some secondary school students showed good performance in routine wise tests and failed to do so in final examinations. There may be some other reasons of secondary school students' low performance in mathematics; but literature supports that mathematics anxiety is most important reason of secondary school students' low performance in mathematics. Literature shows that research studies about relationship between mathematics anxiety and the students' performance in mathematics are not sufficient to the present scenario. Therefore, the researcher intended to conduct this study to find the relationship between mathematics anxiety and mathematics learning of high school students.

Research Question

According to the objective of the study, following research question was framed.

Is there any relationship between secondary school student's achievement and their mathematics anxiety?

Literature Review

Anxiety is a term used for several disorders that cause nervousness, fear, and apprehension. These disorders affect the way we feel and behave. It is also seen as a cognitive behavior rising from self-doubt and self-depreciation (Hembree, 2002). Mathematics anxiety involves feelings of anxiety and tension that interfere with doing mathematical tasks. Mathematics anxiety existed around a set of circumstances in which students suffered from fears that were based upon years of painful experiences with mathematics (Miller & Mitchell, 1994). Mathematics anxiety has been defined as the feeling of tension, helplessness, mental disorganization and dread one has when required to manipulate numbers and shapes and the solving of mathematical problems (Ashcraft, 2010).

Studies indicated that mathematics anxiety is found in elementary students (Zettle, 2000), in high school students and in college students (Furner & Duffy, 2002). Ma (2009) found that at secondary school level, relationship between mathematics anxiety and mathematics achievement is significant and mathematics anxiety affects students' achievement in mathematics. Ashcraft (2010) also found that many students with mathematics anxiety face slight or no confidence to solving mathematics problems. The correlation between mathematics anxiety and academic performance is strongly negative. Similar findings were also reported by Hardfield et al (2012). Tobias (2015) emphasized that math anxiety appears due to several reasons such as absenteeism, poor self-concept and learning without comprehension. Some nonprofessional teachers are also severe reasons of mathematics anxiety among secondary school students. Better way to alleviate mathematics anxiety is to change the teaching strategies according to present needs of learners and societies. Student centered teaching methods and psychological strategies can help to lessen the mathematics anxiety.

A negative relationship between math anxiety and math achievement has been found across all grade levels (Ma, 1999). In the early grades, there is no significant difference in the math anxiety experienced in

either gender (Bisanz, 1995), but females exhibit more math anxiety in secondary school and in college (Bernstein, Reilly, and Cote-Bonanno, 1992; Campbell and Evans, 1997). Some studies support the belief that nontraditional-aged students exhibit more math anxiety than traditional-aged students (Betz, 1978; Royce and Rompf, 1992). However, Bitner, Austin, and Wadlington (1994) found no evidence of this trend, although they did find that nontraditional-aged students reported more anxiety in general than traditional-aged students. Campbell (2007) argued that at primary level, male and female face the same anxiety level; but in secondary schools, females exhibit more math anxiety as compared to male students. Recent research suggests various ways to prevent and reduce math anxiety by using creative teaching methods and providing students a pleasant climate. Moreover, exhibiting a better understanding of learning styles can reduce mathematics anxiety (Sutton, 2012).

Methodology

In this descriptive study, respondents' opinions were required to be sought; therefore the researcher applied survey approach to collect responses from the sampled students. The researcher delimited the study to male students belonging to science group in government sector high schools. By using multi stage sampling, a sample of 320 learners was drawn. At first stage, thirty two government high schools from district Lahore were selected; and in the next stage, ten secondary class students of science group were selected randomly from each school. During reviewing the related literature, researcher found a questionnaire relating to mathematics anxiety best for this study. This research instrument was developed by May (2009). One part of this questionnaire was selected because of its relevancy to the study. Students' responses were collected on a Likert five points rating scale (From 5= Always up to 1= Never)

To make research instrument understandable for respondents, it was translated to Urdu. This translation was checked by language expert to assure its validity. The researcher used the results of class 9 students in mathematics, declared by BISE Lahore as their learning in mathematics. To analyze the results obtained in this study, simple linear regression was used.

Results

Following is the detailed description of results obtained from data analysis.

Table 1

Descriptive statistics on predictor and criterion variables

	N	Mean	Std. Dev.
Mathematics Anxiety	320	2.16	.846
Student's Score in Mathematics Achievement	320	46.31	15.96

Table No.1 shows mean score and standard deviation. Math anxiety mean score was found as 2.16 with SD 0.846 and achievement score in mathematics was 46.31 and SD was 15.96 which are very high in both cases.

Table 2

Pearson Correlation between math achievement score and math anxiety score

Relationships	Math achievement score	Mean score anxiety	Sig. (2-tailed)
Math achievement score	1	-.110**	.000

N= 320, **. Correlation is significant at the 0.01 level (2-tailed).

Table No. 2 shows the information about relationship between the variables.

Results obtained from this study reveal that achievement score in mathematics of secondary school students 46.08 is highly significant at $p < .001$. Therefore, it is concluded that mathematics anxiety affects secondary school students' achievement in mathematics significantly. Table No. 2 shows the information about relationship between the variables. The correlation value is $-.110$. This value indicates that there is a strong negative correlation between mathematics anxiety and students' achievement in mathematics. In the light of this value, it is concluded

that with the increase of mathematics anxiety, students' achievement in mathematics decreases.

By summarizing the results obtained from this study, it is concluded that there is a negative effect of math anxiety on students' achievement in mathematics at secondary school level.

Discussion

Due to severe conditions of mathematics anxiety, several researches have been conducted on elementary and secondary school levels. This study reveals that at secondary school level, students' achievement is negatively affected by mathematics anxiety. Finding of this study matches with the studies conducted by Woodard (2004) and Krinzinger et al. (2009). Result of this study matches with the study conducted by Beilock (2007) in line with the students facing less or no anxiety are high achiever in mathematics and the students with high anxiety are low achiever in mathematics. In addition to mathematics anxiety, there could be other variables affecting students' achievement in mathematics. These potential variables may have influenced the secondary school students' learning in mathematics

Recommendations

This study reported the negative effects of mathematics anxiety on secondary school students' achievement in mathematics. Therefore it is suggested that there should be revolutionary changes in school education system by developing a high school mathematics curriculum according to the students' psychology and needs. School education department may appoint highly qualified and trained teachers. In the light of results obtained by the researches on mathematics anxiety and learners' achievement, school education department may conduct refresher courses and workshops to develop better learning instructional skills. Since teachers play an important role in learners' development, therefore it seems strong to suggest that they must create pleasant atmosphere for their learners to alleviate students' mathematics anxiety. It is suggested that a teacher should apply useful evaluation on regular basis to assess their students' shortcomings and weaknesses in mathematics and hence should facilitate students to cope with mathematics anxiety. It is further suggested that students' parents may help their children to mitigate mathematics anxiety by proper counseling.

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