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Mathematics Anxiety of Secondary School Students in Relation to their Gender, Type of School and Achievements

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ABSTRACT

The contemporary study is an effort made by the researchers to measure the Mathematics Anxiety of students of Secondary School of Jammu Municipality in relation to their Gender, Type of School and Achievements. It looks for variations in anxiety levels between children attending government and private schools, as well as between boys and girls. The project also aims to investigate the relationship between mathematics achievement and anxiety, providing information on how anxiety impacts mathematical academic performance. The researchers selected the 434 class 10th students studying in the various government and private schools of Jammu Municipality as a sample by using simple random sampling. Out of which 209 were girls and 225 were boys. Investigators employed Mathematics Anxiety Self- Test (MAST) constructed by P. Don Bosco and Dr. V.D Swami Nathan in 2021 as a tool for data collection. The scale consists of 20 items which obtained responses on five points. According to the study, there is a negative correlation between secondary school pupils' achievement and their worry about mathematics. Additionally, study demonstrated that there was no discernible difference in the level of mathematics anxiety between secondary school pupils attending government and private institutions. Beside this, the study also proved that the boys and girls of secondary schools were found to reveal insignificant differences in their mathematics anxiety.

Keywords: Private and Government Secondary Schools, Mathematical Anxiety, Gender Comparison, Achievement correlation

The Indian Education System a bunch of different subjects having its own existence. The current research revolves around the subject mathematics. Mathematics is regarded as a fundamental discipline of knowledge. It occupies an important place in social, emotional, mental and personal development of a person. The importance of Mathematics and Science for the society may be understood in terms of their developmental role for the society. Certain abilities that are reared by calculation are the power of reasoning, originality, critical philosophy, problem-solving ability, and operative communication skills. Napoleon opined that, the evolvement and the development of Mathematics are interconnected to the success of the state (A.K. 2010) Forestalling the significance of Mathematics and Science, Kothari Commission (1966) remarked very rightly in its recommendations that "Science and Mathematics should be taught on a compulsory basis to all pupils as a part of general education during the first ten years of schooling". The concomitant suggestions regarding the importance of Mathematics education have also been given by the Secondary Education Commission (1952) and National Policy on Education (1986). It shows that Mathematics must be a fundamental part of the school's curriculum.

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At secondary education, students notice their strong point and welfares. It is the only concluding stage where mathematics is compulsory after that the students have the option to exclude mathematics if they want. Some students take arithmetic just as an apparatus, to be used for meeting the necessities of day today life. Such kind of students can end their recognized mathematics schooling at the secondary stage. Others can continue to learn mathematics to sustenance their upcoming education. An inspection of mathematics teaching in classrooms will disclose a number of challenging factors. We edifice our understanding about the problems which we consider to be the fundamental areas of concern like: a sense of distress, disappointment about mathematics among youngsters, a core curriculum that dissatisfies both a capable minority and non-participation of majority at the same time, a rude means of assessment, perceived mathematics as mechanical calculation, unwillingness of teachers, and sustenance in the teaching related to mathematics.

Mathematics Anxiety and Mathematics Achievements

Mathematics anxiety is regarded as psychological barriers in front of the students while performing task related to mathematics. It is a strong emotive sentiment that can make someone panic, helplessness and mental disorder that occurs in specific students when they are obligatory to solve the problems of mathematics. Today in college campus as well as schools has intended extraordinary counseling programs to help reduce mathematics anxious among students. According to Richardson and Suinn (1972), Math anxiety in terms of the (deliberating) influence of Mathematical Anxiety on performance "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of the mathematical problems in a wide variety of ordinary life and academic situations". Ashcraft & Faust (1994) demarcated math anxiety as a "mental defect, fear of mathematics, a feeling of intense frustration or helplessness when one is required to solve mathematical operations and manipulate numbers or figures". According to Ambedkar (2013), achievement is the accumulation of information and abilities in academic topics, typically indicated by test and examination scores. Devineet, (2012) in their study found that females unveil extra mathematics anxiety as compare to males. Dikkartin (2012) reported an adverse bond between achievement and anxiety with respect to mathematics. Male and female students did not significantly differ in terms of academic achievement, creative ability, or exam anxiety, according to Bala & Shaafiu (2016). However, they did find a positive correlation between an individual's academic achievement and their capacity for problem-solving, as well as a negative correlation between academic achievement and examination anxiety.

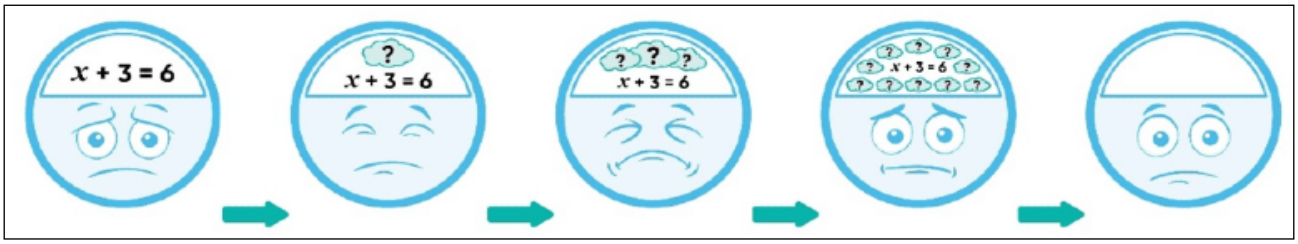
Causes of Mathematics Anxiety

Furner & Duffy (2002) stated that mathematics anxiety is caused by poor grades, negative predisposition of teachers and the parents too. Teachers and parents having the fear of mathematics, pass the same feelings among children and students regarding the subject mathematics. It could be a difficult subject for those students whose parents themselves did not do well in mathematics. Steele and Alferd (1998) highlighted an inappropriate teaching approach as a source of anxiety as most of the teacher uses an inapt approach for explaining, practicing and memorizing mathematics. Several teachers, support the untrue indication that girls cannot achieve well comparatively males in mathematics. Such kind of ideas also source for anxiety in mathematics (Jackson & Leffingwell 1999). Sometimes the actions done by the mathematics teacher provoke students to dislike mathematics. Assigning mathematics problems in place of punishment also frustrate students, which creates the feelings of disliking among students regarding mathematics (Furner & Duffy, 2002).

From the Fig. 1, indication of faces denotes the impact in different ways like the face first indicates that the experiencing symptoms of math's anxiety leads to invasive negative thoughts, leads to ruminating on the negative thoughts, leads to ruminating on thoughts, while trying to complete math's task leads to working memory overload which leads to more error made, freezing or blanking.

Rationale of the Study

After reviewing the related literature, the researchers observed that the studies support multiple results



Source: *Ashcraft & Kirk 2001.*

Fig. 1: The impact of mathematics anxiety on mathematics achievement

leading to phenomena where the need for further research emerged. It was also observed from reviewing literature that qualitative and quantitative methods were used by the researchers. The research studies conducted with a variable, i.e. gender, found that mathematics anxiety of the girls was reported higher than the boys. Rubinstein, Bialik, Devine and Faweett, (2012) also found in their study that females display more mathematics anxiety than male as well as more anxious in math than males. Putech & Khalin, (2016) found a negative relationship between the achievement of the students and their mathematics anxiety. It was also noticed that a profound relationship exists between the mathematics anxiety and academic achievement of the students. Mathematics anxiety is termed as dependent variable, which is determined by multiple factors. Fox (1977) stated, a strong relationship between low math confidence and high math anxiety because of mathematics. The negative effect of mathematics anxiety is demarcated as a sense of fright, weakness and mental incompetence that ascends amongst few people, when they are compulsory to solve the problems of mathematics (Richardson & Suinn, 1972 and Tobias, 1978). Today the anxiety due to mathematics is accepted as one of the major problems in front of students behind their incompletion of math course. Arithmetic anxiety can appear in a variety of ways, including physical, psychological, and behavioral symptoms, all of which can interfere with a student's arithmetic proficiency. Therefore, it is crucial that educators, parents, and students understand the consequences of math anxiety and offer remediation to those who are impacted. Hence, more research is required to gain a better thought of mathematics anxiety. So, the investigator had chosen present study for research work. In the reviewed literature the researchers observed that many studies were undertaken in the foreign context. In India the majority of the studies were conducted in different states, but the researchers found very less studies in U.T. Jammu Kashmir with the variables considered in the present study. Here the researchers have selected the class 10^{th} students because it is a compulsory subject of standard 10^{th} and in further education the students are free to select streams as per their choices. In class tenth the students have to go through the Board examination and also facing stress, fear and anxiety because of family pressure, peer pressure and society too throughout the session. In social media, today we can find the number of students committed suicides because of the mathematics anxiety and of other examination too. The researchers developed the present study's premise and attempted to gauge the level of mathematics anxiety among secondary school pupils in the Jammu Municipality based on the observations they made after carefully reviewing the literature.

OBJECTIVES

1. To measure the mathematics anxiety of standard X of secondary schools of Jammu Municipality.
2. To compare the mathematics anxiety of boys and girls of standard X of Jammu Municipality.
3. To compare the mathematics anxiety of government and private school students of standard X of Jammu Municipality.
4. To ascertain the relationship between mathematics anxiety and mathematics achievements of standard X.

HYPOTHESES OF THE STUDY

1. All the students of standard X of secondary schools do not possess the same mathematics anxiety.
2. There exists no significant difference in mathematics anxiety of boys and girls of standard X of secondary schools.

3. There exists no significant difference in mathematics anxiety of standard X students of government and private schools.
4. There exists no significant relationship between mathematics anxiety and mathematics achievements of standard X.

METHODOLOGY

In the present study, the researchers employed the Descriptive research design. The current study was accompanied on students of 10th class learning in the secondary schools of Jammu Municipality. For the collection of data, a total of 434 class 10th students studying in the various government and private secondary schools of Jammu Municipality was taken as a sample of the study. Stratified random sampling technique was used for drawing out the sample. Out of the total sample drawn, 209 were girls and 225 were boys. The total number of government secondary school students was 153 and private was 281. The study was restricted to the all students of class 10th of Government and Private schools of Jammu Municipality. To achieve the formulated objectives, the data were collected from the constituted sample by using the Mathematics Anxiety Self-Test (MAST). This scale was constructed and standardized by P. Don Bosco and Dr. V.D. Swaminathan (2021). The scale is in English. The scale consisted of 20 items. Each item was provided by the response set in the plan of "Strongly Agree", "Agree", "Undecided", "Disagree", "Strongly Disagree". The investigators obtained the consent from the target-group and collected physically.

DATA ANALYSIS

Table 1: Levels of Mathematics Anxiety among Government and Private secondary school students (N = 434)

Sl. No.	Levels of Mathematics Anxiety	No. of students	Percentage (%age)
1	High (above 77 score)	27	6
2	Moderate (between 52 to 77 scores)	250	58
3	Low (less than 52 scores)	157	36
Total		434	100

Hypothesis I: There exists no significant difference in mathematics anxiety of boys and girls of standard X of Jammu Municipality.

Table 2: Comparison of Mathematics Anxiety scores of standard X students with respect to Gender (N = 434)

Variables		N	Mean	S.D	t-Test value	Level of significance
Gender	Boys	225	56.50	14.35	0.60	Not significant at 0.05
	Girls	209	57.18	12.54		

Table 2 illustrates the anxiety scores of boys (225) and girls (209) students of Standard X. The means of mathematics anxiety scores of boys and girls of standard X of Jammu Municipality is 56.50(boys) and 57.18 (girls) respectively, while the Standard Deviation is 14.35 (boys) and 12.54 (girls) respectively. "t" has a computed value of 0.60. At the 0.05 level, the obtained "t" value of 0.60 is less than the critical value, or 1.96, and is therefore not statistically significant. Thus, it may be concluded that there was no discernible gender-based variation in secondary school pupils' anxiety levels in mathematics. Hence, the hyp 2 stating that "There exists no significant difference in mathematics anxiety of boys and girls students of standard X of Jammu Municipality" has been retained at the 0.05 level of significance.

Hypothesis III: There existed no significant difference in Mathematics Anxiety of Government and Private schools of standard X students of Jammu Municipality.

Table 3: Comparison of Mathematics Anxiety scores of secondary school students with respect to Type of school (N = 434)

Variables		N	Mean	SD	t-value	Level of significance
Type of school	Govt.	160	57.83	11.68	0.21	Not significant at 0.05
	Private	274	56.23	14.38		

Table 3 illustrates the anxiety scores of Govt. (160) and private (274) students in secondary schools. The means of mathematics scores of Governments and Private secondary school students is 57.83 (Govt.) and 56.23 (Private) respectively, while the Standard Deviation is 11.68 (Government) and 14.38 (Private) respectively. "t" has a computed value of 0.21. At the 0.05 level, the obtained "t" value of

0.21 is less than the critical value, or 1.96, and is therefore not statistically significant. Thus, it can be concluded that standard X pupils' anxiety levels in mathematics were not significantly influenced by the kind of school they attended.

Hence, the hypothesis III stating that "There exists no significant difference in mathematics anxiety of government and private schools of standard X students of Jammu Municipality" has been accepted at 0.05, level of significance.

Hypothesis IV: There exists no significant relationship between mathematics anxiety and mathematics achievements of standard X of secondary schools.

Table 4: Relationship between Mathematics Anxiety and Achievements of standard X (N = 434)

Variables	Total No. of Students	Pearson's coefficient of Correlation	dr	Result
Mathematics Anxiety Mathematics Achievement	434	-0.27	432	Significant at 0.01 levels

It can be interpreted from the above table, that the calculated value of the Pearson product moment coefficient of correlation (r) is -0.27, which at d_f = 432 is greater than table value of 0.115 at 0.01 level of significance. Therefore, the hypothesis IV stating "There exists no significant relationship between mathematics anxiety and mathematics achievements of standard X" is rejected at mentioned level of significance. Hence, it can be established that there existed a negative association between mathematics anxiety and mathematics achievements of standard X.

MAJOR FINDINGS

- It was found that students of standard X of Jammu Municipality did not possess the same mathematics anxiety. The research also reported that (58%) of students of standard X were found to have a modest level of mathematics anxiety whereas, 36% were having low and only 6% were having a great level of mathematics anxiety.
- The study exposed that there was no significant difference in the mathematics anxiety of boys and girls' students of standard X of Jammu Municipality. But it indicates the significant difference in the mean value of gender (i.e. Boys & Girls), which reveals that mathematics anxiety among girls was higher than the boys' students.
- The study also reported that no noteworthy difference was found in the mathematics anxiety of standard X students of Private and Government secondary school of Jammu Municipality.
- The study established that there was negative link amid mathematics anxiety and mathematics achievements of Standard X students of Jammu Municipality.
- The study found that, both boys and girls of Standard X were not having any significant difference in their mathematics anxiety.

DISCUSSION OVER THE FINDINGS

The current study concluded that there was no significant difference in mathematics anxiety of Standard X students of government and private school. The study also observed no significant difference in both males and female students of Standard X with respect to mathematics anxiety. The study revealed that the negative relationship between mathematics anxiety and mathematics achievements of standard X was found. These findings are confirmed by the studies of Rubinsten & Bialik (2012), Devine and Faweett, (2012) which states that females exhibited more mathematical anxiety as compare to male. Putech & Khalin, (2016) recorded the negative correlation between the students with respect to mathematical achievement and anxiety. On the basis of the above findings, it can be said that there is a negative relationship between achievement and mathematics anxiety this supports Dikkartin's (2012) theory that anxiety impairs mathematical ability. Similarly, the recognized causes of mathematics anxiety, such as negative attitude of the teachers and parents (Furner & Duffy, 2002) and inadequate teaching approaches (Steele & Alferd, 1998), was also found. However, Devine *et al.* (2012),found that mathematics anxiety was higher among females, are in contrast to the lack of substantial gender differences in mathematics

anxiety. When measuring gender disparities, this study found no statistical significance, despite observing a difference in the mean values, which shows that there is a difference to be taken into account. Further evidence that school type may not have a substantial impact on mathematics anxiety in this particular setting comes from the lack of notable differences between pupils attending government and private schools. On the other hand, this study supports the inferences of Bala & Shaafiu (2016) that there was no considerable difference between male and female students' academic performance or exam anxiety.

CONCLUSION

After having results and in-depth insight over the review of literature related to mathematics anxiety, in a nutshell the researchers reached at the conclusion that, there is a great need to bring change in the pedagogy of mathematics by the teacher, while transacting the content or presenting mathematical problems in the classroom. The teacher should try to identify that either the student has a phobia towards mathematics or any pre-existed a notion in his /her mind because of which they are unable to do well in mathematics. As per the need of the students the teacher should proceed with suitable pedagogy by motivating the students with positive reinforcement. On the other hand, the teachers should develop a triangulation connection with the parents and students. They all can converse on the same platform in a transparent manner, which might be more beneficial for all of them, to work over the matter of students who have shown the sign of mathematical anxiety.

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