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RESEARCH PAPER

An Exploration of Reasons and Relationships between Female Teachers' Anxiety towards Teaching Mathematics and Students' Achievement

Dr. Muhammad Shabbir [1] Dr. Sadaf Jabeen[2] Dr. Sajid Masood [3]

1. Assistant Professor, Department of Education, Govt. College University, Faisalabad, Punjab, Pakistan
2. Assistant Professor, Research and Evaluation Department Lahore College for Women University Lahore, Punjab, Pakistan
3. Assistant Professor, University of Management & Technology, Lahore, Punjab, Pakistan

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Corresponding Author:

mskhalid606@yahoo.com

ABSTRACT

This study explored the relationship between Teaching Mathematic Anxiety of Female Teachers and Students Learning Achievements. Moreover, a comparison was made on the basis of schools' type and gender in context of teachers' anxiety and students' achievements scores. Explanatory mixed method design was adopted. The sample included 128 teachers of mathematics and 512 students of secondary school level selected from four towns of a district. The first research tool used to collect data from teachers was Mathematic Anxiety Rating Scale (MARS). The second research tool was Mathematic Subject based Test (MST) based on students' mathematic course book. Mathematic based Subject Test was administrated to calculated 9th and 10th grades of students, learning achievements' score in mathematics. Findings of the study show that Teaching Mathematic Anxiety of Female Teachers' has significant effect on Students Learning Achievements

Introduction

The study of numbers, shapes and space which needs reasons, a system of symbols and rules to organize and investigate them is called mathematic (Cambridge dictionary, 2011). Bertrand Russell's (1901) said, mathematics has led to a livelier style such as;

"The subject in which we never know what we are talking about, nor whether what we are saying is true" (cited in Garnier & Taylor, 2010, p.52).

There are two specific domains in which mathematics can be divided first one is the affective and last one is cognitive domain of learning (Martinez & Martinez, 1996). The central association to understanding of everyday life is mathematics.

Mathematics subject is scary for some people. Mathematics makes an individual able to deal effectively in the various domains of private, social, and civil life (Anthony & Walshaw, 2009). In most countries for students' who go through basic and secondary education, mathematics rationalizes the compulsion of their study. Therefore, mathematics is an important core subject at these levels of education. Though mathematical studies have high implication in our education system, but still many people openly proclaim their difficulties in math. Concerns about students' numeracy and attainment increase in the area of mathematics (Sterenberg, 2008).

Lack of confidence in mathematic is a Math anxiety. It can result in a feeling of nervousness when performing in mathematical situations (Stuart, 2000). While this type of phenomenon has been given many terms, it will be referred to in this study as "math anxiety". Student learning achievements and attitude towards mathematics is affected by mathematics anxiety (Hembree, 1990).

According to Byrd (1982) when someone is facing challenge with mathematical problem in any way or any situation when someone experiences nervousness is mathematics anxiety. Teachers are role model for their students as they are an essential part of their learning process. They serve as mentor, adviser, and counselor. Their behavior and attitude have great impact on students' personality. The problem addressed in this study is that, female teachers' teaching mathematics anxiety may affect their students' learning achievements. Now a day's math anxiety is a common issue in Pakistani educational scenario. Many female teachers at secondary level have been suffering from mathematics anxiety while teaching math to their students and so that they have a responsibility to be aware of how their mathematics anxiety can influence their students' learning achievements and how they can overcome with it using different strategies. Purpose of this study was to find out teaching mathematic anxiety of female teachers and its effect on students' learning achievements. Population of the study was secondary school level female teachers of mathematics and their students. Following Hypothesis were made for this study

There is no difference between students' learning achievement (SLA) score on the basis of type of school. There is no difference between students learning achievements' (SLA) score on the basis of gender. There is no relationship between female teachers' mathematics and students' learning achievements. There is no effect of math anxiety of female teachers on students' learning achievements'.

The framework of the present study also follows up the different studies related to mathematic anxiety of female teachers and its effect on students' learning achievements'.

According to Arem, (2010) there are two majors types of mathematic anxiety symptoms physical and as well as psychological. Arem describes mathematic anxiety pattern as negatively cycle which ultimately "leads towards poor mathematics performance or achievements, mathematics failure and avoidance".

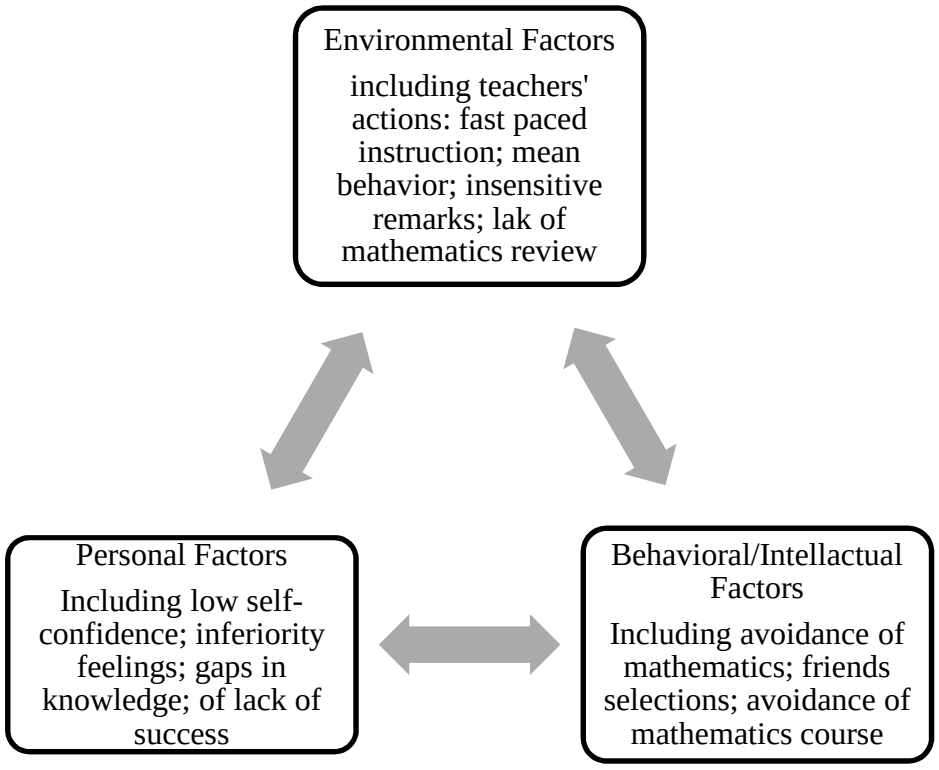
There are different signs include in physical and psychological symptoms of mathematic anxiety according to Arem, (2010) as defined in table as under:

Table 1
Physical and Psychological Symptoms of Mathematic Anxiety

Physical Symptoms	**Psychological Symptoms**
Headaches	Stress on working memory capacity
Increased sweat	Misunderstanding/Confusion
Muscle Spasms/aches from pressure	Incapability to focus
Enlarged heart rate	Illogical thinking
Digestive problems	Mind blanks
Faintness	Fail to recall known formulas
Squatness of breath	Easily diverted

Source: adapted from Arem, (2010, p.30)

(Hadley & Dorward), 2011 said according to many studies anxious teachers' about mathematics are also anxious about teaching mathematics. Lower levels of mathematics teaching self-efficacy exist in anxious teachers' (Bursal & Paznokas, 2006; Swars et al., 2006).



Mathematics Teaching Anxiety and Students' Learning Achievements

According to Goetz, Bieg, Ludtke, Pekrun, & Hall, (2013) they state as that due to poor mathematics achievements' or performance, females contribution could be underrepresentation in different intensive domains of mathematics such as physical science, technology, and engineering.

Instrumentation

Prevalent literature on the anxiety and teaching mathematics anxiety and Students' learning achievements lead towards the most common instruments usually used to analyze the anxiety among teachers was used for data collection and was pilot tested with Cronbach's Alpha Reliability for this was found 0.93.

Interviews were used to gathered qualitative data from SST (n=46) from selected schools. These interviews were unstructured. All interviews were conducted into a written form. Dialogue analysis of data was used for the analysis of qualitative data.

Results and Discussion

Results are presented according to the sequence of hypothesis for this purpose t- test was used for comparison of mathematics anxiety and teachers school types, comparison of students learning achievements (SLA) score of students on the basis of their school types and gender. Pearson coefficient correlation was used.

Table 2
Comparison of Public and Private secondary schools teachers' anxiety

Types of school	N	M	SD	Df	T	P
Public	64	2.13	.68	126	.81	.026
Private	64	2.10	.61			

Table 2 defines that t = 0.81 with df = 126, that is not significant because p> 0.01. Hence, there was no difference between public and private secondary school teachers' mathematics anxiety according to their schools' type. Moreover, mean score value for public teachers is 2.13 and for private school teachers is 2.10. Therefore, standard deviation for public school teachers' is 0.68 and for private school teachers is 0.61. These values of mean score and standard deviations describes that there was no significant difference between them. So, the null hypothesis is accepted here.

Table 3
Comparison of Public and Private secondary schools students' learning achievements (SLA) score

Types of school	N	M	SD	Df	T	P
Public	256	.22	.044	510	.35	.321
Private	256	.22	.043			

Table 3 defines that t = 0.35 with df = 510, that is not significant because p> 0.01. Hence, there was no difference between public and private secondary school students' learning achievements' (SLA) score and students on the basis of type of school. Moreover, mean score value for public school students' is 0.22 and for private school students' is also 0.22. Accordingly, standard deviation for public students' is .044 and for private school students' is .043. These values of mean score and standard deviations describes that there was no significant difference between them. So, the null hypothesis is accepted here.

Table 4
Comparison of male and female secondary schools students' learning achievements (SLA) score

Gender	N	M	SD	Df	T	P
Male	256	.22	.044	510	.21	.021
Female	256	.22	.043			

Table 4 defines that t = 0.21 with df = 510, that is not significant because p> 0.01. Hence, there was no difference between male and female secondary school students' learning achievements' (SLA) score. Moreover, mean score value for male students' is 0.22 and for female students' is also 0.22. Accordingly, standard deviation for male students' is .044 and for female students' is .043. These values of mean score and standard deviations describes that there was no significant difference between them. So, the null hypothesis is accepted here.

Table 5
Pearson Coefficient Correlation between female teachers' mathematics anxiety and students' learning achievements'

Variables	N	M	SD	r	p
students' learning achievements (SLA)	512	71.48	13.846	.070**	.000
Teachers' anxiety	128	2.1172	.64713		

**P<0.01

Table 5 shows that Pearson Coefficient Correlation r = 0.70, is significant at p<0.01.

There was moderate positive correlation between female teachers' mathematics anxiety and students' learning achievements', so the null hypotheses claiming that there is no significant relationship between female teachers' mathematics anxiety and students' learning achievements' is rejected here.

Table 6
Effect of teaching mathematics anxiety on students learning achievements'

R-Square	Adjusted R-Square	Df	F	Sig
0.722	0.734	2	114.40	.000

Table 6 shows that the result of F-test support the predictive utilities of teaching mathematics anxiety (MARS) of secondary school teachers' on students' learning achievements' and R-square = 0.722 and F =114.40 is significant at p<0.01 with df =1.

Table 7
Regression Coefficients for effect of Teachers'Mathematic Anxiety (TMA) on Students' Learning Achievements' (SLA)

Model	B	Std. Error	Beta	T	P
SLA	19.81	15.3		15.70	.000
TMA	13.95	9.50	.11	10.24	.000

a. Dependent Variable: Students' Learning Achievements' (SLA)

b. Teaching Mathematic Anxiety (TMA)

Table 7 describes that the unstandardized coefficient for mathematics anxiety scale (TMA) β^=13.95, and t=10.24 at p=.000 is statistically significant. The null hypothesis claiming no significant effect of teachers' mathematics anxiety on students' learning achievements' is therefore rejected here.

There a is students' learning achievements' (SLA) which is intercept here, while B is Teaching Mathematic Anxiety (TMA) which is coefficient here and X is independent variable (mean).

Y = a+BX

SLA = 19.81+13.95 (TMA)

If the value of TMA is one, then the SLA becomes = 33.76. Whereas, mean score of TMA is 2.1172. Therefore, the Students' Learning Achievements' score in the result of effect of TMA on it, is calculated as under:

SLA =19.81+13.95 x 2.1172

= 71.47

Hence after the effect of TMA on Students' Learning Achievements', the calculated value is 71.47 which is greater than the value of 33.76, which calculated before the effect. Thus, the difference of 37.71 shows that there is an effect of TMA on Students' Learning.

Almost 50.9% teachers believe that mathematics is quite unique and useful subject. Almost 49.1% teachers believe that mathematics is interesting and useful subject it helps in all disciplines of life. Almost 70.5% teachers said that, they had always a positive attitude toward mathematics during their studies. They also said that

they loved to solve mathematics problems. While 29.5% said that they had negative attitude toward mathematics during their studies. They did not like to solve mathematics problems. They consider mathematic as boring and dull subject. Almost 40% teachers said that they feel self-hyper and panic these are the main sign emerge when they feel anxiety.20% said they feel mental stress and depression. However, 40% said they feel head ach.

Almost 25.5%- teachers believe that environmental factor is the main cause of anxiety. Therefore, they believe that an unpleasant incident or experience related to math's may any individual leads toward negative attitude toward mathematics which may effect his/her learning.49% teachers believe that cognitive factor is the main cause of anxiety. Gaps between knowledge and lack of understanding is the reason of anxiety.25.5% teachers said that personality factor is the main cause of anxiety. Attitude or opinion of a person may differ.

Almost 70% said that mathematic anxiety of teacher may affect their students' learning achievements.30% said that mathematic anxiety of teacher does not affect their students' learning achievements.

Results and Discussion

On the basis of data analysis, all the findings were combined regarding descriptive information about subjects of the study. Moreover, conclusions in the results of inferential statistical analysis like Pearson Coefficient Correlation, t- test, Regressions Analysis for effect of

Teaching Mathematics Anxiety of Female Teachers' toward Students' Learning Achievements' have been presented here. Findings are further divided into three sections. The first two sections defined the findings of quantitate phase of the study. The third and the last one show the qualitative findings of the study. Section one includes Descriptive Statistics, T test for the comparison of teachers' on the basis of school types with their anxiety and comparison of Students' Learning Achievements' scores on the basis of type of school and gender of students' ,and Pearson Coefficient Correlation for finding out relationship between Teaching Mathematics Anxiety of Female Teachers' and Students' Learning Achievements.'

Conclusion

The current research supports the result of (Hadley, K. M., & Dorward, J., 2011) that specifies that when teachers were comfortable about teaching mathematics, students achieved somewhat higher test scores, irrespective of whether the teacher experienced general math anxiety. The current study supports the findings of Miller and Mitchell, (1994) shown that there was a relationship between mathematics anxiety and achievement.

The current study does not support the findings of (Hembree, 1990; Ramirez, Gunderson, Levine, & Beilock, 2013) which claims that mathematical achievement is strongly affected by math anxiety. The findings of the present study do not support the previous research of Karimi and Venkatesan, (2009). There was a highly significant negative relationship between anxiety level and mathematics achievements'.

Recommendation

On the basis of the findings, conclusions and discussion above, following recommendations have been made; The results of the present study indicate a strong effect of female teaches' math anxiety on students' learning achievements', So the educational policy makers and Ministry of education should take some pioneer steps and offers some professional training and development program for teachers to reduce their anxiety related to mathematics. Teachers' also should have subject matter knowledge to convey her lecture effectively otherwise she may suffer from math anxiety. Re-examine traditional teaching methods, which do not match with students' learning style and skill and effect their learning achievements. Researches should also conduct on other factors like, teachers' instructional practices its effect on students' learning achievements', students' attitude toward mathematics etc. Investigate the effect of teachers' anxiety on learning achievements of students at higher level.

References

Anthony, G., & *Walshaw*, M. (*2009*). *Characteristics of Effective Teaching of Mathematics: View from the West. Journal of Mathematics Education*, 2(2), 147-164

Arem, C. (2010). *Conquering math anxiety: A self-help workbook*. Grove, CA: Brooks/Cole.

Bryant, M. M. G. (2009). *A study of pre-service teachers: Is it really mathematics anxiety?* Retrieved from http://search.proquest.com/ openview/ 64ad4bfad82c0c86ad 71cf8cf83f46fb/1?pq-origsite=gscholar&cbl=18750&diss=y

Bursal, M., & Paznokas, L. (2006). *Mathematics anxiety and preservice elementary teachers' confidence to teach mathematics and science. School Science and* ...Markku S. Hannula, Gilah C. Leder, Francesca Morselli - Education

Byrd, M. (*2011*). *Aging and cognitive deficits The role of attention resources.* In Craik, F.I.M. and Trehub, S.E., Eds.,

Combridge Dictionary (2011). *Cambridge* : *Cambridge* University Press, *2011* Publisher.

Garnier R., *Taylor* J. (2010). *Discrete Mathematics for New Technology* ... Brooks Cole, *2010*. - 984 pages.

Goetz, T., and Hubbard, K. (2013). *Mathematics anxiety in student teachers* 24, 2079–2087. doi: 10.1177/0956797613486989.

Goetz, T., Frenzel, A. C., Hall, N. C., and Pekrun, ...Kinga Morsanyi, Irene Cristina Mammarella, Denes Szűcs (2017). - Electronic book

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21(1), 33–46. https ://doi.org/10.2307/74945

Hadley, K. M., & Dorward, J. (2011). The Relationship among Elementary Teachers' Mathematics Anxiety, Mathematics Instructional Practices, and Student Mathematics Achievement. *Journal of Curriculum & Instruction*,*5*(2).

Heinze, A., Reiss, K., & Franziska, R. (2005). Mathematics achievement and interest in mathematics from a differential perspective. *ZDM*, *37*(3), 212-220.

Jackson, E. (2008). *Mathematics* anxiety in student teachers. Practitioner Research in Higher Education, *2*(1), 36-42.

Karimi, A., & Venkatesan, S. (2009). Mathematics anxiety, mathematics performance and academic hardiness in high school students. *International Journal of Educational Sciences*, *1*(1), 33-37.

Martinez, J. G. (2006). Preventing math anxiety: A prescription. *Academic Therapy*, 23(2), 117–125.

Miller, L. D. & Mitchell, C. E. (2011). Mathematics anxiety and alternative methods of evaluation. *Journal of Instructional Psychology,* 21(4), 353-359.

Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition and Development,* 14(2), 187–202.

Sternberg, R. J. (2008). Implicit theories of intelligence, creativity, and wisdom. *Journal of Personality and Social Psychology*, 49(3), 607–627.

Stuart, V. B. (2000). Math curse or math anxiety Teaching, *Children Mathematics*, 6, 330-338.