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**ABSTRACT** The paper has shown the relationship between Mathematics anxiety, Mathematics performance and Academic hardiness in high school students. The sample comprised 284 (144 males and 140 females) 10<sup>th</sup> grade high school students from Karnataka state. Pearson correlation analysis and two independent samples T-test are used to analyze the data. The results have revealed that mathematics anxiety has significant negative correlation with mathematics performance but no significant correlation is detected with academic hardiness. It is also found that the gender differences in mathematics anxiety are significant, whereas no significant differences are detected between boys and girls in mathematics performance and academic hardiness. This study has established the fact that the performance of students in mathematics can be perceived by mathematics anxiety and females scored slightly higher on this variable but this relation has not observed with academic hardiness.

# **INTRODUCTION**

Academic frameworks, action research, surveys and other studies carried out by academics, have shown that students' lack of interest and their dropping out drop out of school are complex and multifaceted problems (Angrist and Victor 2002). The psychological factors and their effects on academic situations are the growing concerns of the educational researchers and practitioners attributed to a notable lack of rigorous scientific inquiry in some important factors in the above fields of study. A review of the related literature reveals numerous studies addressing the psychological factors topics in general; while few studies are found to target the special psychological factors in educational situations.

Many learners have already experience mathematics anxiety in our schools consequently. Reported consequences of being anxious toward mathematics include the avoidance of mathematics and the decline in mathematics achievement. This kind of 'anxiety' is first detected in the late 1950s. Dreger and Aiken (1957); noticed undergraduate college students reacting emotionally to arithmetic and mathematics. Although the reaction is appeared to be similar to test anxiety in general, they found that mathematics anxiety is a potential factor prose. They have labeled it 'number anxiety', which is often assumed to be a high level of anxiety impairs performance. A moderate amount of anxiety may actually facilitate performance. Beyond a certain degree, however, anxiety hinders performance particularly in the case of higher mental activities and conceptual process (Shemp 1986). Psychological literature provides a number of conceptualizations of mathematics anxiety. Richardson and Suinn (1972); have defined mathematics anxiety in terms of its (debilitating) effect on mathematical performance. They have observed that the feeling of tension and anxiety interfere with manipulation and solving the mathematical problems in a wide variety of ordinary life and academic situations. It also involves feelings of tension and anxiety that interfere with the manipulation of numbers and solving the mathematical problems in a wide variety of ordinary life and academic situations (Suinn 1988). Many students who suffer from mathematics anxiety have little confidence in their ability to do mathematics and tend to take the minimum numbers of required mathematics courses, which has greatly limited their career choice options (Garry 2005). Mathematics anxiety is the outcome of low self-esteem and the fear of failure. It causes problems for processing the incoming information as well as the previously learned information for problem solving. Such students tend to avoid mathematics whenever or wherever possible (Daane and Tina 1986). According to Ashcraft and Kirk (2001); the correlation between mathematics anxiety and academic performance is negatively significant. More over Clute (1984) and Hembree (1990); have

found that students who have a high level of mathematics anxiety have lower levels of mathematics achievement. They have also noted that math's anxiety seriously constrains Performance in mathematical tasks and reduction in anxiety is consistently associated with improvement in achievement.

The quality of students' Academic hardiness is influenced by wide range of environmental factors. The variable is very important not only to students and their parents, but also to insti-tutions of learning, educationists and curriculum practices. Over the past 20 years, the psycho-logical hardiness construct is emerged as a buffer in the relationship between stressors and illness and has been shown as an element enhancing performance (Maddi and Kobasa 1979). Psychological hardiness comprised of three obliquely related attitudes (Kobasa et al. 1982). The three interrelated hardiness attitudes of commitment, control, and challenge are thought to influence two underlying mechanisms that enhance the performance of every individual person (Maddi and Kobasa 1979). In the other study, it is found that there is negative relationship between individuals' hardiness scores and mathematics anxiety (Ashcraft 2002).On the other hand, whereas the schooling experience of boys and girls is different, current studies have concluded that there is no significant gender difference with respect to academic achievement and general abilities (Lingard et al. 2005). The inspection of Hardiness in two genders also is not significant, but the scores of mathematics anxiety indicates that girls have experienced more level of mathematics anxiety than boys (Garry 2005).

Despite several reports on the relationships between personality characteristics and academic variables, there is rarely if any documentation of the influence of mathematics anxiety on the academic and educational variables. Besides, further studies should be done on the gender differences at the levels of mathematics anxiety in relation to mathematics performance and academic hardiness. In the presents study, the researchers intend to find out the correlations and influences between these issues.

### Hypothesis

- 1 There are significant relationships between mathematics Anxiety, mathematics performance and academic hardiness.
- 2 There are significant differences between

boys and girls in mathematics Anxiety, mathematics performance and academic hardiness.

# **Objectives**

The objectives of the study fall into two divisions:

- a. To examine the relationship between levels of mathematics anxiety, mathematics performance and academic hardiness among high school students in Karnataka.
- b. To examine the effects of gender on students' levels of mathematics anxiety, mathematics performance and academic hardiness.

### METHOD

### Sample

The participants of this study comprise 284 students of 8 grade including 144 males and 140 females, selected randomly from 9 different high schools in Karnataka state (Mysore and Bangalore).

### **Tools and Materials**

The instruments used in the research study are as follows:

a. Mathematics Anxiety Rating Scale-India (MARS-I): This questionnaire was developed by Karimi (2008); and contains 31 items of situations which causes mathematics anxiety. It has two subscales – Math test Anxiety with 15 items and Numerical tasks with 16 items .Each item of this scale was rated on a five – point scale rating , from very much anxious – 5 to not at all anxious-1) . Psychometric properties of this scale are computed by researchers. The correlation between scores on MARS-I and MARS (Richardson and Suinn 1972) was 0.87. Two weeks test-retest reliability of the scale was 0.85 and internal consistency alpha coefficient was computed 0.88.

**b.** Academic Hardiness Scale (AHS): This Scale created by Benishek and Lopez (2001); with 18-item self-report instrument on a four-response Likert scale. This instrument was designed to gather information about student attitudes regarding academic success. The four response options range from 1 = completely false to 4 =completely true. The psychometric properties of this scale has shown that internal consistency alpha coefficient was computed 0.86 (Benishek and Lopez 2001).

*c. Mathematics Performance:* Marks are obtained from the students in the last class examination in the school in mathematics.

### RESULTS

According to the hypothesis of the current investigation, the analysis of data is divided into two parts: At first part the relationship between three variables is evaluated and in the second part, the gender differences in three variables are analyzed.

a. Relationship between mathematics anxiety, mathematics performance and academic hardiness

The correlations between levels of mathematics anxiety, mathematics performance, and academic hardiness are presented in the correlation matrix table 1.

According to the first hypothesis, there are significant relationships between mathematics Anxiety, mathematics performance and academic hardiness. Contrary to the hypothesis, negative significant correlations are found between mathematics anxiety with mathematics performance [r=-.-.15, p < .05] while no significant correlation between mathematics anxiety with academic hardiness is detected [r = .09, P > .05].

Concurrently, significant negative relationships between two subscales of mathematics anxiety with mathematics performance (math test with mathematics performance [r=-.-0.21, p<.01]as well as Numerical task with mathematics performance [r=-.-16, p<.05]) are detected. Besides no significant correlation between two subscales of mathematics Anxiety with academic hardiness is found. Furthermore, a significant correlation between mathematics performance, and academic hardiness is detected [r=.14 (\*), p<.05].

b. The influence of gender on mathematics anxiety, mathematics performance and Academic Hardiness

Table 2 displays the scores of males (boys) and females (girls) in three variables. The results of two independent t- tests are described in table 2.

The investigation on the mean scores of males and females indicates that females scored slightly higher on the mathematics anxiety scale (m = 69.41, SD = 9.370) than males (m = 63.81, SD=3.13). There are not significantly differences between males and females on mathematics performance. (m = 73.62, SD = 11.05) for male and (m = 73.40, SD =

Table 1: Means, standard deviations and correlation matrix of mathematics anxiety, Mathematic performance and academic hardiness.

Variables	Two subscales of	of Mathematics anxiety	Total scores of	Mathematic	Academic	
	Math test $M=33.01$	Numerical task M=33.89	Mathematics anxiety M=66.14 SD=7.01	$\begin{array}{r} performance\\ M=73.47\\ SD= 10.69 \end{array}$	hardiness M=52.70 SD=6.05	
	SD=3.54	SD=3.49				
Math test	"					
Numerical task	.35 (**)	"				
Total Mathematics anxiety	.71(**)	.51 (**)	**			
Mathematics performance	21(**)	16(*)	15 (*)	"		
Academic hardiness	.09	.08	. 09	.14 (*)	"	

N: 284. M= mean. SD= standard deviation

\*\* Correlation is significant at the 0.01 level, p <.01 (2-tailed).

\* Correlation is significant at the 0.05 level, p <.05 (2-tailed).

Table	2:	Means,	standard	deviations	and	estimated	two	independent	samples	t test	for	boys	and	girls	in
three	var	iables						-	_					-	

Dependent variable	Sex	Mean	SD	t-value
Mathematics anxiety	Male	63.81	3.13	4.24**
-	Female	69.41	9.37	
Mathematics performance	Male	73.62	11.05	.27
	Female	73.40	9.31	
Academic hardiness	Male	51.32	7.17	1.46
	Female	54.20	8.22	

N: 424. \*\* Difference is significant at the 0.01 level (2-tailed).

9.31) for female. In Academic hardiness also there is not significantly differences between two gender groups, (m = 51.32, SD = 7.17) for male and (m = 54.20, SD = 8.22) for female.

#### DISCUSSION

The results of the study have revealed significant relationship between mathematics anxiety and mathematics performance. It means that students who have high mathematics anxiety tended to perform fewer score in mathematics performance. However, those who have low mathematics anxiety tended to perform high score in mathematics. The findings confirm the pervious findings, which report significant relationships between mathematics anxiety and mathematics performance (Clute 1984; Hembree 1990; Lee 1996 Ashcraft 2001). With respect to the subscales of mathematics anxiety, there is a significant negative correlation between the two subscales and mathematics performance as opposite to the second part of the hypothesis, indicating there is no significant relationship between mathematics anxieties and academic hardiness. Contrary to the pervious psychological evidence, indicating a negative relationship between hardiness and anxiety (Ashcraft 2002). The study has revealed that no significant relationship is found between the variables. It is probably attributed to the nature of the mathematics anxiety and differences between this kind of anxiety and general anxiety. Mathematics anxiety as a special kind of state anxiety occurs in the academic situations which is not compatible with the obtained results from the academic hardiness.

Moreover there is a significant positive relationship between academic hardiness and mathematics performance which consequently supports the pervious evidence (Maddi 1979). For example, those students with hard attitude will be more motivated to learn class material and more strongly committed to their classes than those who do not possess such kind of attitude.

According to the result obtained from hypothesis two (H2) entitled "There are significant differences between boys and girls in mathematics anxiety, mathematics performance and academic hardiness", the consequences revealed that there is significant gender difference only on the scores of mathematics anxiety, whereas there is not significant gender difference on the scores of mathematics performance and academic hardiness. The findings support Lee (1996) and Orenstein (1994); on the role of gender in mathematics anxiety and mathematics performance. According to Zaslavsky (1994), mathematics anxiety is a common problem between all groups, while women and minorities are the most affected ones. The research pinpoints out that around the seventh grade girls are suspicious their ability to do math. Since self-confidence and math performance are so closely related, it plays a major role in girls' choices to score high in the math tests during high school.

### CONCLUSION AND RECOMMENDATIONS

The present study aims to evaluate the relationship between three variables. The results revealed: a. significant negative correlation between mathematics anxiety and mathematics performance is found. b. A significant positive correlation between academic hardiness and mathematics performance is detected. C. The correlation between mathematics anxiety and academic hardiness is not significant.

It is also found that there are significant gender differences between boys and girls in mathematics anxiety, whereas there are no significant differences between boys and girls in mathematics performance and academic hardiness. According to the above - mentioned results, the performance of students in mathematics can be influenced by mathematics anxiety. It is also reported by the other researchers that reducing of this kind of anxiety leads to improvement in mathematics scores and academic performance. Mathematics anxiety can be reduced by using some special methods in teaching and psychological intervention, which is applicable in the pedagogical domains and the improvement curriculum practices.

Moreover the correlation between academic hardiness and mathematics performance has revealed that students with hardy attitudes will be more motivated to learn class material and more strongly committed to their classes than those reporting not having hardy attitudes. It can be a useful factor in increasing the quality of learning. It is worth mentioned that further research should be conducted on the mathematics anxiety in different stages of academic levels, difference kinds of anxiety and across the other states.

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