MATHEMATICS ANXIETY OF SENIOR SECONDARY SCHOOL STUDENTS IN RELATION TO INTERPERSONAL RELATIONS ,SOCIAL SKILLS , SELF EMPATHY AND ACCEPTANCE OF OTHERS EMOTIONS WITH METACOGNITION

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Abstract -Math anxiety has been found to be an emotional problem that has a negative effect on students´ academic performance across different levels of education. Math anxiety has several inherent challenges related to its study .This type of anxiety could be related to certain cognitive and emotional processes. The objective of the study was to examine the math anxiety in relation to handling emotions in relationships (interpersonal relations), Reading social situations and networks(social skills) able to take others perspective(Self Empathy And Acceptance Of Others) with metacognition. Math students (n=300) from a senior secondary school were surveyed for their mathematics anxiety level The Mathematics Anxiety Scale (Mas-Mskt) (2012) By Dr. Sadia Mahmood and Dr. Tahira Khatoon and Metacognition Inventory (2003) By Dr. Punita Govil Was administered to measure math anxiety and metacognition respectively. The emotional intelligence test by Dr. Sarabjit Kaur was used to measure Interpersonal Dealings, Social Skills, Self-Empathy and Acceptance of Others Emotions. The results show that students having high interpersonal relations has less mathematics anxiety. Students having high social skills has less mathematics anxiety. Students with low social skills and high metacognition has more mathematics anxiety. Students with high social skills and high metacognition has less mathematics anxiety. Students having high empathy and acceptance of others emotions has less mathematics anxiety. Students with low empathy and acceptance of others emotions and high metacognition has more mathematics anxiety. Students having high metacognition has a smaller amount of math anxiety belonging to group -interpersonal skills, social skills and empathy and acceptance of others emotions

INDEX WORDS- Mathematics Anxiety Interpersonal Relations, Social Skills, Self-Empathy and Acceptance of Others Emotions Metacognition, Senior Secondary School Students

Introduction

Mathematical confidence has become increasingly important in our society because of the connection mathematics has with science and technology. Recent research works has demonstrated that math anxiety is more than just the product of poor math skills. Emotional and social factors may play a key role in understanding what it means to be math anxious, and hence may aid in attempts to sever the link between math anxiety and poor math performance.Kranz, cited in Perry, 2004, defined that Math anxiety is "an inability by an otherwise intelligent person to cope with quantification, and more generally, mathematics", .Similarly Richardson & Suinn, cited in Baloglu, (1999) described math anxiety as "the feelings of tension and anxiety that interfere with the manipulation of numbers and solving of mathematical problems in a wide variety of ordinary life and academic situations"., Kitchens (1 995, p. 6) indicated that "any feeling that prevents you from learning math in a natural way as you did as a young child is math anxiety."

Of the wide range of affective variables related to teaching and learning mathematics, mathematics anxiety has been the most actively researched. Mathematics anxiety is a complex construct and has been defined in numerous ways. Gresham, (2007) defined Mathematics anxiety as both a cognitive dread of mathematics, and a learned emotional feeling of intense frustration or helplessness about one's ability to complete mathematical tasks .Accordingly, the influence of affective factors in mathematics has become a significant focus in mathematics education research and within this, understanding the relationship between affective factors such as self-efficacy and mathematics anxiety. Social Cognitive Theory (Bandura, 1986) is a useful framework for understanding these factors. In this theory, learners do not learn in isolation but reflect and assimilate observed actions and interactions that are presented in their environments.

Mathematics is an affective process that has both social and emotional factors that are continually interacting. Else-Quest, Hyde, & Hejmadi, (2008, p. 5) elaborated that Mathematics is often thought of as a purely intellectual and unemotional activity. Recently, researchers have begun to question the validity of this approach, arguing that emotions and cognition are intertwined.Kaasila, 2007;Lutovac & Kaasila, (2009) includes the narratives of seven students found and that they will not only provide a deeper understanding about the important role of emotions in mathematics education

Anthony & Walshaw, (2007) viewed that Mathematics is a powerful social entity. The mathematics community has recognised that succeeding at mathematics is not just about the classroom exercise involving pencil, paper, number lines and an infinite set of word

problems. Ministry of Education, Newzeland (2007) described that it is the confidence to explore and learn about the relationships in quantities, space, and data which help individuals to make sense of the world around them

During the 1960s the research interest in interpersonal relations increased. The objective of research became the study and the improvement of the educational system. The main subject that occupied the educational community was the achievement of students and the quality of their studies. The studies showed that interpersonal relations are important for the improvement of education. The research on the classification of mathematics anxiety is conflicting and ambiguous, however. Some researchers consider mathematics anxiety as an affective variable in addition to the broad constructs of interpersonal relations and social skills. Lim and Chapman (2013) investigated the relationship between variables of the affective domain and mathematics achievement

Another such factor may be the extent to which individuals integrate math into their sense of self. of particular interest in the current study is how one's inclusion of math in self relates (self-empathy and acceptance of others emotions) to one's feelings of math anxiety. An individual's degree of self-math overlap may be one such factor. Steele, 1988; Sherman and Cohen, (2006) declared that If math is an important part of the self (i.e., self-math overlap is higher), then being 'good' at math should be important for maintaining self-integrity, or the belief that the self is good, virtuous, and able to control important life outcomes.

However, in addition to these psychosocial factors, cognitive factors also contribute to math anxiety. It is well known, for instance, Ashcraft and Ridley, 2005 viewed that that there exists a persistent negative relation between poor math skills (a cognitive factor) and high math anxiety. Furthermore, Ma and Xu, 2004; Goetz et al., 2013; Wang et al., 2014 concluded that one's math achievement, one's beliefs about one's math abilities, and genetic factors associated with math problem-solving skills are predictive of math anxiety . Understanding the psychosocial factors that modulate the strength of the association between math performance and math anxiety and how they do so is critical for decoupling this pernicious negative cycle.

As the focus of this study lays in understanding and interpreting how individuals make sense of their world, and more specifically their experiences and emotions, a stand against the notion of positivism in mathematics. Rather than just measuring and explaining a set of feelings deriving in certain situations, this particular study involves a deeper investigation of subjectivity and human conduct. Through these ideas, the researcher is set within an interpretivist epistemology where the main focus is to study the social world, including interpersonal dealings, social skills, self-empathy and acceptance of others emotions with metacognition, by using adequate methods.

METHODOLOGY

Objectives

The study was designed to attain the following objectives:

•To Study the Mathematics Anxiety of senior Secondary School Students in Relation to Metacognition.

•To Study the Mathematics Anxiety of Senior Secondary School Students in Relation to Interpersonal Relations and Metacognition

•To Study the Mathematics Anxiety of Senior Secondary School Students in Relation to Social Skills and Metacognition

•To Study the Mathematics Anxiety of Senior Secondary School Students in Relation to self-empathy and acceptance of others emotions with Metacognition

Hypotheses

The proposed hypotheses were

H1- There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to Interpersonal Relations.

H2-There is no significant difference in Mathematics Anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition (group belonging to Interpersonal Relations)

H3- There is no significant interaction effect between metacognition and Interpersonal Relations of Senior Secondary School students on the score of mathematics anxiety

H4-There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to Social Skills

H5-There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition(group belonging to Social Skills)

H6-There is no significant interaction effect between metacognition and Social Skills of Senior Secondary School students on the score of mathematics anxiety.

H7- There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to self-empathy and acceptance of others emotions

H8-There is no significant difference in Mathematics Anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition(group belonging to self-empathy and acceptance of others emotions)

H9- There is no significant interaction effect between metacognition and self-empathy and acceptance of others emotions of Senior Secondary School students on the score of mathematics anxiety

Research Design:

The investigator was used survey method for studying the problem. Quantitative approach is applied in this study. Furthermore, quantitative research is about identifying relationships between variables through the use of data collection and analysis.

Identification and Recruitment of Participants

In order to conduct the present study, six Government and Aided schools from Hoshiarpur district were selected. For their selection Sample Random Technique was employed. Out of the selected schools, investigation was carried out on 300 students of Government and Aided Schools.

Design of the Study

Two-way analysis of variance (ANOVA) was employed on the score of Mathematics Anxiety. Mathematics Anxiety was dependent variable. Metacognition, self-motivation and interpersonal relations , social skills, self-empathy and acceptance of others emotions were used for classifying the student's viz-a-viz, High, Average and Low Metacognition, High, Average and Low interpersonal relations and High, Average and Low social skills, High, Average and Low self-empathy and acceptance of others emotions. They were studied as Independent Variables.

Instrumentation

The three instruments were used to collect data from the respondents. They include

1) Mathematics Anxiety Scale (Mas-Mskt) (2012) by Dr. Sadia Mahmood and Dr. Tahira Khatoon

Question included in MAS were intended to identify the bi-dimensional effects, positive (e.g. liking, excitement, pleasant, comfortable) and negative (e.g. fear, dread, nervousness, worry) toward math the revised version of the initial MAS contained 25 statements on a 5-point Likert scale. A split-half reliability coefficient was found by correlating scores of the subjects on odd items of the test with their scores on even items. The correlation coefficient thus obtained was 0.81 which when corrected by Spearman Brown Prophecy Formula increased to 0.90.The method employed for establishing validity of the MAS was based on teachers' judgment method.

2) Emotional Intelligence Scale (Seis-Ks) (2016) by Dr. Sarabjit Kaur

The seven fold Emotional Intelligence Scale constructed by Dr. Sarabjit Kaur was based on the books by Daniel Gleman, viz: Emotional Intelligence (1996) and working with Emotional Intelligence (1999). The final form of the SEIS had 63 items. These 63 items with Positive/Negative type distributed in seven dimensions Out of these three dimensions were

Interpersonal Relations (IPR): Talking about feelings effectively; handling emotions in relationships well and accurately. Seven items(3 positive and 4 negative) were belongs to this dimension. Maximum marks are 35 and minimum is 7.

Social Skills (SS): Reading social situations and networks; interacting smoothly; using these skills to persuade and lead, negotiate and settle disputes for cooperation and teamwork. Twenty items (7 positive and 13 negative) were belongs to this dimension. Maximum marks are 100 and minimum is 20.

Empathy and acceptance of other (EAO): Sensing what people are feeling, being able to take their perspective, accepting their point of view and cultivating rapport and atonements with a broad diversity of people. Nine items (3 positive and 6 negative) were belongs to this dimension. Maximum marks are 45 and minimum is 9.

The sevenfold Emotional Intelligence Scale was standardized on a student sample of 800 male and female studying in +2, college level 5-point Likert scale was used. The reliability of Sevenfold Emotional Intelligence Scale was established by Test-retest Method. The reliability coefficients between the two sets of scores was founded as +0-91 which is significant as .01 level of significance. The validity of SEIS was taken into consideration by Experts' expert opinion, on which two items were rejected out of 70 items of 1st draft and some items were modified.

3) Meta-Cognition Inventory (2003) by Dr. Punita Govil

The statements of the Test deal with both the aspects of metacognition: knowledge of cognitive process and regulation of cognitive process. The inventory contains 30 items, each item being a statement followed by a four point scale 'not at all', 'somewhat', 'to a considerable extent' and 'very much so'. The value of reliability coefficient was found to be 0-82.which was found by Test-Retest Method. The test possesses satisfaction content validity.

Procedure

In order to conduct the study 300 students of 12th Senior Secondary School of Hoshiarpur district were selected. The Maths Anxiety Scale had been administrated on selected students. The selected sample had been segregated under three categories viz-a-viz High, Average and Low Metacognition. Now Seven Fold Emotional Intelligence Scale was used to segregate the students in High, Average and Low interpersonal relations. The Mathematics Anxiety of these groups had been taken and scored. Further the data had been given statistical treatment

Now again the students segregated according to metacognition was further segregated in to in High, Average and Low social skills The Mathematics Anxiety of these groups had been taken and scored. Further the data had been given statistical treatment

Now again the students segregated according to metacognition was further segregated in to High, Average and Low self-empathy and acceptance of others emotions. The Mathematics Anxiety of these groups had been taken and scored. Further the data had been given statistical treatment

Statistical Technique: The data was analyzed using two ways analysis of variance to find out the significant differences between groups. Mean and standard deviation of various subgroups will be computed to understand the nature of data

The Data Obtained has been analyzed under the following headings:, self-empathy and acceptance of others emotions

RESULTS AND DISCUSSION

This portion of the study presents the results of the data gathered by the researcher.

MATHEMATICS ANXIETY IN RELATION TO INTERPERSONAL SKILLS AND METACOGNITION

The Means of Sub Groups Of 2×2 Factorial Design on the Scores of Mathematics Anxiety have been Calculated and Presented Below in table 1

TABLE 1

Means and Std of Sub Groups Of ANOVA for 2×2 Factorial Design on the Scores of Mathematics Anxiety in Relation to Interpersonal Relations and Metacognition

IR	LMC	AMC	HMC	TOTAL
LIR	M_1 =39.19 σ_1=7.237 N_1 =37	M_2=42.21 σ_2 =5.467 N_2 =43	M_3 =43.34 σ_3=5.038 N_3 =29	M=41.49 σ =6.213 N =109
AIR	M_4=41.33 σ_4 =5.053 N_4=18	M_5 =41.36 σ_5=4.593 N_5 =22	M_6 =43.94 σ_6=6.375 N_6 =18	M =42.16 σ =5.383 N =58
HIR	M_7 =41041 σ_7=5.339 N_7 =32	M_8=42.53 σ_8=3.301 N_8 =60	M_9 =45.83 σ_9=5.603 N_9 =41	M =43.28 σ =4.920 N =133
TOTAL	M =40.45 σ =6.200 N =87	M =42.22 σ =4.366 N =125	M =44.63 σ =5.645 N =88	M =42.41 σ =5.551 N =300

In order to analyse the variable, the obtained scores were subjected to ANOVA. The result have been presented below in the table 2:

Table2

Summary of ANOVA for 2×2 Factorial Design on the Scores of Mathematics Anxiety In Relation To Interpersonal Relations and Metacognition

Source Of Variance	SS	df	MSS	F
Interpersonal Skills (A)	194.179	2	97.089	3.44*
Metacognition (B)	562.357	2	281.178	9.976*
Interaction (A×B)	95.596	4	23.899	.848
Within	8201.836	291	28.185	
Total	9053.968	300		

*significant at the 0.05 level of confidence.

INTERPERSONAL RELATIONS (A)

From the result inserted in the Table 2 reveals that the variance ratio is 3.44,df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 3.44 > 3.04 that F ratio for difference between the means of Mathematics Anxiety with high, average and low interpersonal relations was found to be significant at 0.05 level of confidence.. Hence, the data provides sufficient evidence to reject the hypothesis H_1 viz. "There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to interpersonal relations.

Further the mean table 1 reveals that mean score of math anxiety with high interpersonal relations is higher than average and low interpersonal relations.it mean students having high interpersonal relations has less mathematics anxiety. Students who handle their emotions intelligently has less mathematics anxiety

The results are in tune with findings of:

Gillen-O'Neel, Ruble, & Fuligini, (2011) found students aware of negative subgroup stigmas are more likely to exhibit anxiety, poor self-esteem, and lack motivation.

METACOGNITION (B)

From the result inserted in the Table 2 reveals that the variance ratio is 9.976, df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 9.976 > 3.04 that F ratio for difference between the means of Mathematics Anxiety with high, average and low interpersonal relations was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data provide sufficient evidence to reject the hypothesis H_2viz. "There is no significant difference in mathematics anxiety of Senior Secondary School in relation to metacognition (belonging to group -interpersonal skills)".

Further the mean table 1 reveals that mean score of math anxiety with high metacognition is higher than average and low metacognition.it mean students having high metacognition has a smaller amount of math anxiety belonging to group -interpersonal skills.

The results are in tune with findings of:

Legg, Angela Marie (2009) found that Metacognition predicted confidence in accuracy such that individuals with high metacognitive ability were more confident in their ability to correctly answer the problems.

INTERACTION (A×B)

From the result inserted in the Table 2 reveals that the variance ratio is .848,df between mean is 4 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 2.42.It may be observed from table that F of magnitude .848 < 2.42 that F ratio for interaction between metacognition and interpersonal skills on the score of mathematics anxiety was not found to be significant even at 0.05 level of confidence. Hence, the data could not provide sufficient evidence to reject the hypothesis H_3viz. "There is no significant interaction between metacognition and interpersonal skills of senior secondary school students.

MATHEMATICS ANXIETY IN RELATION TO SOCIAL SKILLS AND METACOGNITION

The Means of Sub Groups Of 2×2 Factorial Design on the Scores of Mathematics Anxiety have been Calculated and Presented Below in table 3

TABLE 3

Means and Std, s of sub groups of ANOVA for 2×2 factorial design on the scores of Mathematics Anxiety in relation to social skills And Metacognition

SS	LMC	AMC	HMC	TOTAL
LSS	M_1 =38.26 σ_1 =6.203 N_1 =43	M_2 =42.27 σ_2 =4.305 N_2=37	M_3 =42.89 σ_3 =4.267 N_3 =19	M =40.65 σ =5.579 N =99
ASS	M_4 =42.80 σ_4 =5.985 N_4=30	M_5 =42.13 σ_5 =4.703 N_5 =61	M_6 =43.61 σ_6 =5.623 N_6 =23	M =42.61 σ =5.237 N =114
HSS	M_7 =42.14 σ_7 =4.276 N_7 =14	M_8 =42.33 σ_8=3.762 N_8 =27	M_9 =45.85 σ_9 =5.963 N_9 =46	M =44.16 σ =5.374 N =87
TOTAL	M =40.45 σ =6.200 N =87	M =42.22 σ =4.366 N =125	M =44.63 σ =5.645 N =88	M =42.41 σ =5.551 N =300

In order to analyse the variable, the obtained scores were subjected to ANOVA. The result have been presented below in the table 4:

Table 4

Summary of Anova for 2×2 Factorial Design on the Scores of Mathematics Anxiety In Relation To Social Skills and Metacognition

Source Of Variance	SS	df	MSS	F
Social Skills (A)	232.896	2	116.448	4.301*

Metacognition (B)	351.371	2	175.686	6.489*
Interaction (A×B)	288.356	4	72.089	2.663*
With In	7878.151	291	27.073	
Total	548795.000	300		

*significant at the 0.05 level of confidence.

MAIN EFFECTS

SOCIAL SKILLS (A)

From the result inserted in the Table 4 reveals that the variance ratio is 4.301,df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 4.301> 3.04 that F ratio difference between the means of Mathematics Anxiety with high, average and low social skills was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data could provide sufficient evidence to reject the hypothesis H_4 viz "There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to social skills.

Further the mean table 3 reveals that mean score of math anxiety with high social skills.is higher than average and low social skills. It mean students having high social skills has less mathematics anxiety. Students who handle their emotions intelligently has less mathematics anxiety. So students able to read social situations and networks; interact smoothly; using these skills to persuade and lead, negotiate and settle disputes for cooperation and teamwork has less math anxiety..

The results are in tune with findings of:

METACOGNITION (B)

From the result inserted in the Table 4 reveals that the variance ratio is 6.489, df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 6.489 > 3.04 that F ratio for difference between the means of Mathematics Anxiety with high, average and low social-skills was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data provide sufficient evidence to reject the hypothesis H_5 viz "There is no significant difference in mathematics anxiety of Senior Secondary School in relation to metacognition (belonging to group social skills)".

Further the mean table 3 reveals that mean score of math anxiety with high metacognition is higher than average and low metacognition.it mean students having high metacognition has a smaller amount of math anxiety belonging to group - social skills.

The results are in tune with findings of:

Lai Y, Zhu X, Chen Y, Li Y (2015) results showed that children with MLD scored lower in self-image and higher in learning mathematics anxiety (LMA) than the TA and HA children, but not in mathematical evaluation anxiety (MEA). MLD children's LMA was also higher than that of their LA counterparts. These results provide insight into factors that may mediate poor WPS performance which emerges under pressure in mathematics**.**

INTERACTION (A×B)

From the result inserted in the Table 4 reveals that the variance ratio is 2.663, df between mean is 4 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 2.42.It may be observed from table that F of magnitude 2.663 > 2.42 that F ratio for interaction between metacognition and social skills on the score of mathematics anxiety was found to be significant at 0.05 level of confidence. Hence, the data could provide sufficient evidence to reject the hypothesis H_6 viz. "There is no significant interaction between metacognition and social skills of senior secondary school students.".

Further, the examination of the corresponding means from the Table 3 suggests that:

•The mean scores of Mathematics Anxiety of students having high social skills is higher than the students having low and average social skills. It indicates that the students with high social skills has less mathematics anxiety.

•The mean scores of Mathematics Anxiety of student having high metacognition is higher than the students having low and average metacognition. It indicates that the students with high metacognition has less mathematics anxiety.

•The mean scores of Mathematics Anxiety of students with low social skills and high metacognition is higher than the students having high and average social skills. It indicates that the students with low social skills and high metacognition has more mathematics anxiety.

•The mean scores of Mathematics Anxiety of students having high social skills and high metacognition is higher than the students having low and average metacognition. It indicates that the students with high social skills and high metacognition has less mathematics anxiety.

The same has been depicted through interaction graph in the FIG.I:

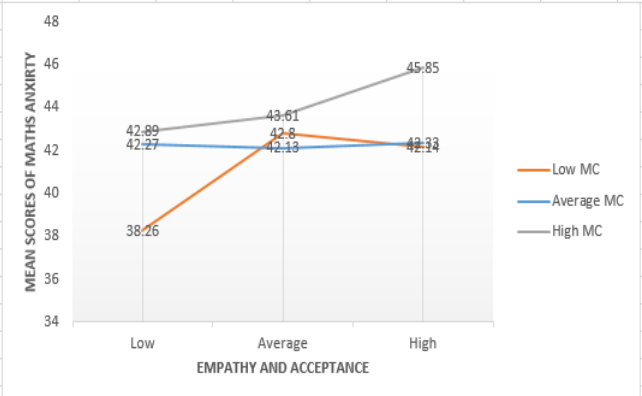

Fig I: 2×2 Interaction graph between Metacognition and Social Skills on the means scores of Mathematics Anxiety.

The results are in tune with findings of:

Daniel Goleman (1998) examined that students who have high EQ, or emotional intelligence, show high levels of positive affect and low negative affect levels. They are conscientious and acceptor and have fewer emotional problems and in interpersonal relationships, have better performance

ATHEMATICS ANXIETY IN RELATION TO EMPATHY AND ACCEPTANCE OF OTHERS EMOTIONS AND METACOGNITION

The Means of Sub Groups Of 2×2 Factorial Design on the Scores of Mathematics Anxiety have been Calculated and Presented Below in table 5

TABLE 5

Means And Std, of Sub Groups of Anova forv2×2 Factorial Design on the Scores of Mathematics Anxiety in Relation to Empathy and Acceptance of others Emotions and Metacognition

EAO	LMC	AMC	HMC	TOTAL
LEAO	M_1 =38.08 σ_1=6.583 N_1 =36	M_2 =41.70 σ_2=4.032 N_2 =44	M_3 =43.50 σ_3 =3.951 N_3 =10	M =40.46 σ =5.526 N =90
AEAO	M_4 =42.56 σ_4=4.710 N_4 =27	M_5=42.29 σ_5 =4.941 N_5 =41	M_6=43.88 σ_6 =5.533 N_6 =25	M =42.80 σ =5.032 N =93
HEAO	M_7 =41.36 σ_7=6.106 N_7 =27	M_8=42.70 σ_8=4.134 N_8 =40	M_9 =45.19 σ_9=5.971 N_9 =53	M =43.61 σ =5.600 N =117
TOTAL	M =40.45 σ =6.200 N =87	M =42.22 σ =4.366 N =125	M =44.63 σ =5.645 N =88	M =42.41 σ =5.551 N =300

In order to analyse the variable, the obtained scores were subjected to ANOVA. The result have been presented below in the table 6:

TABLE-6

Summary of Anova for 2×2 Factorial Design on the Scores of Mathematics Anxiety In Relation To Empathy and Acceptance of Others Emotions and Metacognition

Source Of Variance	SS	df	MSS	F
Empathy And Acceptance (A)	178.079	2	89.039	3.230*
Metacognition (B)	400.839	2	200.419	7.270*
Interaction (A×B)	371.889	4	92.972	3.372*
Within	8022.342	291	27.568	
Total	8973.149	300		

*significant at the 0.05 level of confidence.

MAIN EFFECTS

EMPATHY AND ACCEPTANCE (A)

From the result inserted in the Table 6 reveals that the variance ratio is 3.230, df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 3.230 > 3.04 that F ratio for difference between the means of Mathematics Anxiety with high, average and low empathy and acceptance of others emotions was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data could provide sufficient evidence to reject the hypothesis H_7 viz. "There is no significant difference in mathematics anxiety of Senior Secondary School students in relation to empathy and acceptance of others emotions.".

Further the mean table 5 reveals that mean score of math anxiety with high empathy and acceptance of others emotion is higher than average and low empathy and acceptance of others emotions. It mean students having high empathy and acceptance of others emotions has less mathematics anxiety. Students who accepts others point of view and cultivating rapport and atonements with a broad diversity of people has less math anxiety.

The results are in tune with findings of:

Lou, Wang, and Lou (2009), "Middle school students in our country face much pressure in mathematics learning which, to some extent, leads to students' mathematics anxiety".

METACOGNITION (B)

From the result inserted in the Table 6 reveals that the variance ratio is 7.270, df between mean is 2 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 3.04.It may be observed from table that F of magnitude 7.270 > 3.04 that F ratio for difference between the means of Mathematics Anxiety with high, average and low metacognition was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data provide sufficient evidence to reject the hypothesis H_8 viz. "There is no significant difference in mathematics anxiety of Senior Secondary School in relation to metacognition (belonging to group empathy and acceptance of Emotions).".

Further the mean table 5 reveals that mean score of math anxiety with high metacognition is higher than average and low metacognition.it mean students having high metacognition has a smaller amount of math anxiety belonging to group - empathy and acceptance of Emotions

The results are in tune with findings of:

Wells, (2009).it is the thinking style more than the content of thoughts, which give rise to psychological distress such as anxiety

INTERACTION (A×B)

From the result inserted in the Table 6 reveals that the variance ratio is 3.372,df between mean is 4 and among group is 291.Entering F with these degree of freedom the value at 0.05 level is 2.42.It may be observed from table that F of magnitude 3.372 >2.42 that F ratio for interaction between metacognition and empathy and acceptance of others emotions on the score of mathematics anxiety was found to be significant at 0.01 and 0.05 level of confidence. Hence, the data could provide sufficient evidence to reject the hypothesis H_9 viz. "There

is no significant interaction between metacognition and empathy and acceptance of others emotions of Senior Secondary School students on the score of mathematics anxiety".
The results are in tune with findings of:
Further, the examination of the corresponding means from the Table 5 suggests that:
•The mean scores of Mathematics Anxiety of students having high empathy and acceptance is higher than the students having low and average empathy and acceptance. It indicates that the students with high empathy and acceptance of others emotions has less mathematics anxiety.
•The mean scores of Mathematics Anxiety of student having high metacognition is higher than the students having low and average metacognition. It indicates that the students with high metacognition has less mathematics anxiety.
•The mean scores of Mathematics Anxiety of students with low empathy and acceptance and high metacognition is higher than the students having high and average empathy and acceptance. It indicates that the students with low empathy and acceptance of others emotions and high metacognition has more mathematics anxiety.
•The mean scores of Mathematics Anxiety of students having high low empathy and acceptance and high metacognition is higher than the students having low and average metacognition. It indicates that the students with high empathy and acceptance of others emotions and high metacognition has less mathematics anxiety.
The same has been depicted through interaction graph in the fig.II :

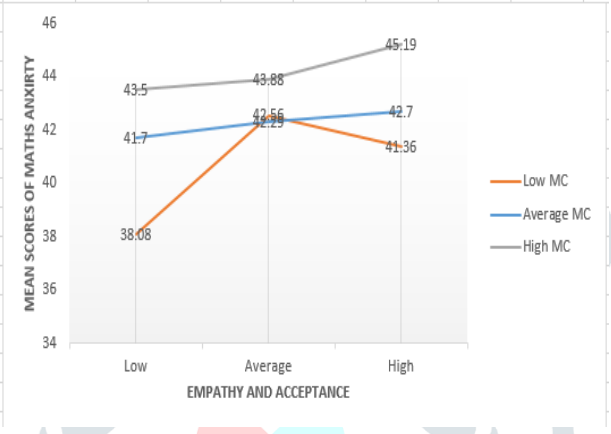

Fig. II: 2×2 Interaction graph between Metacognition and -Empathy and Acceptance of Emotions on the means scores of Mathematics Anxiety.

Truls Ryum et.l (2017) found that while gender was correlated with worry, gender predicted anxiety beyond the effect of worry. Taken together, the results imply that both worry and metacognitive beliefs play a prominent role for the development of anxiety.

Finding

- It was found that there is significant difference in mathematics anxiety of Senior Secondary School students in relation to Interpersonal Relations.
- It was found that there is significant difference in Mathematics Anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition (group belonging to Interpersonal Relations)
- It was found that there is no significant interaction effect between metacognition and Interpersonal Relations of Senior Secondary School students on the score of mathematics anxiety
- It was found that there is significant difference in mathematics anxiety of Senior Secondary School students in relation to Social Skills
- It was found that there is significant difference in mathematics anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition(group belonging to Social Skills)
- It was found that there is no significant interaction effect between metacognition and Social Skills of Senior Secondary School students on the score of mathematics anxiety.
- It was found that there is significant difference in mathematics anxiety of Senior Secondary School students in relation to self-empathy and acceptance of others emotions
- It was found that there is significant difference in Mathematics Anxiety of Senior Secondary School students in relation to High, Average and Low Metacognition(group belonging to self-empathy and acceptance of others emotions)
- It was found that there is significant interaction effect between metacognition and self-empathy and acceptance of others emotions of Senior Secondary School students on the score of mathematics anxiety

FUTURE IMPLICATIONS

Math anxiety impacts students as early as the first grade by affecting their working memory. Working memory is like a 'mental scratchpad'. It is important when we need to keep track of numbers. But this working memory can be disrupted by math anxiety in both elementary and secondary school students. This can lead students with math anxiety to be as much as half a school year behind their peers in math. Even for students who don't struggle with math anxiety, it's important to develop positive study habits that will help them as math becomes more complex. Students coping with math anxiety need to feel that they can excel at math. Teachers can have a great impact on a student's feelings toward math. As we have found that interpersonal relations have significant effect on math anxiety so teacher has to improve interpersonal relations to reduce math anxiety

From the first day of kindergarten to the last day of high school, teachers play a critical role in helping students develop interpersonal relationships. Whether it's resolving a conflict or promoting cooperation, there are endless opportunities to teach students how to interact with those around them. Developing interpersonal relationships is so important, in fact, that many teachers may not realize their role in it. ... To promote the learning of these skills, teachers must create an inclusive atmosphere that welcomes all students to interact with one another. Teachers have always used group projects and collaborative activities to encourage teamwork in the classroom. This remains a

positive way to foster interpersonal development. Supporting interpersonal relationships outside the classroom is another important way to support the social needs of your students. Spark PE says that after-school activities help build both social skills and personal confidence. Working with others in a new environment, such as at a new sport, helps students learn the value of teamwork and to develop leadership skills And Social skills. One of the best ways to teach social skills is to take advantage of opportunities during real life situations. KidsMatter writes that when a student is visibly upset with another student, a teacher can intervene to help them express their emotions in a productive way that helps both parties learn. This is what's referred to as self-regulation. The Highly Effective Teacher says that teaching students how to appropriately express their feelings and understand the consequences of their actions is key for developing friendships. In turn, strong friendships lead to more positive attitudes and reduce mathematics anxiety which helps for higher academic achievement in mathematics. It's also important for teachers to identify passive aggressive bullying and interpersonal conflict between classmates.

Emotions are the DNA of human experience. Social relationships play a pivotal role in helping us become fully human. ... However, in our view, it is the combination of comprehensive socio-emotional learning that leads to increased well-being and better learning. A Emotions are the DNA of human experience. Social relationships play a pivotal role in helping us become fully human. Connectedness is an essential need for our species. So, we tend to assume it comes naturally and also thus, needs to be taught in schools.

It is only recently that policymakers and organisations are paying attention and defining emotions and social skills as essential to a well-rounded education. This is mostly based on growing evidence that socio-emotional skills increase academic outcomes. Our study give enough evidence and suggesting that social and emotional skills (SES) can be taught in schools through a combination of approaches We need to teach children to be aware and in control of their impulses and emotions so that they are able to focus on how others feel without dismissing their own feelings or letting them get in the way to reduce mathematics anxiety. Only then will empathy and compassion build true connectedness. Teaching empathy requires also helping students understand and acknowledge the discrimination, condescension or oppression –open or hidden, macro or micro– that other people and groups experience day to day due to their gender, age, ethnicity, faith, socio-economic condition, sexual orientation, etc. This is a lens that sharpens empathy and needs to be trained time and again because it tends to wear off. Empathy is a first step which helps in the reduction of mathematics anxiety.

So there is need to Similar to "treat the patient, not the disease", what this means is that children must be seen as individuals with minds of their own, entitled to opinions, emotions, concerns and preferences; and not as "adults in the making", "work in progress", projects of future workers, future citizens, or future parents. Then, what will matter is how they view and experience their own learning, enough so that it shapes and drives the education process to provide children with learning opportunities that fulfil their childhood needs. Experiences that spark their natural curiosity, inspire their efforts, grip their concentration, endow them with the joy of mastery, give them purpose, build their confidence, drive them to collaborate, connect them with others and with the world. Ultimately, the goal is for children to be happier, kinder and, healthier.

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