

Cognitive Behavior Group Therapy in Mathematics Anxiety

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The present study investigated whether the CBGT has any impact on mathematics anxiety of high school students. The sample consisted of 16 subjects in the experimental group and 17 subjects in the control group who had high level of Mathematics anxiety on Mathematics anxiety rating scale (MARS). After the pre test of two groups, the intervention by CBGT was given to the experimental group in (15 sessions) for 1.5 hours – two time in a week and at the end of intervention, again the Mathematics anxiety evaluated. Analyses of data of pre and post test by repeated measures ANOVA has shown that CBGT was highly effective in reducing Mathematics anxiety and two subscales of this scale (test anxiety and numerical anxiety). More over with respect to gender, there is a significant difference between boys and girls in mathematics anxiety in post test of experimental group.

Keywords: Intervention, CBGT, Mathematics, Anxiety and High School Students

Many learners experience Mathematics anxiety in our schools today. Reported consequences of being anxious toward mathematics include the avoidance of mathematics and the decline in mathematics achievement. Suinn, Taylor and Edwards (1988) suggested that it affects many people and threatens both performance and participation.

This kind of 'anxiety' was first detected in the late 1950s. Dreger and Aiken (1957) noticed undergraduate college students reacting emotionally to arithmetic and mathematics. Although this reaction appeared to be similar to test anxiety in general; they found that mathematics anxiety has an existence of its own. They labeled it 'number anxiety'. It is often assumed that high level of anxiety impairs performance. A moderate amount of anxiety may actually facilitate performance. Beyond a certain degree, however, anxiety hinders performance particularly in the case of higher mental activities and conceptual process (Shemp, 1986).

Psychological literature provides a number of conceptualizations of mathematics anxiety (Rabalise, 1988). Richardson and Suinn (1972) defined mathematics anxiety in terms of its (debilitating) effect on mathematical performance. They observed that the feeling of tension and anxiety interfere with manipulation and solving of mathematical problems in a wide variety of ordinary life and academic situations. Many students who suffer from mathematics anxiety have little confidence in their ability to do mathematics and tend to take the minimum numbers of required mathematics courses, greatly limiting their career choice options (Garry, 2005). Mathematics anxiety is an outcome of low self-esteem and fear of failure. It causes problems for processing the next oncoming information as well as in using previously learned information for problem solving. Such students tend to avoid mathematics whenever or wherever possible (Daane, Judy, & Tina, 1986).

Mathematics anxiety may be a critical factor in the educational and vocational

choices students make and may influence whether or not they achieve their educational or career goals (Betz, 1978). Identifying individuals suffering from Mathematics anxiety and gaining a better understanding of the domains that contribute to such anxiety is a start to addressing the problem of mathematical illiteracy today. A number of studies pertaining to mathematics anxiety and attitudes towards mathematics have been conducted. But instead of working together, the majority of these studies are against each other. Results of this study can help us to understand the real scene of mathematics anxiety determine the level of effectiveness of the CBGT intervention in reducing Mathematics anxiety in a group of Iranian students.

A different teaching methodology has been used to reduce math's anxiety. Vacc (1993) believes that a personal and process-orientated teaching method which emphasizes understanding rather than drill and practice reduces Mathematics anxiety. Moreover few studies have considered the use of psychological interventions in the treatment of Mathematics anxiety. Relaxation training resulted in significantly lower mathematics anxiety and significantly higher mathematics performance (Sharp, Colthar, Hurford, & Cole, 2000). Moreover, Schneider and Nevid (1993) found that systematic desensitization and stress management training with college students lowered math's anxiety but did not change performance on an aptitude test. Cognitive behavioral therapy (CBGT) also is an effective treatment of anxiety in the general population and in the school and there is some indication that it may be effective for Mathematics anxiety. The aim of the present study was to evaluate the effect of CBGT as a treatment in Mathematics anxiety.

Method

Sample:

The study was carried out on two independent groups of subjects. Participants

were selected through screening of more than 400 students in the age range of 13 – 16 years and randomly assigned to two groups. The control group consisted of 16 subjects (8 girls and 8 boys) and the experimental group also consisted of 17 subjects (9 girls and 8 boys).

Measures:

Mathematics Anxiety Rating Scale (MARS), developed by Alexander and Martray (1989), consisted of 25 items in two subscales. This version was designed with the belief that "Math anxiety is defined primarily by a Math test anxiety (with 12 items) and secondarily by anxiety about executing Math tasks or taking Math courses (with 13 items). The correlation between scores on the 25 item of this scale and 69 items MARS Richardson and Suinn (1972) was computed 0.93 and internal consistency alpha coefficient was 0.86. For each item is 5 options (1- not at all anxious , 2- not anxious , 3- slightly anxious , 4-anxious , 5-very much anxious) and the ranges of scores is between 25 to 125 .

Procedure:

The study was carried out in 3 separate but interconnected phase's viz. pre test, intervention and posttest as described below.

Phase 1: Pre test. In this phase Mathematics Anxiety Rating Scale (MARS) was administered to 400 students and 25 of them with high level of Mathematics anxiety were selected and assigned randomly to two groups (control and experimental).

Phase 2: Intervention. This phase consisted of adapting a Cognitive-Behavioral Group Therapy (CBGT) treatment manual which has proven to reduce Mathematics anxiety. The CBGT therapy contains 15 sessions for 1.5 hours, two times in a week and was co-led by two doctoral level psychologists using the adapted CBGT treatment manual. Participants were given a workbook with a summary of the material presented in each session and worksheets used in sessions and for home practice

assignments. All sessions were carried out each week - on Monday and Thursday in school. Intervention program, consisted of identify negative thoughts NAT, coping with NAT, assertiveness and modeling parts [The purpose of the program and CBGT was explained for students in 3 sessions, identify negative automatic thoughts (N.A.T) and training the students on how to cope with N.A.T has done in 6 sessions. Assertiveness training and modeling methods in 6 sessions].

Phase 3: Post test. After 5 days from

phase 2, MARS was administered on two groups and data has given for computing by SPSS. In this study, testing was done in a quiet atmosphere. The instruction was given clearly without any ambiguity and there was no time limit for answering the questionnaire.

Results

Table 1 presents the various domains of MA in control and experimental groups. The results of repeated measures ANOVA are described below.

Table-1 Mean, SD, pre and post test scores of experimental and control groups on various domains of MA.

Group/ Gender	Domains of Mathematics anxiety											
	Math test and Course				Numerical task				Total MA scores			
	Pre		Post		Pre		Post		Pre		Post	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Experimental												
Male	87.10	6.10	55.70	6.58	19.70	4.16	13.00	3.01	106.70	9.36	68.40	10.01
Female	88.40	6.415	66.10	4.72	22.70	3.12	18.70	3.46	111.10	6.98	84.80	4.93
Total	87.75	6.129	60.90	7.718	21.20	3.90	15.85	4.308	108.90	8.35	76.60	11.39
Control												
Male	88.10	8.65	90.30	8.60	19.70	4.27	20.20	3.93	105.30	10.27	107.00	10.51
Female	87.60	6.88	82.50	10.98	22.10	3.84	22.70	3.65	110.30	7.36	105.60	13.17
Total	87.85	7.61	86.40	10.40	20.90	4.14	21.45	3.91	107.80	9.07	106.30	11.62
Male	87.60	7.04	73.00	6.42	19.70	4.19	16.60	3.098	106.00	9.61	87.70	9.342
Female	88.00	6.54	74.30	6.83	22.40	3.33	20.70	2.94	110.70	7.13	95.20	7.72
Total	87.80	6.62	73.65	6.49	21.05	3.94	18.65	3.61	108.35	8.58	91.45	9.18

Total scores: In total Mathematics anxiety scores a significant decrease was observed from pre to post test session in the high school students irrespective of the groups ($f = 36.123$ $p < .000$). In the pretest, both groups had mean MA scores of 108.35 which had reduced to 91.45. Moreover the reduction in MA scores with respect to group was also found to be significant ($f = 66.57$ $p < .000$). The mean values also show us that the experimental group had a reduction from 108.90 to 76.60 and control group had a reduction from 107.80 to 106.30. In term of percentages 81 percent of the reduction in the scores was observed in the experimental group.

With respect to gender and gender group, there were no significant differences

in pre test of total scores. But the differences was significant in post test of experimental group ($f = 21.57$ $p < .000$). In the post test mean scores of boys was 87.70 but for girls it was 95.20.

Math test domain: As it has shown, there is a significant decrease from pretest to post test in math test domain, irrespective of the groups ($f = 46.57$ $p < .000$). In the pre test the total sample had mean 87.80 which had reduced to 73.65. The reduction of math test domain with respect to groups also was significant ($f = 77.49$ $p < .000$). In experimental group, the mean scores reduced from 87.75 to 60.90. But in control group the redaction was only from 87.85 to 86.40 and it was not significant.

Moreover with respect to gender and gender group, there was not significant differences in pre test of Math test scores. But it was significant in post test of experimental group ($f = 16.471$ $p < .001$). In the post test mean scores of boys was 55.70 but for girls it was 66.10.

Numerical Domain: In numerical domain a significant decrease was observed from pre to posttest sessions irrespective of the groups. ($f = 4.27$ $p < .05$). In the pretest the mean scores of two groups was 21.05 which had reduced to 18.65. (In this domain also the reduction in experimental group (from 21.20 to 15.85) was significantly more than control group (from 20.90 to 21.45). The change in the numerical domain, with respect to gender, and group and gender were all found to be non-significant.

With respect to gender and gender group, in this domain also there was not significant differences in pre test of numerical domain. But the differences was significant in post test of experimental group ($f = 15.382$ $p < .001$). In the post test mean scores of boys was 13.00 but for girls it was 18.70.

Discussion

The objective of the study was to explore the effectiveness of CBGT therapy on mathematics anxiety among high school students in Iran. The finding revealed that CBGT was highly effective in reducing Mathematics anxiety in the two domains- test and Numerical anxiety. The results of this study have approved the hypothesis and are agreement with previous studies. Hembree (1990) found that psychological treatments such as systematic desensitization, anxiety management training and Cognitive behavioral therapy (CBGT) are highly successful in reducing mathematics anxiety levels.

Other researchers also have shown that cognitive factors should be taken into account in the treatment of math's anxiety. Hadfield

& Maddux (1988), found that CBGT treatments can help students to overcome their cognitive difficulties in the learning of mathematics may be associated with an appreciable reduction in math's anxiety. Genshaft (1982) also suggests that cognitive-behavioral therapy (CBGT) is an effective first-line strategy for the treatment of Mathematics anxiety.

In addition with respect to gender and gender group, there was no significant differences in total Mathematics anxiety scores between boys and girls and the differences was significant only in post test of experimental group. For that reason the results of this study doesn't support the previous studies by Frankensteini (1984); Juliet (2000), that has shown the significant difference between boys and girls in total scores of Mathematics anxiety.

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