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A study of mathematics anxiety among secondary school students in relation to personal and school related factors

[1] Ruchi Srivastava, [2] Dr. Ali Imam, [1] Gyan Pratap Singh, [3] Dr. Shivendra Pratap Singh

[1] Research Scholar, Department of Education, Integral University, Lucknow (India)

[2]Associate Professor, Department of Education, Integral University, Lucknow (India)

[3] Assistant Professor, Department of Education, V B C E Bhagalpur, Bihar, (India)

Abstract
The study proposes and confirms a set of independent variables (gender and school type) and its effect on dependent variable is mathematics anxiety. The sample size is 1000 secondary school students. The tools used are Mathematics anxiety scale (MAS), An Intuitional Background Assessment Questionnaire and A Personal Background Questionnaire. The data was analyzed using computation of means and standard deviation, computation of standard error and use of t–test and f-test for measuring the significant of the difference between the means. The results found that there exist significant difference between male and female students so far as their anxiety in math is concerned. Second major finding is that, there is significant difference among the type of schools and math anxiety.

Keywords: Mathematics Anxiety, Gender and School Type.

1. Introduction

Arithmetic is the language of commercial activity, algebra gives the idea of functional dependence and generalization, geometry teaches logical thinking and natural design. All these combine to produce a very valuable literature of interpretation, control and progress. We understand the world better. Graphical representation of numbers is becoming very common. Mathematics in home decoration designs, measurement and construction in banking and business, in protection of life and property in painting and art is playing a vital role.

Math anxiety often leads to avoidance of mathematics by those who experience it. Often students who are anxious, bored and fearful towards math or who do not comprehend the importance of math in professional and personal life are the once most likely to avoid the study of mathematics. It cannot be stressed more forcefully the fact that mathematics is truly the gateway to engineering, scientific, technological fields. Mathematics anxiety in students has become a concern for our India society. Evidence of student's poor attitude and high levels of anxiety towards math is abundant. In the midst of a technological era, declining mathematics scores in 'Scholastic Aptitude Test' as well as poor math scores had been published in the third 'International Mathematics and Science Study'. The other notable consequences of math anxiousness are the inability to do math, the decline in mathematics achievement, the avoidance of mathematics courses, the limitation in selecting majors and future careers and the negative feeling of guilt and shame (Betz, 1978; Donady & Tobias, 1977; Hendel, 1980; Rechardson & Suinn, 1972) [5].

Reserches have suggested that anxiety in mathmatics in secondary schools is a function of many interrelated variables like students' abilities, attitude, perception, socio economic values, parental education and occupation, family size, peer gourps, size of the school, types of management, resources, salaries of the teachers and tuition fees and so forth. Many of these variables are home and families related and thus are difficult to change and also out of control of the educations. However, the school related variables such as attitude, perceptions and knowledge of the role of mathmatics achievement in future career opportunities that be influencing and is easy to change by educational interventions.

Student's gender is significant factor for math Anxiety. The study of math anxiety shows, there are gender differences in math anxiety among younger students, though it appears that during the elementary and junior high school years, boys express slightly more positive affect about math than do girls (Aiken 1970). During the high school and college years Female students report more anxiety about math than do male students (Betz, 1978; Bruch, 1980) numerous studies have shown that male achievement in math is higher. Due to the fact that gender differences do not appear until around puberty. Boys and girls have similar mathematics and science proficiency scores on tests at the age of 9, but a gap begins to appear at around age 13, early findings showed that children (boys and girl) did not differ in their math performance during elementary school but that differences began to appear in middle school and increased with time and schooling (Fennema & Sherman 1978) Moreover, mathematics is often labeled as a masculine ability as a result, girls often have low confidence in their math capabilities. These gender sterotypes can reinforce low confidence in girls and can cause math anxiety. However, a note of cautious has to be added while describing gender as a major variable effecting math anxiety. For example, Gierl and Bisanz (1995) finds no significant gender difference for math anxiety, on the other had Campbell and Evans (1997) [7] finds that females exhibit more mathematics anxiety in secondary school and in college. Jordan and nettles (1999), who analyzed data from the National Educational Longitudinal study of 1988

(NELS), reported that girls had lower scores than boys on math in the 12th grade. Research has shown that females do not enjoy math and often see it as having little relationship to their lives or their futhures (Fennema and Sherman, 1978). Females display more math anxiety than males in secondary school and college (wood and, 2004).

The type of school has strong correlation with math anxiety, missionary and managed ones show lower level of anxiety in comparison to other types of schools. Vergnese (1994) found that schools managed by private sector show marginally better performance than government schools. Duraisamy (1999) results indicate that students from private unaided schools do significantly better than public school counterports and private aided school students in language and mathe. Coleman *et al* (1982) [8] provide strong evidence that there is, in vocabulary and math, higher achievement for comparable students in catholic and other private schools than in public schools Veeragahvan and Bhatcharya, 1989, Nurthy and Kuishrereshtha 1991, white, 1992, Estalls *et al*, 1997, Goldhabar, 1996, singh Satvir, 1996 provide in their studies a stron evidence that there is in vocabulary and math, higher achievement for comparable students in private schools than in public schools.

2. Objectives

1. To compare the mathematics anxiety of secondary school students on gender basis.
2. To study the influence of school types on mathematics anxiety of students.

3. Hypotheses

1. There is no significant difference in the mathematics anxiety of male and female students.
2. There is no significant difference among different type of schools and mathematics anxiety of students.

4. Tools used

The tools employed for collection of the data mentioned above included the following:

4.1. Mathematics anxiety scale (MAS): This test was developed by Dr, (Mrs.) Sadia Mahmood, Department Of Education, Aligarh Muslim University, Aligarh and Dr. (Mrs.) Tahira Khatoon, Associate Professor, department of education, Aligarh Muslim University, Aligarh.

4.2. An Intuitional Background Assessment Questionnaire: This test was prepared by the investigator.

4.3. A Personal and Environmental Factors Assessment Questionnaire: This questionnaire was prepared by the investigator.

5. Methodology

The research was conducted in Lucknow (U.P).The researcher selected the sample mainly from the city, Lucknow, U.P India. Simple random sampling methodology was used. Only secondary schools were selected for the study. The sample size was limited to 1000 students. The study was conducted taking different variable which contribute towards mathematics anxiety but only gender, school type were selected. In the study 500 male and 500 female students were administered and taking into consideration the school type variable the sample was divided into private, government, semi government and minority managed school taking 250 students as sample for every types of schools.

6. Following statistical techniques were used for analyzing the data

1. Computation of means and standard deviation.
2. Computation of standard error.
3. Use of t –test for measuring the significant of the difference between the means.
4. Use of f –test for measuring the significant of the difference between many means.

7. Results and Analysis

7.1. Relationship between gender difference and mathematics anxiety.

The data was collected from four types of schools that are government schools, private schools, semi government and minority managed school. Out of the sample size of 1000, 250 students are selected from each type of schools.

Gender	N	Mean score	SD	df	t-Value	Sig./ Not sig.
Male	500	31.18	7.62	998	6.156	Sig. at 0.05
Female	500	34.50	9.37			

The mean anxiety of males is 31.18 with standard deviation of 7.62 and that of females 34.50 with SD of 9.37. The t-value has been calculated as 6.156. The Degrees of freedom in this case = 998. At 95% confidence interval, t value calculated 6.15 is more than t table value at 95% confidence interval with 998 degrees of freedom i.e.1.96. The results clearly indicate that there is significant difference between anxiety scores of both males and females. Females have more anxiety levels than males for mathematics.

7.2. Relationship between School type and mathematics anxiety.

a. Summary of analysis of variance in respect to mathematics anxiety and type as school

Source of Variance	Df	Sum of Squares	Mean Square	F-Value	Sig./ Not Sig.
Between Groups	3	17057.16	5685.72	96.89	Sig. at 0.05
Within Groups	996	58443.87	58.67		

To find out the influence of school type an mathematics anxiety of the students, the total sample was categorized into four group i.e. Government school, Semi Government school, Private school and Muslim Minority school Analysis of variance was employed to determine the significance of difference in mathematics anxiety scores of the schools. The total sums of squares between and within the means of student were calculated and are given in table. The calculated value of f is 96.89 which is significant at df 3, 996. The result shows that there were overall significant difference between means.

b. Comparison of mathematics anxiety scores among the four group of schools

Group	School type	N	Mean	SD	t-value			
					A	B	C	D
A	Private	250	25.90	8.82	x			
B	Govt.	250	36.54	6.38		x		
C	Semi Govt.	250	35.19	8.26			X	
D	M.M.S.	250	33.74	6.90				X

The result clearly shows that students of private school have lowest mathematics anxiety scores than the other three groups. Hence the hypothesis stating that "there is no significant difference among the type of schools and mathematics anxiety students" was rejected.

8. Finding and conclusion of the study:

1. There exist significant difference between male and female students so far as their anxiety in math is concerned. Females have more anxiety levels than males in mathematics.
2. There is significant difference among the type of schools and math anxiety. The result clearly shows that students of private school have lowest mathematics anxiety scores than the other three groups (government, Semi. government, Muslim minority).

9. Discussion

The results of the analysis of data have shown the gender difference, difference in achievement levels, difference in education levels of both mother and father and difference in attitude have significant impact on anxiety among the students towards mathematics. There are significant difference in mathematics anxiety scores between boys and girls in the present study. The findings of this study are well support from other previous studies conducted. This study is supported by Asante, Koppong (2010), Helen (2010) found that generally female students attained higher grades in all other school subjects besides mathematics than other male counterpart. Males have higher achievement in mathematics and higher levels of enrollment in mathematics course (Hanna, 2003). Females display more mathematics anxiety than males in secondary school and college (wood and, 2004). Leili Hosseini found that female students scored higher in the subscales of anxiety than male. Abdullah, (2013) [1] found that there was no statistical significant difference between girls and boys in respect of mathematics anxiety but in respect to mathematics problem solving and evaluation girls gained higher mean. Researchers have shown that boys tend to score higher in math than girls.

The different type of schools, another important variable of the study a definite relationship has been found to exist between this variable and mathematics anxiety of the students. Different type of schools, managed by different authority has different types of influences on performance of their students. In this ways sample schools range from good to poor in their performance. For instance the students of private managed schools also achieved significantly higher achievement mathematics score and less anxiety than students other type of schools and semi government schools achieved significantly higher mathematics score than the students of the government schools. In this way students of private schools are high achiever and students of state government schools are low achiever in mathematics.

It has been statistically proved in present study that level of anxiety is more among government, semi government, Muslim minority schools than private school students. Estalle, *et al*. (1997) [9] found that private management is more efficient than Public management in achieving academic quality. Coleman (1982) [8] found that private schools are higher achievement in mathematics than public schools. Murthy (1999) found that government and private schools students differ significantly in academic achievement and this difference is in a favour of private schools.

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