RELATIONSHIP BETWEEN MATHEMATICS ANXIETY AND USE OF EMOTION REGULATION STRATEGIES IN YOUNG ADULTS

A

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Submitted by
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UNDER THE SUPERVISION OF

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THAPAR UNIVERSITY
PATIALA
June, 2017

CERTIFICATE

This is to certify that the thesis entitled "**Relationship between mathematics anxiety and the use of emotion regulation strategies in young adults**" being submitted in partial fulfillment of requirements for the award of degree of **Masters of Arts in Psychology**, submitted in the **School of Humanities and Social Sciences, Thapar University, Patiala**, is the bonafide work carried out under the supervision of Dr. Santha Kumari, Professor and Head, School of Humanities and Social Sciences, Thapar University, Patiala and that no part of this project has been submitted for the award of any degree.

(VASUDHA SOOD)

This is to certify that above statement made by the student concerned is correct and true to be best of my knowledge.

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CANDIDATE'S DECLARATION

I, hereby declare that the work presented in the thesis entitled "**Relationship between mathematics anxiety and the use of emotion regulation strategies in young adults**" in partial fulfillment of the requirement of for the award of Degree of **Masters of Arts in Psychology,** submitted to **School of Humanities and Social Sciences, Thapar University, Patiala** is an authentic record of my own work carried out under the supervision and guidance of Dr. Santha Kumari, Profressor and Head, School of Humanities and Social Sciences, Thapar University, Patiala , and refer other researcher's work which are duly listed the reference section.

The matter embodied in this thesis has not formed the basis for the award of any other degree of this or any other university.

Date: 2nd June, 2017

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This is to certify that the above declaration made by the student concerned is correct and true to the best of my knowledge.

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List of abbreviations

MA Mathematic anxiety

ERS Emotion regulation strategies

CR Cognitive reappraisal

ES Expressive suppression

Abstract

Mathematics anxiety, the debilitating emotional reaction to mathematics, involving a feeling of nervousness, can have harmful effects for mathematics achievement in students. Though there is an upsurge of interest in emotion regulation research, the way the emotion regulation functions in relation to specific emotions remains unelaborated. The present study focuses on the relationship between mathematic anxiety and the use of emotion regulation strategies in young adults. A sample of 160 student volunteers (80 males and 80 females) of the age range 18-25 yrs participated in this study. It was hypothesized that females show high mathematics anxiety as compared to males. In addition to this it was also predicted that high math anxiety individuals use more of expressive suppression and low math anxiety individuals use more of cognitive reappraisal emotion regulation. Gender differences in emotion regulation were also investigated. The findings of the studies confirmed all the hypotheses posited except the first one where no difference between males and females in mathematic anxiety was observed. High math anxiety group used expressive suppression and low math anxiety group used cognitive reappraisal emotion regulation. And also males used more of cognitive reappraisal and females used more of expressive suppression emotion regulation.

Keywords: Mathematics anxiety, Emotion regulation strategies, Gender

CONTENTS

Certificate i

Candidate's declaration ii

Acknowledgement iii

List of Abbreviations iv

Abstract v

List of Tables x

CHAPTER1

INTRODUCTION

1.1 Mathematic anxiety 1

1.2 Exposure to negative attitudes towards mathematics 2

1.3 Emotion and emotion regulation 2

1.4 Emotion regulation (2-3)

1.5 Emotion regulation strategies 3

CHAPTER 2

REVIEW OF LITERATURE

2.1 Math anxiety and gender differences related studies (4-5)

2.2 Math anxiety and emotion regulation related studies (5-6)

2.3 Use of emotion regulation strategies and gender differences related studies (6-8)

CHAPTER 3

MOTIVATION OF THE STUDY 8

3.1Motivation of the study 8

3.2Objectives of the present study 8

3.3 Rationale and hypotheses (9-10)

CHAPTER 4

METHODOLOGY

4.1 Sample 11

4.2 Design 11

4.3 Tools used (11-12)

4.4 Procedure 12

CHAPTER 5

RESULTS

Table 1- table 6 (13-17)

CHAPTER 6

DISCUSSION 18

6.1 Conclusion (18-20)

6.2 Implications 20

6.3 Limitations & Future scope 21

REFERENCES **(**21-22)

APPENDICES 23

Appendix A: Consent form 23

Appendix B: Math anxiety rating scale short version (24-25)

Appendix C: Emotion regulation questionnaire (26- 28)

List of Tables

Table 1: Mean, standard deviation of math anxiety, cognitive reappraisal (CR) and expressive suppression (ES) of males and females. 13-14

Table 2: Mean, standard deviation and t-value of cognitive reappraisal (CR) and expressive suppression (ES) of high and low math anxiety group. 14

Table 3: Regression analyses for math anxiety and expressive suppression (Males) 15

Table 4: Regression analyses of math anxiety and cognitive reappraisal (Males) 15-16

Table 5: Regression analyses of math anxiety and cognitive reappraisal (Females) 16

Table 6: Regression analyses of math anxiety and expressive suppression (Females) 17

Chapter 1

Introduction

1.1 Mathematic Anxiety

The functioning of an individual depends upon the positive and the negative emotions. Different quantitative skills such as an ability to perform basic mathematical operations and the use of problem solving strategies plays an important role in determining children's future success in their classrooms. Education, psychology and neuroscience have contributed tremendously in the understanding of mathematics anxiety in its own particular way. Mathematics anxiety implies anxiety of an individual about their own ability to do mathematics. This phenomenon is often considered while examining student's problem in mathematics. When it comes to mathematics people experiences worry or fear while dealing with numerical data. A negative emotional response occurs when it comes to opening of a book or entering a classroom, but it doesn't ends there. According to Ashcraft and Kirk (2001) individuals who are highly math anxious will avoid situations in which they have to perform some mathematical calculations. A panic state for math anxious people could occur, when people are encountered with various situations like reading a cash register receipt or when they have to figure out the sales tax on their purchases. Indeed, for few individuals the level of arithmetic anxiety is so high to the point that they end up being nervous even after simply reading out loud numerical equations.

Anxiety occurs in those individuals who are having poor mathematic skills. When people are given math assignments they experience worries which is often about performing inadequately on the math assignment and afterwards these worries often leads to valuable thinking and reasoning resources which is required for the task that needs to be done. The hindrance in the mathematics achievement is because of math anxiety due to which students avoid math, math classes and math related career courses. An exposure to negative attitudes about mathematics and an arousal of cognitive predispositions are the main causes for mathematics anxiety. Math anxiety has an unfavorable emotional reaction to math or prospect of doing math. An individual having math anxiety are less skilled and perform poor in math. Math anxious individuals tend to worry about those situations and its consequences when they came across with the math task.

1.2 Exposure to Negative Attitudes toward Mathematics

The impact of parents and teachers has also been probed as significant environmental factors in the development of mathematic anxiety and negative attitudes and beliefs about mathematics. It has been observed that external factors like role of parents of children and their teachers too plays an important role in forming anxiety towards mathematics subject and in some cases even a negative attitude and beliefs towards it. Feeling anxious about mathematics has been linked to avoidant behavior, poor performance and test anxiety. For high math anxious parents, math homework is like an opportunity for them to express their children about their own dislike, frustration or confusion about mathematics itself.

1.3 Emotions and Emotion regulation

As we know emotions are expressed by individuals in various forms. The intensity of emotions also varies from person to person. In extreme cases, a person may show high level of joy and in other cases, there can be sign of showing frustration, anguish guilt etc. A person may even inflict injury upon himself to keep these strong emotions under control.

1.4 Emotion regulation

All individuals whilst on their way to fulfill personal goals or ambitions encounter different level of emotions which one try to control. This is referred to as emotion regulation. These emotions may flow from events to which are actual or imaginary. Keeping in mind one's goal to seek after one's objective, and to suitably react to environmental demand the term "emotion regulation" implies to the range of activities that enables a person to monitor, access and change the nature and course of an emotional reaction. For example, Gross (1998) describes emotion regulation as the process by which an individual impacts the feelings they experience, their depth and timings, and the subjective experience of outflow of emotion. Hence emotion regulation term is basically used to portray a capacity of person to adequately manage and to react to an emotional affair. Extrinsic phenomenon for individuals likes the sudden occurrence of a dangerous snake, or intrinsic, as recollection of memories, envisioned situations, prognosis about the future, interpretations, or convictions and so on, can elicit emotions. According to them Gross and Thompson, (2007) in many ways emotions that are experienced and regulated are

indistinguishable. Emotion regulation implies how one tries to impact which feelings they have, when they occur, and how they encounter and impart those feelings. Emotions are generally conceptualized as multifaceted, which is manifested phenomenon which involves loosely coupled changes and conscious processes.

1.5 Emotion regulation strategies (ERS)

Gross (2007) has distinguished between antecedent focused strategies and response focused strategies in relation to emotional regulation. Antecedent-focused strategies; deal with what is going to/ about to happen regarding the emotional response, such as the occurrences that is prior to emotional events. On the other hand, Response-focused strategies deal with emotional events when it is on progress. Especially four distinct sorts of antecedent focused strategies are given i.e. situation selection, situation modification, attentional deployment, and cognitive change. Another methodology given is a response modulation, which is a signature kind of a response-focused methodology. There are various emotion regulation strategies such as suppression, which is consideredless efficient, and is significantly associated with more symptoms of psychopathology. Whereas other emotion regulation strategy, such as cognitive reappraisal, is considered more efficient, and is thus associated with fewer symptoms of psychopathology (Aldao, Nolen-Hoeksema,& Schweizer, 2010).In clinical phenomena, the use of specific emotion regulation strategies such as suppression has been linked to high anxiety, depressive symptoms, and rumination, while reappraisal showed a negative correlation with depressive symptoms like rumination, anxiety, trait neuroticism (Garnefski & Kraaij ,2007; Gross & John 2003; Roemer & Borkovec, 1995).Cognitive reappraisal, as defined by Gross and his colleagues require considering as it is one's subjective experience of an emotion and other potential ways to appraise the emotion-eliciting stimulus which is similar to venting, the subject does not deny or inhibit a part of the emotional experiences; however, its association with more adaptive outcomes suggests that reappraisal may involve a more productive level of processing instead of serving to maintain an unhelpful focus on the negative effect.

Chapter 2

Review of literature

2.1 Math anxiety and gender differences related studies.

According to a study conducted by Hombery (1990) involving 151 researches indicated that mathematics anxiety is much more in females as compared to males. Studies on gender differences by Hunt (1985) reported that difference between males and females are significant (cited by Ma, 1990). It is obvious that there are other reasons such as weak background in mathematics, support of a family, past experience, role of a teacher plays a huge role. Mathematics anxiety could occur with respect to social and cultural differences. In relation to mathematic anxiety some other aspects can be considered as well like individuals accepted beliefs concerning males and females and their deduced value of maths. Therefore such components results into girls viewing themselves as weak in comparison with boys (Campbell & Evans, 1997).

Betz (1978) showed that math anxiety is more in female students as compared to male students during their high school and college years. Various other studies showed that in mathematics, male achievement is high. It is a fact that gender differences do not appear until puberty. In a test, at the age of 9, boys and girls showed same mathematics and science proficiency. The gap begins to appear when they turn 13. Earlier findings showed that girls and boys do not differ during their elementary school, but differences begins to occur in middle school and increases with more time and schooling. However girls often have low self esteem in their math capabilities and mathematics is often labeled as a masculine ability.

A few studies demonstrated that at young age, girls are not so sure but rather more anxious about mathematics than young men. Additionally anxiety is bigger than genuine gender differences in math accomplishment. The attitude is an important indicator of math performance and math-related profession choices. Women tend to think more about working with individuals, and men have a tendency to be more inspired by working with things, and research demonstrates that this distinction identifies the gender gaps in determination of math-related vocations. Different studies have found that boys tend to utilize more novel critical thinking methodologies, though

girls will probably take after school-instructed procedures. Boys have a tendency of being stronger in the capacity to mentally represent and control objects in space, and these skills anticipate better math performance and STEM profession decisions. Luckily, a few analysts have found that spatial abilities can be enhanced through preparing, and one study even found that the gender gap in spatial aptitudes was disposed of with training. Spatial skills are a great topic of interest. In this area of research many researchers reported that the relationship of spatial and mathematical skills appeared to be gender specific. Friedman (1995) found that the researches supported the idea that for boy, space math relationship might be stronger as compared to girls.

According to Richardson and Woolfolk (1980) that negative generalizations incorporate thoughts that females are not mathematically capable and that math is not a feminine action. Good, Rattan, and Dweck (2012) found that female undergrads with higher math anxiety had a lower feeling of having a place in mathematics. Besides, the individuals who trusted that females are less able in math and that mathematical ability is fixed, they had a lower feeling of having a place in mathematics than male students. The researchers also found that teacher's give grades to girls lower in mathematics than boys by one tenth of a standard deviation. The researcher also found that girls do not receive as much affirmation for scholarly work in contrast with boys. Teachers are empowering the gap between the genders in mathematics instead of preventing it by not urging the girls to attempt more complicated mathematical issues. The contrasts amongst male and female students in mathematical abilities increases as the students move into high school and college. As girls mature and develop more aware of the generalizations identified with girls and mathematical abilities they became more anxious about mathematics, which in turn can influence their grades. Females have a highly inclined to drop out of the mathematics pipeline contrasted to boys, which could possibly be because of anxiety about the topic. This contributes to the absence of a female in STEM professions.

2.2 Math anxiety and emotion regulation related studies

According to a study by Gross and John (2003) the increased psychopathology could be a result of the use of high emotion regulation methodologies for example expressive suppression and cognitive reappraisal. Yet it has not been established so far if these strategies indeed represent cognitive style that is associated with psychopathologies. The individuals are predominantly either "suppressors" or "reappraisers. There has been a development of four patterns that have

emerged i.e. high regulators; high reappraisers/low suppressors; moderate reappraisers/low suppressors; and low regulators. Individuals who showed infrequently and inadequately controlling their emotions (low regulators) have lead to higher depression, anxiety, and posttraumatic stress disorder (PTSD). Conversely there are individuals who showed frequently and adequately use of reappraisal and low levels of suppression (high reappraisers/low suppressors) showed the low levels of these symptoms, indicating that the particular blend of emotion regulation that may be most adaptive.

Richard and Gross (2000) explored the significance of specific emotion regulation strategies like reappraisal and suppression in daily life in situations such as social interaction, ability to recall the details of an event and ager management. Studies have shown that suppression leads to decreased or less effective regulation of emotions and increase psychological arousal and self reported negative effect. Whereas reappraisal leads to decreased self reported negative effect and more effective regulation and thus there is an insignificant change in physiological arousal and behavioral expression. Studies have also shown higher levels of anxiety will predict more frequent use of avoidance and suppression, in accordance with findings linking high anxiety leads to less acceptability and more avoidance of the emotional experience.

2.3 Use of emotion regulation strategies and gender differences related studies

According to studies, most of the emotions regulation strategies are used by women as compared to men. In women the emotion regulation strategies related to psychopathology is much same as that of men. As compared to men, women use the strategy called rumination that leads to greater depth and anxiety in them. The reason for more alcohol misuse in men as compared to women is because of their greater tendency to use alcohol as a coping strategy.

According to Tamres et al. (2002) the internally focused and unassertive responses to emotions are more used by women (for example rumination as per some gender roles theories) whereas, men engrosses themselves more in suppression or avoidance. Sometimes, men engross themselves in use of those substances which helps them to avoid their emotions as their gender role is believed to be more active and agentic. To control or change those situations that men believes are driving their emotions, they engage themselves more in problem solving and reappraisal as compared to women.

According to a study by Gross and John (1998) and Williams and Barry (2003), the regulation of emotions and experiences in men and women are shaped by both biological and socialization processes. According to some previous studies, the differences seen in gender in terms of emotion regulation are relatively small or average.

Individuals with regard to use of reappraisal and suppression are linked to psychological and social functioning. The reappraisal can handle stressful events in more optimistic way and by taking appropriate steps to fight their negative moods. Researchers showed that individuals who use this strategy turn out to be more optimistic and leave a positive impact and the individuals who use less of this strategy are prone to pessimism and more of negativity (Gross & John 2003). The study also shows that individuals who make use of this strategy has a strong social relationships and have more self esteem and they find the life more satisfied which ultimately makes them less prone to depressive symptoms. Further those who are suppressors find it difficult to improve their moods and expressing themselves freely and thereby showing less positive impact. Thus it has been observed that the suppressors have less of self esteem and shows more depressive symptoms. They also find it difficult to enjoy quality relationships with others or even may maintain very poor relations. At the same time, the individuals who used emotion regulation strategies in a given situation experiences better interpersonal relationships.

In another study by Gross and John (2003) it was observed that though individuals who are adept in using reappraisal have more positive emotional outlook and less of negative emotions. Thus the low reappraisers and high reappraisers are good at managing anger shows less negative emotions and exhibit more positive emotions whenever they are angrily provoked. Thus reappraisal is a cool attentional focus, and constructive anger expression might be associated with women. Moreover it is believed that women exhibit more emotional feelings then men and women have been labeled as a master stereotype. Thus the individuals who used reappraisal in their day to day life show less negative affect and exhibit few symptoms of depression.

Tamres et al. (2002) found that women were found to use more coping strategies as compared to men because they are more stressed. By studying the issue of gender differences in stressor appraisal lessened the usage of strategies in gender differences. Further studies shows that women are more prone to use strategies like dynamic adapting, evasion, positive reappraisal and self blame in comparison to men. Thus, women appraised the stressor as more extreme in

contrast to men, demonstrating that gender difference in these methodologies could be the after effect of gender contrast in stressor appraisal.

Chapter 3

3.1 Motivation of the study

The present study in college students focuses on the linkage between mathematic anxiety and the use of emotion regulation strategies. Previous studies on emotion regulation and math anxiety have been mainly conducted in western culture. In the present study an attempt is made to understand this relationship in the Indian context. In addition to this, the previous studies reported mixed results. Several studies have indicated that math anxious individual shows poor math performance. By understanding the emotion regulation strategies used by high math anxiety individuals, appropriate counseling procedures and therapeutic interventions may be used to deal with math anxious individuals.

3.2 Objectives of the present study

The main objective of the present study is:

1) To compare math anxiety of males and females.
2) To study the relationship between math anxiety and emotion regulation strategies.
3) To study the gender differences in emotion regulation strategies.

3.3 Rationale and hypotheses

According to Betz (1978) males show higher math achievement as compared to females. Mathematics is often labeled as a masculine ability and girls often have low confidence in their mathematic capabilities. However these gender stereotypes can reinforce low confidence in girls and thus causes math anxiety. Based on a fact that gender differences do not appear until around puberty, boys and girls have similar math and science proficiency but the gap begins to appear when they turn 13. Hunt (1985) studied the researches that was performed earlier on the basis of gender differences, and concluded that differences between males and females was indeed significant (cited by Ma, 1990). Good, Rattan, and Dweck (2012) found that female undergrads with higher math anxiety had a lower feeling of having a place in mathematics. Besides, the individuals who trusted that females are less able in math and that mathematical ability is fixed, they had a lower feeling of having a place in mathematics than male students. Based on the above premises hypothesis has been formulated.

H_1: Females have high math anxiety as compared to males.

According to a study by Gross and John (2003) the increased psychopathology could be a result of the use of high emotion regulation methodologies for example expressive suppression and lower cognitive reappraisal. Yet it has not been established so far if these strategies indeed represent cognitive style that is associated with psychopathologies. The individuals are predominantly either “suppressors” or “reappraisers. And another study by Richard and Gross (2000) explored the significance of specific emotion regulation strategies like reappraisal and suppression in daily life in situations such as social interaction, ability to recall the details of an event and anger management. Based on the above studies following hypotheses have been formulated.

H_2: High math anxiety individuals use more of expressive suppression emotion regulation.

H_3: Low math anxiety individuals use more of cognitive reappraisal emotion regulation.

According to Tamres et al. (2002) the internally focused and unassertive responses to emotions are more used by women. For example rumination as per some gender roles theories .Whereas,

men engrosses themselves more in suppression or avoidance. Sometimes, men engross themselves in use of those substances which helps them to avoid their emotions as their gender role is believed to be more active and agentic. To control or change those situations that men believes are driving their emotions, they engage themselves more in problem solving and reappraisal as compared to women.

Tamres et al. (2002) also found that women were found to use more coping strategies as compared to men because they are more stressed. By studying the issue of gender differences in stressor appraisal lessened the usage of strategies in gender differences. Further studies shows that women are more prone to use strategies like dynamic adapting, evasion, positive reappraisal and self blame in comparison to men. Thus women appraised the stressor as more extreme in contrast to men, demonstrating that gender differences in these methodologies could be the after effect of gender contrast in stressor appraisal. On the basis of this the following hypotheses were formulated.

H_4: Males use more of cognitive reappraisal (CR) as compared to females.

H_5: Females use more of expressive suppression (ES) as compared to males.

Chapter 4

Method

4.1 Sample

A total of 160 students volunteers (80 males) and (80 females) of Thapar University participated in this study. The participants in the study were of the age range 18 to 25 years (males: M=20.31, SD=1.51) and (females M=20.47, SD=1.64). All the participants filled and signed a consent form. They were told that results obtained from the study would be kept confidential and will be revealed if they are interested.

4.2 Design

In the present study the independent variables are gender and mathematics anxiety where as the dependent variables are emotion regulation strategies and mathematics anxiety. Data was analyzed using descriptive statistics, t test and regression.

4.3 Tools used

(a) Mathematics anxiety rating scale: short version (MARS) Suinn, (2003)

The mathematics anxiety rating scale short version consists of 30 items questionnaire. This test was developed by Richard M. Suinn in 2003. In clinical studies (1972), the Mathematics Anxiety Rating Scale (MARS) has been a major scale that is used for researches. For MARS 30-item, the test-retest reliability was .90. It is a 5 point Likert scale and the scoring was done with reverse order i.e. 5 to 1. This scale was developed to assess the things that cause fear or apprehension in individuals.

(b) Emotion regulation questionnaire (ERQ) (Gross, & John, 2003)

It is a 10 item scale to gauge the respondent's inclination to direct their emotions in two ways: Cognitive Reappraisal and Expressive Suppression. The respondents answer every item on a 7-point Likert-sort scale that reaches from 1 to 7 i.e. (strongly disagree) to (strongly agree). The scoring of the 10 items was finished by making up items of

1,3,5,7,8,10 which make up cognitive reappraisal and 2,4,6,9 that make up expressive suppression.

4.4 Procedure

Initially a consent form was filled by the participants declaring their name, age, gender and educational qualification. The total of 160 where 80 (males) and 80 (females) age ranging from 18 to 25 years from Thapar University participated. Then two tests: mathematics anxiety rating scale: short version and emotion regulation questionnaire (ERQ) were administered. The participants were asked to answer all the questions honestly. Then the participants were told about the confidentiality of their results. The two groups were classified on the basis of the median value: high math anxiety group and low math anxiety group.

Chapter 5

Results

The mean, standard deviation and t-value of math anxiety, cognitive reappraisal and expressive suppression were computed and the values are given in Table1.

Table 1: Mean, standard deviation of math anxiety, cognitive reappraisal (CR) and expressive suppression (ES) of males and females.

	Math anxiety		Cognitive reappraisal		Expressive suppression	
gender	MEAN	SD	MEAN	SD	MEAN	SD
males	113.25	27.09	26.51	9.8	19.23	6.93
females	115.51	21.07	19.75	11.55	18.12	6.87
t- value	-0.49		3.85*		1.01	

N =160

*p<0.05

The above table shows that, the mean of females (M=115.51, SD=21.07) is more than mean of males (M=113.25, SD=27.09) thus, females shows more math anxiety as compared to males. The t value is t (158) = 0.49, p>0.05. However there was no significant difference between these two groups in math anxiety. Hence, there is no difference in males and females in relation to math anxiety.

The mean of males (M=26.51, SD=9.8) of cognitive reappraisal is more than the mean value of females (M= 19.75, SD=11.55) thus, males use more of cognitive reappraisal as compared to females. The t value is t (158) = 3.85, p< 0.05. Hence, males use more of cognitive reappraisal as compared females as the value is significant.

On the other hand, the mean of expressive suppression in males (M=19.23, SD=6.93) is more than the mean of females (M=18.12, SD= 6.87) and t value is t (158) = 1.01, p> 0.05 is (less) than the critical value, which is insignificant and there is no gender difference in expressive suppression.

High and low math anxiety gap was identified based on the median value i.e. 120.5 and 118.5. Individuals above the median value were categorized as high math anxiety individuals and below were categorized as low math anxiety individuals.

Table 2: Mean, standard deviation and t-value of cognitive reappraisal (CR) and expressive suppression (ES) of high and low math anxiety group.

	Cognitive reappraisal		Expressive suppression	
	MEAN	SD	MEAN	SD
High	18.13	8.42	23.00	4.11
Low	26.51	16.13	15.75	6.74
t –value	5.181**		8.212**	

N=160

**p < 0.01

The mean of low math anxiety group of cognitive reappraisal is higher (M=26.51, SD= 16.13) than the mean of high math anxiety group (M= 18.13, SD= 8.42) and the t value is t (158) = (5.181), p< 0.01 is more than the critical value and is thus significant. This shows that low math anxiety individuals use more of cognitive reappraisal.

The above table depicts that the mean of high math anxiety group is higher in expressive suppression (M= 23.0, SD=4.11) than the mean of low math anxiety group (M=15.75, SD= 6.74) and the t value is t (158) = 8.212, p< 0.01 which is more than the critical value and is thus significant. Hence, high math anxiety individuals use more of expressive suppression.

Table 3: To substantiate the results further, regression analyses was used and the results are given in table 3, 4, 5, 6.

Table 3: Regression analyses for math anxiety and expressive suppression (Males)

Model	B	Std. Error	Beta	t	Sig.	Adjusted R square
1 (Constant)	-1.862	2.326		-.801	.426	.521
Math Anxiety Scores(M)	.186	.020	.726	9.325	.000	

a. Dependent Variable: Expressive suppression facet

The regression table 3 of emotion regulation strategies of males depicts that the Adjusted R square for expressive suppression is .52. Therefore 52% variation in the dependent variable (expressive suppression) is attributed to independent variable (math anxiety). B value explains that one unit increase in math anxiety leads to .186 increase in expressive suppression (males).

Table 4: Regression analyses of math anxiety and cognitive reappraisal (Males)

Model	B	Std. Error	Beta	t	Sig	Adjusted R square
1 (Constant)	43.573	4.315		10.013	.000	.162
Math Anxiety Scores(M)	-1.50	.037	-.415	-4.029	.000	

a. Dependent Variable: Cognitive reappraisal facet

The regression table 4 of emotion regulation strategies for math anxiety (males) depicts that the Adjusted R square for cognitive reappraisal is .16. Therefore 16% variation in the dependent variable (cognitive reappraisal) is attributed to independent variable (math anxiety). B value

explains that one unit increase in math anxiety leads to .15 decrease in cognitive reappraisal (males).

The regression table 5 of emotion regulation strategies for math anxiety (females) depicts that the Adjusted R square for cognitive reappraisal is .52. Therefore 52% variation in the dependent variable (cognitive reappraisal) is attributed to independent variable (math anxiety). B value explains that one unit increase in math anxiety leads to .39 decrease in cognitive reappraisal (females).

Table 5: Regression analyses of math anxiety and cognitive reappraisal (Females)

Model		B	Std. Error	Beta	t	Sig	Adjusted R square
1	(Constant)	66.058	5.001		13.210	.000	.523
	Math Anxiety Scores(F)	-.399	0.43	-.728	-9.366	.000	

a. Dependent Variable: cognitive reappraisal facet

The regression table 6 of emotion regulation strategies for math anxiety (females) depicts that the Adjusted R square for expressive suppression is .58. Therefore 58% variation in the dependent variable (expressive suppression) is attributed to independent variable (math anxiety). B value explains that one unit increase in math anxiety leads to .25 increase in expressive suppression (females).

Table: 6 Regression analyses of math anxiety and expressive suppression (Females)

Model		B	Std. Error	Beta	t	Sig	Adjusted R square
1	(Constant)	10.838	2.770		-3.913	.000	.586
	Math Anxiety Scores(F)	.251	0.24	.769	10.627	.000	

a. Dependent variable : expressive suppression

Chapter 6

Discussion

The aim of the present study was to investigate the relationship between math anxiety and emotion regulation strategies in college students. The first hypotheses that females have more math anxiety as compared to males, has not been confirmed i.e. there was no difference between males and females in math anxiety. Although previous studies showed that female shows greater math anxiety than males the present study did not confirm the findings. It can be attributed to the sample selected for the study. As the participants were from engineering background and all these students are relatively good in math and this might have caused this kind of findings. Moreover, the non-significant results can be attributed to the fact that these females are likely to have high spatial and mathematical ability. There are number of studies related to the high levels of anxiety in females as compared to males. According to a study by Hombery (1990) it was revealed out that mathematics anxiety is prevailing more in females as compared to males. Whereas some existing literature suggests that it is obvious that there are other reasons like poor background in mathematics, support of a family, past experiences, and some role of a teacher plays a huge role. There could be social and cultural differences in respect to mathematics anxiety. Some other factors that can be considered in relation to mathematics anxiety are the individuals accepted beliefs concerning gender and their deduced value of math. These components however result into girl's weaker self- image as compared to boys. Good, Rattan, and Dweck (2012) study revealed that female undergrads with higher math anxiety had a lower feeling of having a place in mathematics. Thus our hypothesis is aligned with this study.

The second and the third hypotheses that high math anxiety individuals use more of expressive suppression and low math anxiety individuals use more of cognitive reappraisal are confirmed. The expressive suppression of high math anxiety individuals is more than low math anxiety individuals. This indicates that individuals with high math anxiety use expressive suppression emotion regulation strategy as compares to low math anxiety individuals. Similarly the cognitive reappraisal of low math anxiety individuals has been found to be higher as compared to the high math anxiety group. This shows that low math anxious group make use cognitive reappraisal strategies. Hence, low math anxiety individuals use more of cognitive reappraisal. The regression

analyses show that out of all regression analyses, females used more of expressive suppression According to a study by Gross and John (2003) the increased psychopathology could be a result of the use of high emotion regulation methodologies for example expressive suppression and cognitive reappraisal. Yet it has not been established so far if these strategies indeed represent cognitive style that is associated with psychopathologies. The individuals are predominantly either "suppressors" or "reappraisers. Another study by Richard and Gross (2000) showed that suppression leads to decreased or less effective regulation of emotions and increase psychological arousal and self reported negative effect. Whereas reappraisal leads to decreased self reported negative effect and more effective regulation and thus there is an insignificant change in physiological arousal and behavioral expression. Studies have also shown higher levels of anxiety will predict more frequent use of avoidance and suppression, in accordance with findings linking high anxiety leads to less acceptability and more avoidance of the emotional experience. Thus this study supports our present results.

It was also hypothesized that males use more of cognitive reappraisal strategy as compared to females and this hypothesis was confirmed. According to Tamres et al. (2002) the internally focused and unassertive responses to emotions are more used by women (for example rumination as per some gender roles theories) whereas, men engrosses themselves more in suppression or avoidance. Sometimes, men engross themselves in use of those substances which helps them to avoid their emotions as their gender role is believed to be more active and agentic. To control or change those situations that men believes are driving their emotions, they engage themselves more in problem solving and reappraisal as compared to women.

It was also predicted that females use more of expressive suppression as compared to males. It was found out that there is a not much difference between genders in the use of expressive suppression in emotion regulation strategies. According to a study by Tamres et al. (2002) the women were found to use more coping strategies as compared to men because they are more stressed. By studying the issue of gender differences in stressor appraisal lessened the usage of strategies in gender differences. Further studies shows that women are more prone to use strategies like dynamic adapting, evasion, positive reappraisal and self blame in comparison to men. Thus, women appraised the stressor as more extreme in contrast to men, demonstrating that

gender difference in these methodologies could be the after effect of gender contrast in stressor appraisal.

6.1 Conclusion

The findings of the present study indicate that study that there was no difference between males and females in math anxiety. It was also found that high math anxiety individuals use more of expressive suppression and the low math anxiety individuals use more of cognitive reappraisal. In addition to this study reveals that females use more of expressive suppression and males use more of cognitive reappraisal strategy in emotion regulation strategies.

6.2 Implications

The aim of the study was to investigate was the relationship between the math anxiety and the use of emotion regulation strategies. The study can shed some light in understanding the emotion regulation strategies used by the mathematics anxious individuals. This will help teachers, parents and counselors in identifying the appropriate therapeutic methods to alleviate math anxiety.

6.3 Limitations and Future Scope

One of the limitations of the present study is that the convenient sampling technique was used. Future studies should make use of random sampling for generalization of results. In addition to this, was that all the participants were engineering students. Further studies can be conducted using heterogeneous population. In the present study the mathematic achievement was not taken into account.

The math anxiety could be considered with other coping mechanisms so that it could be known about what coping strategies the male and female uses as there could be more emotion regulation strategies such as positive refocusing, self blame, rumination, catastrophize etc. instead of cognitive reappraisal and expressive suppression.

The future scope could be that that various factors like math problem solving anxiety, math learning anxiety and math evaluation anxiety and math teacher anxiety. Math achievement is not there in the current study.

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Appendices

Appendix A: Consent Form

I am a student of MA (Clinical) Psychology from Thapar University, School of Humanities and Social Sciences. I am doing a Dissertation related to Attitude towards Mathematics and Emotion Regulation Strategies. I require your sincere cooperation in filling up these questionnaires.
I assure you that the information given by you would be used only for academic purposes and will be kept strictly confidential. Thank you for your kind assistance and cooperation.

Name:
Age:
Gender:
Educational qualification:

Signature

Appendix B: Mathematics Anxiety Rating Scale: Short Version

The items in the questionnaire refer to the things that may cause fear or apprehension. For each item, place a check in the box under the column that describes how much you are frightened by it nowadays. Work quickly but be sure to consider each item individually.

	Not at all	A little	A fair amount	Much	Very much
1. Taking an examination (final) in a math course	□	□	□	□	□
2. Thinking about an upcoming math test one week before.	□	□	□	□	□
3. Thinking about an upcoming math test one day before.	□	□	□	□	□
4. Thinking about an upcoming math test one hour before.	□	□	□	□	□
5. Thinking about an upcoming math test five minutes before	□	□	□	□	□
6. Waiting to get a math test returned in which you expected to do well.	□	□	□	□	□
7. Receiving your final math grade in the mail.	□	□	□	□	□
8. Realizing that you have to take a certain number of math classes to fulfill the requirements in your major.	□	□	□	□	□
9. Being given a "pop" quiz in a math class.	□	□	□	□	□
10. Studying for a math test.	□	□	□	□	□
11. Taking a math section of a college entrance exam.	□	□	□	□	□
12. Taking an examination (quiz) in a math course.	□	□	□	□	□
13. Picking up the math text book to begin working on homework assignments.	□	□	□	□	□
14. Being given a homework assignment of many difficult problems which is due the next class meeting.	□	□	□	□	□
15. Getting ready to study for a math test	□	□	□	□	□
16. Dividing a five digit number by a two digit number in private with	□	□	□	□	□

pencil and paper.					
17. Adding up 976 + 777 on paper.	□	□	□	□	□
18. Reading a cash register receipt after your purchase.	□	□	□	□	□
19. Figuring out your monthly budget.	□	□	□	□	□
20. Figuring the sales tax on a purchase that costs more than $1.00.	□	□	□	□	□
21. Being given a set of numerical problems involving addition to solve on paper.	□	□	□	□	□
22. Having someone watch you as you total up a column of figures.	□	□	□	□	□
23. Totaling up a dinner bill that you think overcharged you.	□	□	□	□	□
24. Being responsible for collecting dues for an organization and keeping track of the amount.	□	□	□	□	□
25. Studying for a driver's license test and memorizing the figures involved, such as the distances it takes to stop a car going at different speeds.	□	□	□	□	□
26. Totaling up the dues received and the expenses of a club you belong to.	□	□	□	□	□
27. Watching someone work with a calculator.	□	□	□	□	□
28. Being given a set of division problems to solve.	□	□	□	□	□
29. Being given a set of subtraction problems to solve.	□	□	□	□	□
30. Being given a set of multiplication problems to solve.	□	□	□	□	□
Total score:					

Appendix C: Emotion Regulation Questionnaire (ERQ)

EMOTION REGULATION QUESTIONNAIRE (ERQ)

Reference:

Gross, J.J., & John, O.P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85,* 348-362.

Description of Measure:

A 10-item scale designed to measure respondents' tendency to regulate their emotions in two ways: (1) Cognitive Reappraisal and (2) Expressive Suppression. Respondents answer each item on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Note: the authors request that researchers do not change the order of the items.

Abstracts of Selected Related Articles:

Ochsner, K. & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9*, 242-249.

> The capacity to control emotion is important for human adaptation. Questions about the neural bases of emotion regulation have recently taken on new importance, as functional imaging studies in humans have permitted direct investigation of control strategies that draw upon higher cognitive processes difficult to study in nonhumans. Such studies have examined (1) controlling attention to, and (2) cognitively changing the meaning of, emotionally evocative stimuli. These two forms of emotion regulation depend upon interactions between prefrontal and cingulate control systems and cortical and subcortical emotion-generative systems. Taken together, the results suggest a functional architecture for the cognitive control of emotion that dovetails with findings from other human and nonhuman research on emotion.

Butler, E. A., Egloff, B., Wilhelm, F. H., Smith, N. C., Erikson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion, 3*, 48-67.

> At times, people keep their emotions from showing during social interactions. The authors' analysis suggests that such expressive suppression should disrupt communication and increase stress levels. To test this hypothesis, the authors conducted 2 studies in which unacquainted pairs of women discussed an upsetting topic. In Study 1, one member of each pair was randomly assigned to (a) suppress her emotional behavior, (b) respond naturally, or (c) cognitively reappraise in a way that reduced emotional responding. Suppression alone disrupted communication and magnified blood pressure responses in the suppressors' partners. In Study 2, suppression had a negative impact on the regulators'

emotional experience and increased blood pressure in both regulators and their partners. Suppression also reduced rapport and inhibited relationship formation.

Mauss, I. B., Levenson, R. W. McCarter, L., Wilhelm, F. H., Gross, J. J. (2005). The tie that binds? Coherence among emotion experience, behavior, and physiology. *Emotion, 5*, 175-190.

Emotion theories commonly postulate that emotions impose coherence across multiple response systems. However, empirical support for this coherence postulate is surprisingly limited. In the present study, the authors (a) examined the within-individual associations among experiential, facial behavioral, and peripheral physiological responses during emotional responding and (b) assessed whether emotion intensity moderates these associations. Experiential, behavioral, and physiological responses were measured second-by-second during a film that induced amusement and sadness. Results indicate that experience and behavior were highly associated but that physiological responses were only modestly associated with experience and behavior. Intensity of amusement experience was associated with greater coherence between behavior and physiological responding; intensity of sadness experience was not. These findings provide new evidence about response system coherence in emotions.

Scale (take directly from http://psychology.stanford.edu/~psyphy/resources.html**):**

Instructions and Items:

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1	2	3	4	5	6	7
strongly disagree			**neutral**			**strongly agree**

1. ____ When I want to feel more *positive* emotion (such as joy or amusement), I *change what I'm thinking about*.

2. ____ I keep my emotions to myself.

3. ____ When I want to feel less *negative* emotion (such as sadness or anger), I *change what I'm thinking about*.

4. ____When I am feeling *positive* emotions, I am careful not to express them.

5. ____When I'm faced with a stressful situation, I make myself *think about it* in a way that helps me stay calm.

6. ____ I control my emotions by *not expressing them*.

7. ____When I want to feel more *positive* emotion, I *change the way I'm thinking* about the situation.

8. ____ I control my emotions by *changing the way I think* about the situation I'm in.

9. ____When I am feeling *negative* emotions, I make sure not to express them.

10. ____When I want to feel less *negative* emotion, I *change the way I'm thinking* about the situation.

Scoring:

Items 1, 3, 5, 7, 8, 10 make up the Cognitive Reappraisal facet.
Items 2, 4, 6, 9 make up the Expressive Suppression facet.

Scoring is kept continuous.
Each facet's scoring is kept separate.