



Mathematics anxiety among ninth grade students of Bharuch City

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ABSTRACT

A great deal of research has been accumulated on mathematics anxiety all over the world. It deals with fear and anxiety which could cause extreme feelings of dislike. The recognition of mathematics anxiety in the Indian educational context is quite new. This pilot study aimed to examine the level of mathematics anxiety among 9th graders. A standardized tool 'The Mathematics Anxiety Scale' developed by Bindak (2005) was used for data collection. Data were analyzed using SPSS software. Independent samples t-test and One-Way ANOVA were used for data analysis. The pilot study results showed a significant difference in mathematics anxiety among 9th graders in terms of gender, between the liking and disliking of the subject, according to their achievement level.

Keywords: Mathematics Anxiety, Achievement score, Pilot Study

INTRODUCTION

Despite its importance, in daily life, mathematics is often viewed as a difficult subject. Such perception is in part, due to the nature of math. However, it also has to do with preconceived notions about mathematics and the anxiety individuals have for mathematics (Yang *et al.*, 2022). A remarkable body of research has been accumulated on mathematics anxiety since the 1960s (Cipora *et al.*, 2022; Rossi *et al.*, 2022; Klee *et al.*, 2022; Albelbisi *et al.*, 2022). There have been a variety of definitions of what constitutes mathematics anxiety. It is also viewed as tension and anxiety that interfere with manipulating numbers and solving mathematical problems in a wide variety of ordinary life and academic situations (Rounds & Hendel, 1980). Mathematics anxiety has to do with fear and apprehension of specific math-related situations (Miller & Mitchel, 1994).

Studies point out a host of factors associated with mathematics anxiety (Cipora *et al.*, 2022; Rossi *et al.*, 2022; Klee *et al.*, 2022, Albelbisi *et al.*, 2022). These variables range from environmental factors such as family pressure for higher achievement to intellectual factors such as learning styles or personality factors such as low self-esteem. In other words, mathematics anxiety is a multifaceted construct with affective and cognitive dimensions (O'Hara *et al.*, 2022). Personality, self-concept, self-esteem, learning style, parental attitudes, high expectation of parents, negative attitudes toward mathematics, avoidance of math, teachers' attitudes, ineffective teaching styles, negative school experiences, and low degree of achievement in mathematics are among the concepts and constructs related to mathematics anxiety (Morán-Soto & González-Peña, 2022).

Mathematics anxiety in school students indicates that its onset coincides with the early years of schooling. This could in part be due to social learning from parents and teachers with mathematics anxiety or negative perceptions of math. A great deal of research has been accumulated all over the world (Živković *et al.*, 2022 and Orbach, 2022).

REVIEW INSIGHTS AND SIGNIFICANCE

The review reveals that abroad many studies are conducted on mathematics anxiety. However, few studies are conducted on mathematical anxiety. The researcher pointed out from the literature of reviews that recognition of mathematics anxiety in the Indian educational system is quite new. Thus, the purpose of this study pilot study was conducted to develop a strong background on mathematics anxiety for further study. The study aimed at examining the factor contributing to mathematics anxiety in ninth-grade school students in Bharuch City. The purpose of this study was to examine whether ninth graders' mathematics anxiety for a group of variables such as gender, liking mathematics class, whether or not students, had gender stereotypes about success in mathematics, and achievement level in mathematics. Thus, students with these excessive worries develop negative attitudes toward mathematics which are expressed as "I can't do mathematics" or "I hate mathematics." However, since they do have to deal with mathematics, these beliefs lead to a great deal of distress and unease.

RESEARCH OBJECTIVES

The current study pertains to the below research objectives:

- a) To analyze the distribution of mathematics anxiety with respect to liking or not liking mathematics
- b) To analyze the beliefs about gender and success in mathematics anxiety
- c) To analyze the achievement level in mathematics on mathematical anxiety

RESEARCH METHODOLOGY

This prospective and observational single-center pilot study was carried out in July 2022 on consecutive 50 school students of ninth grade among the two Private schools (Takshashila Vidhyalaya and Munir Munshi Boys) of Bharuch City. The current work attempted to investigate on ninth for grade students' mathematics anxiety has any impact on gender, liking for mathematics class, and achievement in math.

Population and sample

The population comprises all the Private schools in Bharuch City. sample of the pilot study constitutes 50 school students of ninth grade from two Private schools of Bharuch City.

Data collection tool

"The Mathematics Anxiety Scale" was used for data collection. The scale was developed and standardized by Bindak (2005) to assess mathematics anxiety in school students. It is a 5-point Likert-type scale consisting of 10 items. Split half reliability coefficient to test the Scales' reliability and found a Spearman-Brown correlation coefficient of 0.83, and a Cronbach Alpha coefficient of 0.84. Based on the reliability score it was considered to be a good standardized tool. Factor analysis done for validity testing of the scale resulted in one factor. Other information like Gender, whether participants liked mathematics class or not, whether or not they believed success in mathematics is relevant to gender and mathematics, and achievement was developed by the researcher.

DELIMITATION OF THE STUDY

The study was delimited to the private school having a Gujarati medium of instruction in the academic year 2022-23.

OPERATIONALIZATION OF THE TERM

- **Mathematical Anxiety:** To the extent, a mathematical anxiety score achieved using a mathematical anxiety scale is considered mathematical anxiety among Ninth-grade students of Bharuch City.

DATA ANALYSIS

- Independent samples t-test and One-Way ANOVA were used for data analysis. A significant level of 0.05 was used for all analyses. These analyses were found using SPSS software.

Below is a summary of findings obtained from data analysis procedures in answering the research questions.

Table 1: t-value wise distribution of mathematics anxiety with respect to gender

Variable		n	Mean	SD	t	p-value
Gender	Male	25	18.38	8.65	2.18	0.03
	Female	25	20.47	8.74		

*Significance at 0.05 level

As shown in above Table 1, the results showed a significant difference between mathematics anxiety scores of males and females ($df = 48$, $t = 2.18$, $p < .05$). More specifically, female students scored significantly higher ($M = 20.47$, $SD = 8.74$) than males ($M = 18.38$, $SD = 8.65$).

Table 2: t-value wise distribution of mathematics anxiety with respect to liking or not liking mathematics

Variable		n	Mean	SD	t	p-value
Liking Mathematics	Yes	43	19.06	7.29	11.82*	0.01
	No	7	32.44	7.02		

*Significance at 0.05 level

Table 2 represents the concerning liking mathematics, the results showed a significant difference between mathematics anxiety scores of those who liked their mathematics class and those who did not like ($df = 48$, $t = 11.82$, $p < .05$). Students who did not like mathematics class had higher mathematics anxiety ($M = 32.44$, $SD = 7.02$) than those who liked the class ($M = 19.06$, $SD = 7.29$).

Table 3: Analysis of beliefs about gender and success on mathematics anxiety using One-way ANOVA

Variable		Sum of squares	DF	Mean square	F	p-value
Achievement level	Between Groups	347.891	3	174.59	61.94*	0.01
	Within Groups	7643.154	47	87.28		
	Total	7991.045	50			

*Significance at 0.05 level

As shown in Table 3, One-way ANOVA was performed to inquire if students' levels of mathematics anxiety differed significantly according to whether or not they believed success in mathematics is gender dependent, and to their achievement level in mathematics (excellent, high, average, and low).

Table 4: Analysis of achievement level in mathematics on mathematical anxiety One-way ANOVA

Variable		Sum of squares	DF	Mean square	F	p-value
Achievement level	Between Groups	347.891	3	174.59	61.94 *	0.01
	Within Groups	7643.154	47	87.28		
	Total	7991.045	50			

*Significance at 0.05 level

As shown in Table 4, students' mathematics anxiety did not differ significantly according to their beliefs about success in mathematics being gender-dependent. ($df = 48$, $F = 2.09$, $p > .05$). Students' mathematics anxiety differed significantly according to their achievement levels in mathematics (excellent, high, average, and low) ($df = 47$, $F = 61.94$, $p < .05$)

DISCUSSION

The study was important considering the background status of mathematical anxiety in terms of gender, liking mathematics class, and whether or not students had gender stereotypes about success in mathematics and achievement level in mathematics on mathematics anxiety levels of ninth-grade school students in Bharuch City.

Results showed that ninth-grade school students' mathematics anxiety differed significantly according to gender, liking mathematics class, and achievement level in mathematics. Female students were found to be higher levels of mathematics anxiety than their male Students. Students who like their mathematics class were found to be significantly lower mathematics anxiety. Students more successful in mathematics had lower degrees of mathematics anxiety. On the other hand, students' mathematics anxiety did not differ significantly as per their gender stereotypes regarding success in mathematics.

Results regarding gender and mathematics anxiety are similar to those of Lafferty (1996) who found higher self-reported anxiety by females. However, they differ from the findings of Rexses (1995) who did not detect any significant gender differences in mathematics anxiety among school students. It is noteworthy that female participants in Rexses' sample did have higher means however not to a statistically significant degree. Likewise, working with a sample of school students, Gierl and Bisanz (1995) also did not find any differences between mathematics anxiety scores of male and female students. In short, studies examining gender and mathematics anxiety have not always found higher anxiety in females and often report mixed results.

Research believed that students' mathematics anxiety would worsen with time. Part of the rationale for this expectation is that factors contributing to mathematics anxiety (i.e., low self-confidence, low self-efficacy performance in math, low grades in math, negative attitudes toward math, negative attitudes of parents and teachers, learning styles, and ineffective teaching strategies) might perpetuate one another, thereby causing higher mathematics anxiety. Results showed that students who like mathematics class had significantly lower mathematics anxiety. As mentioned before, students' failure in mathematics can also lead to mathematics anxiety and even to hating math. Students who did not like mathematics class reported higher levels of mathematics anxiety which is consistent with findings of previous studies.

Results did not show a significant difference in students' anxiety levels according to their beliefs about gender and mathematics. In other words, students' anxiety about dealing with mathematics did not differ depending on whether or not they believe that success in mathematics is related to one's gender. This finding supports the results by Senfeld (1996) who found a significant positive relationship between negative beliefs about mathematics and mathematics anxiety. Likewise, working with a sample of high school students and university students, Yüksel-Şahin (2004) also did not find any differences significantly according to this belief. Despite these findings, stereotypes could have powerful implications. Female students are believing that males are better equipped with mathematical abilities. On the contrary, male students perceive themselves as more skillful in mathematics than their female peers. These beliefs could impact students' self-efficacy, and expectations about their performance in mathematics and thus could have considerable influence on their achievement in mathematics in the long run (Casey, Nuttall & Pezaris, 1997). Bruno (1999) recommends that parents and teachers should specifically point out that they expect a similar degree of achievement from males and females alike.

RECOMMENDATION AND SUGGESTIONS

Group work and collaborative learning alleviate mathematics anxiety and have a positive impact on students cognitively, emotionally, and socially. Students should be evaluated based on their performance on tests, projects, participation in class, and performance homework. These changes will be particularly helpful for students with mathematics anxiety. In addition to traditional exams, using group assessments, group observation; homework, and comparing performances on in-class problem solving will eliminate stress, provide opportunities for creativity, and allow more comfortable test taking which in turn will minimize existing problems. Such approaches will decrease the anxiety degrees of the students and increase their achievement level in mathematics. Results of the study could have implications for students, teachers, counselors, and parents in handling mathematics anxiety.

CONCLUSION

This study helps to understand the mathematics anxiety level among Ninth-grade students of Bharuch City. Research gets real-time insight into the mathematics anxiety of ninth-grade students. Further, a study could be conducted by taking larger samples for its effectiveness and generalization purpose.

