EFFECT OF COGNITIVE RESTRUCTURING ON THE REDUCTION OF MATHEMATICS ANXIETY AMONG SENIOR SECONDARY SCHOOL STUDENTS IN OGUN STATE, NIGERIA

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ABSTRACT

This study focused on the effect of Cognitive-Restructuring training on mathematics anxiety in Mathematics among a group of Senior Secondary School Students in Ogun State. A 2 x 2 x 3 pre-test, post-test factorial design (treatment, gender, and study habit) was used in the study. The sample was drawn from Mathematics anxious students who were randomly assigned to one experimental group and one control group. Only the experimental group were treated with Cognitive Restructuring training while the control group received a placebo treatment. The subjects comprised ninety males and ninety females of high, medium and low levels of study habit. Two validated instruments namely Mathematics Anxiety Rating Scale Revised (MARS-R) by Plake and Parker (1982) and Study Habit Inventory (SHI) by Bakare (1977) were used in generating response from the students. Analysis of Covariance was used to analyse the three hypotheses formulated and tested at 0.05 level of significance. Results of this study revealed a significant effect of treatment (Cognitive-Restructuring training) on subjects' level of Anxiety in Mathematics (F-ratio= 5.81, P < 0.05). Cognitive-Restructuring was found to be more effective (× = 40.80) than the control group. The study also revealed that gender affected students' anxiety in Mathematics significantly (P< 0.05) with male students having more reduction in Mathematics anxiety than female students. It was found that study habit did not affect students' anxiety in Mathematics significantly. Based on these findings, it was recommended that counselors could use Cognitive- Restructuring treatment as a strategy to reduce anxiety in Mathematics among Secondary School Students since it has been identified as effective.

Key words: Anxiety in Mathematics, Cognitive-Restructuring, Control group, Gender and Study habit.

1.0 Introduction

Mathematics, which happens to be one of the core subjects in many secondary schools is facing some challenges and that is why Adebule (2004) concludes that mathematics education in Nigeria has persistently been experiencing one form of problem or the other, particularly in relation to the general poor performances of students. According to him, such academic problems include students' unparalleled hatred, indifference, anxiety and poor attitude towards mathematics, teachers' dissatisfaction, poor environment, non-availability of appropriate textbooks and poor method of teaching.

Hopper (2005) and Phillips (2000) support this view in their assertion that mathematics to some students is often associated with pain and frustration and a decrease in the ability to perform higher mental activities and perceptual processes (Goleman 1996). Akinsola, Tella and Tella (2007) also recognize that many students refer to mathematics as being difficult. Moreover, students' prior negative experiences in mathematics class and at home when learning mathematics are often transferred, causing a lack of understanding of mathematics (Hong & Sas, 2006).

Tobias (1993) defines anxiety in mathematics as feelings of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situation. According to him, anxiety in mathematics can cause one to forget and lose one's self confidence. It is very real and it occurs among many students. The question that readily comes to mind then is why students should experience anxiety in mathematics since mathematics as opined by Akinsola and Tella (2003) is an important school subject which is associated with more academic and/or career opportunities. Similarly, Burton cited in Agwah and Usman (2003) relate the importance of mathematics to the scientific, industrial, technological and social progress of a society.That mathematics is an important subject is undetestable. But it is very sad to note that many students' performance in the subject in recent time is not encouraging (Adesemowo, 2005). This however, can be attributed to the fact that majority of students have phobia for mathematics. In supporting this view, (Dwyer, 1993; Dika, Granvillee & Singh, 2002)find that positive attitude towards mathematics is inversely related to anxiety in mathematics

In a study carried out by Raines, Susan Zettle, and Robert (2005), the relationship between anxiety in mathematics and test anxiety was found to vary as a function of gender. Significantly, higher levels of both mathematics and test anxiety are noted for women as well as a significantly stronger relationship between mathematics and test anxiety than between mathematics and trait anxiety.

The importance of gender difference in the association of anxiety in mathematics with test and trait anxiety is further underscored by the results of Frost (1984) who discovered that large gender differences do exist with respect to attitude towards mathematics. She noticed that slight differences may be found concerning anxiety towards mathematics, girls being more anxious than boys.

Idu (1988) and Omirin (1999) find out that no significant difference exists between the scores of male and female students on the same instruments developed for measuring attitudes towards mathematics and science oriented subjects respectively. The study of Adebule (2004) on a comparative investigation as to whether there will be any significant difference between the scores of male and female students on a locally standardized rating scale in mathematics for Nigerian students showed that there was no significant difference between the ratings of both male and female students and that gender issues did not influence the response on the scale. Looking at literature on gender and anxiety it is obvious that it is inconclusive, thus, it becomes justifiable to speculate that gender could act as a moderating variable in this study.

Another moderating variable in this study is study habit. This is premised on the fact that evidences suggest that victims of anxiety in mathematics suffer from lack of preparation for a test (as indicated by cramming the night before the examination, poor time management, failure to organize text information, poor study habit and worry about past performance in examinations emanated from how friends and other students are doing and the negative consequences of failure (Penberthy 2007). According to him, test anxiety can affect the student by causing nervousness in terms of having difficulty in reading and understanding the questions on the examination paper. It also involves having difficulty retrieving key words and concepts when answering essay questions and doing poorly in the examination even though the student knows the material. However, a research conducted by Bakare (1977) shows a negative correlation between test anxiety and study habit of -0.52.

Study habit might be defined by the amount of studying that actually occurs as measured by time. In a study conducted by Jiao and Onwuegbuzie (2000) to examine empirically the relationship between specific study habits and anxiety, findings reveal that study habit weaknesses are identified in the areas of note-taking and reading skills. An all possible subsets multiple regression analysis led to the identification of eight specific study behaviours that predict levels of library anxiety.

Also, the study of Musch and Broder (1999) which investigate the relative contribution of test anxiety, study habits, and mathematics skill to performance in a statistics examination discover that both mathematics skill and test anxiety add unique variance in explaining performance, whereas Study Habits did not. The researcher's choice of study habit as a second moderator variable is premised on the fact that there have been differences in research findings on anxiety and study habit over the years.

However, the needs of the society today require greater need for mathematics and this explains why a credit in mathematics is one of the qualifications for admission into tertiary institutions of learning. Moreover, the key to success in any examination or test is knowing how to manage or treat anxiety problems. Therefore, since it is very dangerous to neglect the adverse effects of anxiety in mathematics which increased academic failure in mathematics (Adesemowo, 2005; Oyedeji, 2004), various attempts have been made by several researchers (Aremu & Sokan, 2003; Hassan, 1983; Sofesan, 1981; Wiseman, 1973 to mention a few) to examine the causes of poor academic performance. They discovered causes like intellectual ability, poor study habit, achievement motivation, lack of vocational goals, socio economic status and anxiety; few of them have actually dwelt on anxiety as a major cause of poor academic performance and its reduction among students.

Ssveral psychologists have come up with several psychotherapies such as systematic desentization (Davis & Palladino, 2002; Hassan, 1990 & Hersen, 2003; Morakinyo, 1984; Nietzel, Bertsetn & Sandrock, 1999 to mention but a few; exposure therapy (Lovell, 2002), aversion therapy (Marlatt & Gordon, 1985) Cognitive-restructuring (Adejoyu, 1995; Akinranti, 1984; Akinwale, 2004; Hassan, 1990.

The therapeutic technique the researcher used in this study was cognitive restructuring. This was developed by Aaron Beck (1963) is an approach to the treatment of abnormal behaviour that tries to help individuals behave more adaptively by modifying their thoughts. Its emphasis is on the effect of thought on behaviour and behaviour change techniques. According to Meichenbaum (1993), cognitive behaviour therapists strive to change misconceptions, strengthen coping skills, increase self-control and encourage self reflection. Hewstone, Fincham and Foster (2005) define cognitive-restructuring technique as a relatively short term treatment designed to get clients thinking about events in their lives. In other words, cognitive-restructuring therapists focus more on patients' cognitive and affective experiences. It is a social skill training programme designed to help

mathematics anxious students reduce their anxiety in mathematics so that they can have improved academic performance in the subject. This basically, is the fundamental reason for the researcher's choice of this technique as a therapy in reducing students' anxiety in mathematics.

According to Marshal and Barbare (1990) in Aderanti (2006), cognitive factors play an important and well documented role in anti-social behaviours and conduct disorder, just as they do with anxiety and depression. The counselor uses direct experience and influence to identify common themes of thinking, automatic thoughts and cognitive errors of the mathematics anxious individual and within the cognitive factors, the behaviour of the individual usually makes sense.

According to Feltham and Horton (2001), cognitive-restructuring is the most researched of all the 'talking therapies' as outcome studies into the cognitive treatment of anxiety have shown generally good results. Hemberg, Roth and Winnie (2002) also support the superiority of cognitive-restructuring by emphasizing that it is a very versatile treatment, adaptable to both group and individual settings as it has used children, adolescents and adults across a wide range of cultural and socio-economic backgrounds. The choice of cognitive-restructuring is also based on the fact that it is a time efficient treatment with most uncomplicated causes of anxiety being treated in 4 to 14 sessions (Roth, 2002).

Thus, it is contended that the need to reduce students' anxiety in mathematics and the fact that cognitive-restructuring training and some learner characteristics (sex and study habit) could influence students' anxiety in mathematics provided the theoretical basis to create the problem of the study.

2.0 Statement of the problem

The problem of this study emanated from the poor performances of students in mathematics despite the efforts of parents and teachers and the fact that other researchers have carried out studies on ameliorating this situation. When students fail mathematics, they become frustrated. Students that would have been admitted into the university and become gainfully employed and useful to themselves and their parents and the nation at large may become drop outs or end up in petty trading or small scale business. Their options regarding careers are reduced, thus eroding the country's resource base in science and technology and a colossal loss in terms of financial investments. In addition, drop outs later constitute problems to the society since they are not qualified to be gainfully employed.Since mathematics is a core subject in getting admission into higher institutions of learning, there is a need to identify test anxious students in mathematics so as to help them reduce their anxiety in mathematics. Moreover, while acknowledging the fact that different studies have demonstrated the efficacy of cognitive-restructuring technique in reducing anxiety and other antisocial behaviours, there is still dearth of research efforts on the use of cognitive-restructuring and problem-solving in reducing anxiety in mathematics among public secondary school students. It is based on this that the researcher sought to investigate how cognitive restructuring could be used as a tool in reducing anxiety in mathematics among senior secondary school students.

3.0 Statement of the Hypotheses

The following null hypotheses were hereby generated for the study.

1. There is no significant difference in the anxiety in mathematics of subjects exposed to cognitive-restructuring training and those in the control group.
2. There is no significant difference in the effect of sex on students' anxiety in mathematics.
3. There is no significant difference in the effect of study habit on students' anxiety in mathematics.

4.0 Methodology

4.1 Research Design

The researcher adopted a pre-test and post-test control group quasi-experimental design involving a 3 x 2 x 3 factorial matrix. The treatment package (cognitive-restructuring training) and a placebo treatment for the control group were crossed with gender (male and female) and study habit (low, medium and high).

The systematic representation for the design is shown below:

Experimental Group (T1): O_1 X_1 O_2

Control Group (T2): O_1 X_3 O_2

Where:

O_1 represents pre-test scores

O_2 represents post-test scores

X_1 and X_2 represent treatments in experimental and control groups respectively.

T1 represents cognitive-restructuring training and

T2 represents placebo treatment given to the control group.

The researcher adopted a factorial design because the design accomplishes in one experiment what otherwise might require two or more separate studies. Apart from this, the design also provides opportunity for the study to show the interaction effect of the moderating variables.

Screening was done by the researcher to identify subjects that fall into high mathematics anxious group based on their scores on the anxiety in mathematics rating scale. Mathematics anxious subjects were therefore assigned randomly to the cognitive restructuring and control groups. The subjects in the control group received no treatment but were given placebo treatment. (A debate on the most important subject - mathematics or English language was organised).

Also, since study habit and sex are the two moderating variables in the study, a questionnaire was used to divide subjects into high, medium and low study habit as well as gender (male and female). Thus, mathematics anxious students in experimental group were divided according to their gender (male and female) and level of study habit (high, medium and low). The same thing was done to the control group.

4.2 Target Population

The target population for this study consisted of all high mathematics anxious SS II students in public secondary schools in Ado-Odo Ota and Ifo Local Government Areas of Ogun State. There are twelve public secondary schools in Ado-Odo zone while Ota zone has seven public secondary schools. Ifo Local Government on the other hand has 12 secondary schools. These local government areas were considered for the study because of their proximities to the researcher's area of operation.

4.3 Sample and Sampling Techniques

The researcher used stratified random sampling technique to select 300 students from two schools which were screened using anxiety in mathematics rating scale-revised (MARS-R) to select high mathematics anxious students. Study habit inventory was also used to identify mathematics anxious students with high, medium and low study habit. Out of these 300 students only 120 were selected and randomly distributed into three groups of high, medium and low study habit. Simple random sampling method was used in picking the two secondary schools in two local government areas of Ogun State. (Ado-Odo/Ota and Ifo Local Government Areas of Ogun State). This becomes imperative to take care of the confounding effect of having more than one treatment group in the same location. Stratified random sampling technique was used in each of these schools to

select 60 students from SS II (30 boys and 30 girls). The identified subjects were distributed randomly to the experimental and control groups. Each of the experimental and control groups had 60 subjects comprising 20 high, 20 medium and 20 low study habit mathematics anxious subjects. Male and female subjects were equally represented in each experimental and control groups for the three levels of study habit.

Table 3.1: Distribution of the Sample according to Treatment Groups

Treatments	**Level of gender and study habit**				**Total subject**
	Level of sex	**Level of study habit**			
		High	**Medium**	**Low**	
Experimental Group (Cognitive Restructuring training)	Male	10	10	10	30
	Female	10	10	10	30
Control Group	Male	10	10	10	30
	Female	10	10	10	30
Total		40	40	40	**120**

4.4 Instrumentation

The following scales were adopted for use in this study:

1. Anxiety in mathematics Rating Scale – Revised (MARSR)
2. Study Habit Inventory

4.4.1 Anxiety in mathematics Rating Scale – Revised (MARSR)

The Anxiety in mathematics Rating Scale – Revised (MARSR) developed by Plake and Parker (1982) was used. The scale measures anxiety in mathematics through a 24-item self-referencing statements tapping the appraisal and expression of anxiety in themselves. Participants rated the extent to which they agreed or disagreed with each statement on a five point Likert type scale ranging from 1 (no anxiety) to 5 (high anxiety). The MARSR has demonstrated a coefficient alpha reliability of .98 with the full scale MARS (Plake & Parker, 1982). Those with scores between 10-24 were classified as having high anxiety. While those with scores between 1-5 were regarded as having low anxiety. The researcher opted for MARS-R developed by Plake and Parker (1982) for the following reasons: First, Plake and Parker showed that the scale has sound psychometric properties. Secondly, the scale has been used by many scholars outside the shore of Nigeria such as Gierl and Bisanz (1995), Bernstein, Reilly and Cote - Bonnano (1992), Campbell and Evans (1997), Woodward (2004) and Marci (2006). Thirdly, the scale was found to exhibit good reliability and factorial validity in mathematics classroom in Southern California (Marci 2006).

4.5 Method of Data Collection

The method of data collection was done in three main phases. Firstly, the Mathematics anxious subjects were identified through the anxiety in mathematics rating scale revised (MARS – R) while students' level of study habit (high, medium low) were identified through the study habit inventory. The identified mathematics anxious subjects were randomly assigned to the treatments and control groups in equal representation of gender and level of study habit (high, medium and low) as indicated in the table shown in Table 3.1

Secondly, the experimental group was exposed to one hour of eight sessions of therapy on cognitive restructuring training. In all, each of the subjects in the experimental group had eight contact sessions of therapy. The treatment commenced with an address by the researcher to the experimental group on the reason for the programme, the rules of the programme, the need to be themselves, feel free to discuss their problems and ask questions when the need arises Students in the control group were not given the same treatment like the two experimental group but rather the therapist organized debates for them on the most important subject out of English and Mathematics.

The third phase involved the evaluation of the treatment package and the entire programme. The researcher administered the post-test to determine the use of the treatment package in reducing anxiety in mathematics. After this, the researcher thanked the subjects for their cooperation throughout the programme.

4.6 Method of Data Analysis

The data collected through this study was statistically analyzed to determine the effects of independent variable (Problem-solving training) on the dependent variable (anxiety in mathematics). The following statistical procedures were used for this study.

i. Analysis of covariance (ANCOVA)
ii. t-test

ANCOVA was used to compare the effects of independent variables as well as take care of differences that might exist between and within the groups. The t-test was used to determine which therapy is more effective in reducing anxiety in mathematics.

5.0 Result

A total number of 120 high mathematics anxious senior secondary school students participated in this study. This consisted of 60 males and 60 females with different levels of study habit. These were distributed into one treatment group (problem-solving) and a control group. The descriptive statistics of data for the post treatment assessment of anxiety in mathematics by treatment, gender and study habit of participants are presented in Table 4.1.

Table 4.1: Descriptive Statistics of Data for the Post Test Anxiety in mathematics Scores of Students by Experimental Group, Gender and Study habit of Students

TREATMENT	GENDER	STUDY HABIT	N	MEAN	STD. DEVIATION
Cognitive Restructuring	Male	Low	10	54.10	19.50
		Medium	10	54.60	20.31

		High	10	46.70	19.91
		Total	30	51.80	19.56
	Female	Low	10	50.20	13.25
		Medium	10	43.40	9.42
		High	10	38.10	12.24
		Total	30	43.90	12.41
	Total	Low	20	52.15	16.35
		Medium	20	49.00	16.45
		High	20	42.40	16.68
		Total	60	47.85	16.72

5.1 Test of Hypothesis

5.1.1 Hypothesis One

There is no significant difference in the anxiety in mathematics of students exposed to cognitive restructuring treatment and those in the control group.

In testing hypothesis one, analysis of covariance was used. Result was tested for significance at P< 0.05 level of significance as presented in Table 4.2 (which also showed the summary of the results of all hypotheses tested in this study).

Table 4.2: Summary of Analaysis of Covariance of Anxiety in mathematics by Treatment, Sex and Study Habit.

SOURCE	TYPE III SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
Corrected Model	4057906	21	341.01	94.94	0.01
Intercept	914.57	1	319.41	12.26	0.00
Anxiety in mathematics Pre test	214.75	1	214.75	5.80	.00
Treatment	2866.11	2	179.13	5.80	.00*
Gender	8474.68	1	847.47	122.85	.00*
Subject study habit	1251.50	2	139.06	2.69	.06
Treatment “by” Gender	759.50	1	759.50	4.40	0.06

Treatment Study habit	556.29	1	556.29	2.10	0.38*
Gender "by" Study habit	2112.89	1	242.89	169.03	0.05*
Treatment "by" Gender "by" Study habit	214.78	1	214.78	.95	.43
Error	1900.39	54	431.11		
Total	5842.01	72			
Corrected Total	2132.00	71			

- ∗ Denote significance at P < 0.05
- Results in Table 4.2 reveals:
- Significant effect of treatment (F = 5.81); P < 0.05;
- A significant effect of gender F = 122.85; P < 0.05, study habit (F = 2.69), P > 0.05) was not significant.

The result also indicated the two-way interaction effect of treatment and gender (F = 4.40; P > 0.05) was not significant. Also, the interaction effect of treatment and study habit (F= 2.10; P > 0.05) was not significant.

However, the interaction effect of gender and study habit (F = 169.03; P < 0.05) was significant but the three-way interaction effect of treatment, gender and study habit (F= .949; P > 0.05) was not significant.

For hypothesis one, the result revealed a significant effect of treatment on students anxiety in mathematics (F =5.81, P < 0.05).That is, a univariate F-ratio of 5.81, P < 0.05 which was found to be significant beyond the predicated 0.05 level was revealed.

This implies that there is a significant effect of treatment (cognitive restructuring training) on the anxiety in mathematics of students. However, their counterparts in the control group had no observable reduction in their anxiety in mathematics level when compared to the treatment group. Therefore the null hypothesis of no significant difference in the anxiety in mathematics of students exposed to treatment (cognitive restructuring) and those in the control group is rejected.

Test of Significant Difference in the Anxiety in mathematics of students under the Cognitive restructuring and Control Group

			95% Confidence Interval	
Treatment	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Cognitive-restructuring	40.80	2.70	35.38	46.21
Control Group	72.20	3.04	39.00	104.00

a. Evaluated at covariates appeared in the model: Anxiety in mathematics pre-test = 89.5417

b. Based on modified population marginal mean.
c. The data were exposed to statistical analysis of covariance to adjust for the pre- anxiety in mathematics scores as covariate.

Results in Table 4.3 revealed that students exposed to cognitive-restructuring had the lowest mean score of 40.80 with 95% confidence interval of between 35.39 and 46.21 with a standard error of 2.71 while students under the control group had a mean score of 72.20 with 95% confidence interval of between 39.00 and 104.00 with a standard error of 3.04.

This result shows that Cognitive-restructuring training had the greatest potency of reducing students' anxiety in mathematics because it has the lowest mean score of post test anxiety in mathematics when compared with the mean scores of students who were in the control group.

Also, to further confirm the magnitude of the anxiety in mathematics scores of students exposed to the treatment condition and the control group, pair wise comparison of the treatment groups was used. The results are presented in Table 4.4.

Table 4.4: Pairwise Comparisons of the Anxiety in mathematics Level of Students in the Experimental and Control Groups

					95% Confidence Interval	
TREATMENT	**Treatment**	**Mean Difference (I – J)**	**Std. Error**	**Sig(s)**	**Lower Bound**	**Upper Bound**
Cognitive-restructuring	PR	-.86	3.36	.79	-7.59	
	CTR	-25.85	3.22	.00	-32.30	-19.39
Control Group	PR	25.85(b)	3.22	.00	19.39	32.30
	CTR	24.98(c)	3.28	.00	18.41	31.55

Based on the estimated marginal means

- The mean difference is significant at 0.05 level
- Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustment).
- An estimate of the modified population marginal mean (J)
- An estimate of the modified population marginal mean (l)

5.1.2 Hypothesis Two

There is no significant difference in the effect of sex on students' anxiety in mathematics.

The result in Table 4.5 revealed the differences between anxiety in mathematics scores of male and female students.

Table 4.5 Descriptive Statistics of Anxiety in mathematics Scores of Male and Female Students

			95% Confidence Interval	
Gender	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Male	52.11	2.45	24.00	95.00
Female	42.71	2.01	21.00	84.00

a. Evaluated of covariates appeared in the model: Anxiety in mathematics pre-test = 89.5417
b. Based on modified population marginal mean.

The result of Table 4.6 revealed that the mean score of male mathematics anxious students was 52.11 as opposed to the mean scores of female students which was 42.71. Further analysis to discover if there is any significant effect of gender could be found on this difference and the results are presented in Table 4.6.

Table 4.6: Univariate Analysis of Covariance Differences in the Mathematic Anxiety Scores of Male and Female Students

	Sum of Square	Df	Mean square	F	Sig.
Contrast	8474.67	1	8474.67	122.85	.000
Error	1862.57	27	68.98		

F test the effect of SEX. This test is based on the linearly independent pair wise comparisons among the estimated marginal means.

The sum of square 8474.70 with a df of 1 and 27 and mean square of 8474.68, the F ratio of 122.85 this is significant at 0.05 level of significant with a significant value of 0.00 of male and female anxious students.

The result in Table 4.6 revealed a significant difference effect of sex on students' anxiety in mathematics. The f-ratio value of 122.85 significant at 1 and 27 degree of freedom is less than 0.05 level of significance (that is $F = 3.872$; $P < 0.05$). The null hypothesis of no significant difference was therefore rejected by this finding. Thus, anxiety in mathematics is gender sensitive. Also, pair wise comparison was used to determine the effect of sex on anxiety and the result is presented in Table 4.7

Table 4.7: Pairwise Comparisons of the Differences in the Anxiety in mathematics Scores of Male and Female Anxious Students

					95% Confidence Interval	
SEX (I)	**Sex (J)**	**Mean Difference (I – J)**	**Std. Error**	**Sig(s)**	**Lower Bound**	**Upper Bound**
Male	Female	-9.40	3.19	0.05	-3.02	-15.78
Female	Male	9.40	3.19	0.05	3.02	15.78

Based on the estimated marginal means

- The mean difference is significant at the 0.05 level
- Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustment).
- An estimate of the modified population marginal mean (J)
- An estimate of the modified population marginal mean (l)
- From the table above, male and female means differences (I - J) of 9.4000; P < 0.05 was significant therefore this hypothesis of no significance is rejected. The fact that Sex significantly affected students' anxiety in mathematics was further confirmed here.

5.1.3 Hypothesis Three

There is no significant difference in the effect of study habit on students' anxiety in mathematics

The result in Table 4.8 showed the anxiety in mathematics scores of students with low, medium and high study habit.

Table 4.8: Descriptive Statistics of Anxiety in mathematics Scores of Students with Low, Medium and High Study Habit

			95% Confidence Interval	
Subject Study Habit	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Low	40.07	3.24	33.50	46.64
Medium	42.35	2.96	36.35	48.35
High	43.95	3.52	36.83	51.07

a. Evaluated at covariates appeared in the model: Anxiety in mathematics pre-test = 89.54.
b. Based on modified population marginal mean.

The result in Table 4.9 showed that students with low study habit had a means score of 40.08; the mean score of students with medium study habit was 42.35 while the mean score of students with high study habit was 43.95 when the covariate appearing in the model was estimated at 89.54. Further analysis was carried out to determine if the mean scores were significantly different. Result of which, are presented in Table 4.9.

Table 4.9 Univariate Analysis of Covariance of the Differences in the Anxiety in mathematics Scores of Students with Low, Medium, and High Study Habit

	Sum of Square	Df	Mean square	F	Sig.
Contrast	1251.50	2	139.06	2.69	.061
Error	1120.87	27	373.36		

The F test the effect of STUDENTS' STUDY HABIT. This test is based on the linearly independent pair wise comparisons among the estimated marginal means.

Results in Table 4.9 revealed that there was no significant difference effect of study habit on students' anxiety in mathematics. This is because the calculated f-ratio of 2.69 at 2 and 27 degree of freedom at $P > 0.05$ level of significance. The null hypothesis was therefore not rejected. Also, pair wise comparison of mean scores of students' anxiety in mathematics was sought to determine the direction of the difference and the results of these are presented in Table 4.10.

Table 4.10: Pairwise Comparisons of the Differences in the Anxiety in mathematics Scores of Students with Low, Medium and High Study Habits

					95% Confidence Interval	
Students' Study Habit	Students' Study Habit	Mean Difference (1 – J)	Std. Error	Sig(s)	Lower Bound	Upper Bound
Low	Medium	-1.72	3.56	.631	-8.92	5.47
	High	2.95b)	4.42	.509	-5.99	11.89
Medium	Low	1.72	3.56	.631	-5.47	8.99
	High	4.67	3.65	.208	-2.71	12.06
High	Low	2.95 (c)	4.42	.509	-11.89	5.99
	Medium	4.67 (c)	3.65	.208	-12.06	2.71

Based on the estimated marginal means

a. The mean difference is not significant at 0.05 level
b. Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustment).
c. An estimate of the modified population marginal mean (J)
d. An estimate of the modified population marginal mean (l)

The pairwise comparisons of mean scores of students with low study habit was not significantly different from those with medium study habit. (Mean difference I - J = 1.72 and also the mean score of students with low and high study habit was also not significantly different with

the mean difference of 2.95 (c), while the mean difference between the anxiety in mathematics scores of students with medium and high study habit was 4.67(c). This finding implies that students' anxiety in mathematics is not significant with any level of study habit.

6.0 Discussion of the Findings

The first hypothesis which stated that there is no significant difference in the anxiety in mathematics of students exposed to cognitive-restructuring and those in the control group was rejected because the result of the findings revealed that significant difference exists in the effectiveness of the treatment on students' anxiety in mathematics when compared to the control group. This indicated that the cognitive-restructuring training is effective in treating anxiety in mathematics.

This result confirms the significant influence that the independent variables exert on dependent variables. The reason for the significant effect of treatment group could be as a result of the students' exposure to eight weeks of treatment with cognitive-restructuring training while the control group were not. Strupp (1986) confirmed that psychotherapists help their clients develop awareness and bring about changes in their behavior, feeling and thinking.

This is also supported by Coon (2000) who found out that positive changes in behavior are facilitated by using behavioural techniques. Moreover, Passer and Smith (2003) also confirmed that much has been learnt about the effectiveness of the various therapeutic approaches. .

The reduction of students' anxiety in mathematics in the cognitive-restructuring training compared to their counterparts in the control group could be attributed to the content of cognitive-restructuring treatment package. For instance, students were taught the negative effects of negative statements on their attitude towards mathematics. They were taught that such negative attitudes may make them have hatred for their mathematics lessons and teachers, eventually avoiding mathematics lessons and this may aggravate their tension and anxiety for mathematics. They were also taught how to overcome anxiety in mathematics by redirecting their minds and exchanging the bad thoughts with good thoughts. Repeated practice and concretization of the benefits of cognitive-restructuring by helping clients how to manage their obsessional thoughts were also a great help to students in the cognitive-restructuring experimental group when compared to students in the control group who were only exposed to a debate on the most important subject out of mathematics and English language. This probably explains the reason for the non-appreciable reduction in their anxiety in mathematics level compared with those in the cognitive-restructuring treatment group.

The result obtained from this study confirmed the results and findings of previous studies by other researchers such as Hassan and Okatahi (1990); Locke, Myrers and Herr (1993); Wright and Beck (1994); Feltham and Horton (2001); Hemberg, Roth and Winnie (2002) and many others who reported the efficacy of Cognitive-restructuring and implosive therapy in the treatment of anxiety in mathematics over the control group who had no such treatments.

The second hypothesis which states that there is no significant difference in the effect of sex on students' anxiety in mathematics was rejected because a significant difference existed in the effect of gender on students' anxiety in mathematics.The implication of this finding is that sex affect anxiety in mathematics among students and that both male and female students are not equally prone to anxiety in mathematics. That is, levels of subjectivity to anxiety in mathematics among students depend on sex. The reason for this significance may be because of the traditional belief that mathematics and sciences are for male students and that female students are destined to pursue languages and art related students (Adebule, 2004). The submission of Gire (1988) that the more a student believes that mathematics is a male or female domain the lower his performance will

be may also be an explanation for the significant difference in the anxiety in mathematics found among the male and female students in the study.

Also, the studies of Tronsky, Chen, Jackson and Marchant 1999, presented evidence that sex differences in anxiety in mathematics exist because boys are faster at retrieving basic time and mental energy on the other operations necessary to obtain necessary solution than girls. The studies of Bernstem, Reilly and Cobe-Bonanno cited in Preis and Biggs (2001) also agreed with the findings in this study as they found out that male students had higher anxiety in mathematics than did the females. Likewise the study of Hembree (1980) which agreed with this present study as it showed that female students exhibited more test anxiety than males.

However, the findings of this study did not support the findings of Idu (1988) and Omirin (1999) who found no significant difference between the scores of male and female students on the instruments developed for measuring attitudes towards mathematics and science oriented students respectively.

This can be supported with the submission of Wade (1980) that identical scores for boys and girls were indicative of the same level of anxiety. Moreover, the study of Adebule (2004) on gender difference on a locally standardized anxiety rating scale in mathematics also disagreed with the result of this study as it concluded that there is no significant difference between the scores of male and female students on the anxiety in mathematics scale in relation to statistical significance.

In addition, the studies of Lusser (1996) is also inconsistent with the findings of this study as it failed to find a significant relationship between gender and anxiety in mathematics stating that mathematics background had to be considered. Nevertheless, the use of gender as a moderating variable in this present study is significant despite the great disparities among researchers on its significance to anxiety in mathematics.

The third hypothesis stated that there is no significant difference in the effect of study habit on students' anxiety in mathematics. This hypothesis was also accepted because no significant difference was observed in the study habit of students' anxiety in mathematics. This study thus indicated that anxiety in mathematics is not limited to any specific level of study habit (high, medium and low).

Also, in the study of Musch and Broder (1999) which investigated the relative contribution of anxiety in mathematics, study habits and mathematics skill to performance, in a statistics examination, it was discovered that study habit did not add unique variance in explaining performance. The result of this study thus confirms the findings of this present study despite the differences found in the two environments in terms of the exposures of learners to different teachers, school environment, teaching methods and principles, learning facilities and the likes. This is an indication that anxiety in mathematics is not limited to any specific level of anxiety in mathematics.

The study of Bakare (1977) also confirms the findings of this study as it discovered a negative correlation between anxiety in mathematics and study habit among students. However, the study of Jiao and Onwuegbuzie (2000) contradicts the result of this study as it discovered that study habits explained 45.8percent of the variance in library anxiety which, using Cohen's criteria represents a large effect size. The difference in the two results may be due to the fact that while this present study was determining significant difference between study habit and anxiety in mathematics, the study of Jiao and Onwuebguzie (2000) was determining if there was a significant difference between study habit and library anxiety.

7.0 Conclusion from the Findings

This research work has been able to provide meaningful insight to the use of cognitive-restructuring training as a strategy for reducing anxiety in mathematics among secondary school students. It has also been able to determine it's effectiveness in the treatment of students (males and female) with different levels of study habit (low, medium and high). It was also discovered that anxiety in mathematics is gender sensitive. That is, there is a significant difference between the anxiety in mathematics of male and female students and that anxiety in mathematics does not have a significant effect with study habit.

8.0 Recommendations

Based on the conclusions of these findings, it is recommended that:

Parents should:

1. Motivate their children/wards to have a positive attitude towards mathematics by buying textbooks for them and if possible get a lesson teacher for them so that they will not be afraid of the subject but rather develop interest in it.
2. Identify the cause of their children/wards anxiety in mathematics and make it known to the school authority so that the child could be helped as quickly as possible.

- Counsellors should:
  1. Use this study to get a theoretical and empirical basis for adopting suitable methods of reducing anxiety in mathematics.
  2. Use either cognitive-restructuring or problem solving as identified in the study to treat anxiety in mathematics but most importantly, cognitive-restructuring should be used more.
- Teachers should:

1. Cooperate with the school counselors by referring the mathematics anxious students to the counselors as quickly as possible instead of using cane or force to make them perform better in mathematics.
2. Re-examine their traditional teaching methods which often make learning mathematics a pain instead of being enjoyable.
3. Recognise children's psychological problems, adapt their teaching styles and aids to the psychological characteristics of different children and establish a psychological climate (which facilitates learning) in the classroom. This researcher is of the opinion that the output of teachers would markedly increase if they are able to do this.

- Government should:

1. Sponsor seminars/workshops for counselors on how cognitive-restructuring and problem solving would be used more effectively to help identified mathematics anxious students.
2. It is recommended that federal, state, local government and proprietors of private institutions should equip all schools with material resources like psychological tests which can be used by counsellors (since it has been observed that it is difficult for teachers to identify highly test anxious students).
3. Ensure that schools organize workshops for students regularly on the importance of mathematics to their career development and progress.

It is hoped that this research finding will be given the widest publicity by delivering seminar and lectures on the topic and publishing the content of the study in international journals.

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