

# EFFECT OF COGNITIVE RESTRUCTURING ON JUNIOR SECONDARY SCHOOL MATHEMATICS TEST ANXIETY IN OSHIMILI SOUTH L.G.A OF DELTA STATE

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## Abstract

The study investigated the effect of cognitive restructuring on junior secondary school mathematics test anxiety in Oshimili south L.G.A of Delta State. Two research questions and two hypotheses tested at 0.05 level of significance guided the study. Quasi-experimental research design was adopted for this study. The population for this study was a total of 1224 students. These comprised of all the JSS 2 students from Oshimili South Local Government Area of Delta State. Research sample consisted of 120 JSS 2 students with high level of mathematics test anxiety selected through purposive sampling technique. The instrument adopted for this study was Maths anxiety rating scale-R. Data collected from the study were analyzed using mean and ANCOVA. Results obtained from the study indicated that Cognitive restructuring therapy (CRT) was effective on mathematics test anxiety of junior secondary school students. The results equally showed that Cognitive restructuring therapy was more effective on the female students' mathematics anxiety than their male counterparts. Furthermore, the results indicated a significant difference in the post-test mathematics test anxiety mean scores of students treated with CRT and those in the control group. Also, there was significant difference in the post-test mathematics test anxiety mean scores of male and female students treated with CRT. Based on the findings of this study, some recommendations were noted. The researcher recommended, among others that Schools' Guidance Counselors should be empowered to make good use of the cognitive restructuring technique, in counseling students who find it difficult to comprehend mathematics skills.

**Keywords:** Cognitive Restructuring therapy, mathematics, test anxiety, counselling.

## Introduction

The poor achievement of students in Mathematics especially in external examinations in Nigeria has become a source of great concern to parents, teachers, counsellors, educationists and all stake holders in education. Mathematics is one of the core and unavoidable subjects for all secondary school students. This is why it has been made compulsory for admitting candidates into almost all the disciplines in our tertiary institutions in Nigeria. Therefore, for students to be admitted to their desired course of study and attain success in their desired academic career, they are required to pass the subject appropriately with at least a credit pass.

According to Cohen, O'Donoghue & Fitzsimons (cited in Ogugua, 2010), Mathematics is the language of science, as a discipline. It is the pivot around which the whole essence of living revolves. Again Mathematics is viewed as the basis for scientific and technological analysis. Also Mckee (2012) opined that, every new body of discovery is mathematical in form. This is because, variables such as time and age, must be calculated mathematically, since it is concerned with symbols and is necessary for any meaningful involvement in modern civilization. This is why adolescents, who must fit positively into society, are expected to understand the basic concepts and principles of the subject mathematics by constantly practicing the rudimentary concepts involving figures, particularly in the basic areas of Factorization like and unlike terms, simultaneous equation, quadratic equation and word problems in mathematics, as their usefulness is relevant in everyday dealings. Despite the importance of mathematics, it was observed that students face anxiety in mathematics test and perform poorly in mathematics tests and exams. This should be of great concern to all stakeholders in education because if mathematics anxiety is not checked in most students it could continuously lead to poor performances in mathematics.

According to Onwuka and Tibi (2014), Mathematics test anxiety is a persistent fear towards the study of mathematics which leads student to avoid mathematics. Chang and Beilock (2016) further described mathematics test anxiety as a deficit in the ability to process numbers or number related tasks. Olubusayo (2014) defined mathematics test anxiety 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. In line with the above, Bursal and Paznokas (2006) defined mathematics test anxiety as discomfort that occurs in response to situations involving mathematical tasks that are threatening to self-esteem and panic, helplessness, and mental disorganization arising among some people when they are required to solve a mathematical problem. Anxiety is a state of emotional and physical disturbance induced in a person by a real or imagined threat. It becomes more dangerous when it is encountered by students during examinations. It causes some students to experience some physiological reactions during examination such as increased heart rate, cold hands, frequent urination, dried mouth, muscle spasm, increase respiration (Onwuka, 2014). These are manifested when taking Mathematics examination. Examination anxiety is dangerous to the growth of an educational system because it brings about poor academic performances of students and this accelerates into decline in educational growth.

Several literatures had different views as regards to gender differences in mathematics test anxiety, hence, it is justifiable to bring in gender as a moderating variable in this study. For instance, Onwuka (2014) found no significant difference in the pre-test and post-test scores of male and female mathematics anxious students. In other words, gender has no influence on students' post-test mathematics anxiety scores after treatment. Olubusayo (2014) discovered a significant difference on the effect of gender on students' mathematics anxiety. In other words,

male and female students are not equally prone to anxiety in mathematics. Previous studies on gender differences in mathematics anxiety proved inconclusive, hence, the researcher deemed it necessary to determine the gender differences on Effect of Cognitive Restructuring on Mathematic Test Anxiety.

To deal with mathematic test anxiety, various behavioural intervention strategies have been developed over the years to reduce mathematics anxiety such as cognitive behavioural therapy, systematic desensitization technique and individual mathematics tutoring (Supekar et al., 2015). Studies by Maples-Keller, Bunnell, Kim and Rothbaum (2017) found technology-infused intervention to be effective in reducing social anxiety, specific phobias, post-traumatic stress disorder, general anxiety and panic disorders. On the other hand, evidence abound in literature about the role and efficacy of cognitive restructuring technique on various behavioural problems especially those concerning secondary school students. For instance, research carried out by Olubusayo, (2014) found Cognitive restructuring to be effective in reducing general anxiety. In a study by Ogugua (2010), cognitive restructuring was found to be effective in enhancing Mathematics achievements of secondary school students.

Cognitive Restructuring Therapy (CRT) was developed by Aaron Beck in 1963. According to Beck (1976), cognitive restructuring is an approach to the treatment of abnormal behavior which help individuals behave more adaptively by modifying their thoughts. Cognitive restructuring is a type of therapeutic technique which refute one's irrational ideas and replaces them with rational ones (Ogugua, 2010). Similarly, Meichenbaum cited in Olubusayo (2014), opined that cognitive behavior therapists strive to change misconceptions, strengthens coping skills, increase self-control and encourage self-reflection. Cognitive restructuring is widely accepted as an evidence-based technique for many disorders. Lawan (2016) asserts that CRT is

used to help individuals experiencing a variety of psychiatric conditions including depression, anxiety disorders, social phobia among others. It has been proved to be effective for treatment of variety of conditions including school and other school phobias, mood, anxiety, personality, eating disorder, substance abuse and psychotic disorders (Ahmed, 2016). It is against this background that the researcher sought to investigate the Effect of Cognitive Restructuring on Junior Secondary School Mathematics Test Anxiety in Oshimili South Local Government Area of Delta State.

### **Purpose of the Study**

The main purpose of the study was to determine the Effect of Cognitive Restructuring on Junior Secondary School Mathematics Test Anxiety in Oshimili South L.G.A of Delta State. Specifically, the study sought to find out:

1. The effect of Cognitive restructuring in reducing mathematics test anxiety among junior secondary school students?
2. The differences in pre-test and post-test scores of male and female junior secondary school students who are exposed to cognitive restructuring technique?

### **Research Questions**

The following research questions guided the study

1. What is the effect of Cognitive restructuring therapy (CRT) in reducing mathematics test anxiety among junior secondary school students?
2. What is the difference in pre-test and post-test scores of male and female junior secondary school students who are exposed to cognitive restructuring therapy (CRT)?

## Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between junior students treated with cognitive restructuring and those in the control group.
2. The effect of CRT in reducing students' test anxiety in mathematics will not differ significantly due to their gender.

## Methods

The researcher adopted a pre-test and post-test control group quasi-experiential design. It investigated the possible cause and effect relationship by exposing one treatment group and one control group (not exposed to treatment)

## Table I

The quasi-experimental design is graphically presented as follows:

Group	Pre-test	Research condition	Post-test
Experimental	O <sub>1</sub>	X <sub>1</sub> (treatment)	O <sub>2</sub>
Control	O <sub>1</sub>	X <sub>0</sub> (no treatment)	O <sub>2</sub>

Here,

O<sub>1</sub> stands for the pre-test that was given to all the pupils

X<sub>1</sub> stands for the treatment (CRT) which was given to the experimental group.

X<sub>0</sub> stands for treatment that was not given to the control group.

O<sub>2</sub> stands for the post-test which was given to both the experimental and control groups.

### **Population of the Study**

The population of the study is 1224 students. These comprised of all the junior secondary school 2 students from Oshimili South Local Government Area of Delta State. There are 29 secondary schools in Oshimili South Local Government Area managed by the State Education Commission (S.E.C). In order for the researcher to get the population of students with high level of mathematics test anxiety in the region, he visited 15 selected secondary schools and administered Mathematics Anxiety Rating Scale-Revised (MARS-R). A total of 1800 copies of questionnaire were administered in the 15 secondary schools with the help of few selected teachers. Those found high in mathematics test anxiety constitute the population of the study.

### **Sample and Sampling Technique**

The sample of the study is 120 JSS 2 students with high level of mathematics test anxiety. A purposive sampling technique was used in selecting two secondary schools because they have the highest number of students with high mathematics test anxiety. The instrument, Mathematics Anxiety Rating Scale-Revised (MARS-R) was used for the identification of students with mathematics test anxiety problem. The researcher after the pre-test, apportioned 60 participants to each of the groups, by placing one of the school made up of 30 males and 30 females to represent the experimental group and 30 males and 30 females from the other school were made to represent the control group thus:-

Experimental Group – 60

Control Group - 60.

### **Instrument for Data Collection**

The instrument adopted for this study was Maths anxiety rating scale-R developed by Plake and Parker (1982). MARS-R is a 24 item scale measuring general trait anxiety, specific/situation state anxiety and mathematics anxiety. MARS-R assesses an individual's level of apprehension or anxiety about maths testing on a 1-5 likert scale, asking for participants response about how anxious they would feel in response to various settings and experiences. MARS-R has demonstrated strong reliability estimates with a Cronbach alpha of 0.98.

### **Method of Data Collection**

Students with high scores were considered to be having high mathematics test anxiety and were assigned to both the experimental and control groups in equal proportion. A special request was made to the schools principals of the chosen schools for the provision of adequate and conducive counselling centre for the administration of the questionnaire and treatment. The Mathematics Anxiety Rating Scale-Revised (MARS-R) was administered to the students in the chosen schools for this study by the researcher, with the help of two research assistants. The research assistants collected the Questionnaire from the respondents and handed over to the researcher for scoring; the results of the first administered Questionnaire made up the pre-test scores. All responses for the thirty items on questionnaire were summed to yield a total score.

### **Experimental Procedures**

The researcher visited the chosen schools, solicited for the cooperation of the principals so as to build in the programme in the schools' activities. The researcher explained the purposes and benefits to be derivable from the treatment to the principals of the schools. The experiment was done in three phases: Pre-treatment phase – Treatment phase – Post-treatment phase

**Pre-treatment phases:** Before the commencement of the training, the counsellor took time to familiarize herself with the subjects to ascertain for instance, their competency, interest and the academic problems they encounter in school. Afterwards, Maths Anxiety Rating Scale-R was administered on the students in the experimental and control group. The tests were administered by the research assistants with the researcher monitoring the exercise, to make sure that the test was taken under the same conditions and then collected the entire completed questionnaire.

**Treatment phase:** The researcher administered the experimental treatment, while the research assistants in control group handled the control group and administered copies of the questionnaire. The treatment was designed to last for 8 weeks using the normal school timetable that allocated 45 minutes for guidance and counselling. A total of eight sessions were used for the experiment. The control group was exposed to conventional counselling with the school counsellors providing the services to the control group. This also continued for 8 weeks, and then the pupils were post-tested.

**Post-treatment:** After the treatment, the Maths Anxiety Rating Scale-R was re-administered to the experimental and control groups. The instrument was disguised by reshuffling before they were re-administered. This was done by the 8th week. The researcher monitored the exercise to ensure that the students are under the same conditions and then, collects all completed questionnaire. The student responses were scored and data generated were collected for statistical analysis.

### **Method of Data Analysis**

The data collected for this study were organized in tables and analyzed. Mean was used in answering the research questions and analysis of covariance (ANCOVA) was used in testing the hypotheses at 0.05 levels of significance.

## Presentation of Results

### Research Question one

What is the effect of Cognitive restructuring therapy (CRT) in reducing mathematics test anxiety among junior secondary school students?

**Table 2: Pre-test and Post-test mathematics anxiety mean scores of students treated with CRT and those in the control group.**

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Source of Variation	N	Pre-test Mean	Post-test Mean	Mean lost	Remarks
CRT	60	100.38	68.81	31.57	Effective
Control	60	101.47	99.15	2.32	

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Research question one shows that the students treated with CRT had pre-test mean score of 101.38 and post-test mean score of 68.81 with mean loss of 31.57 in their mathematics anxiety scores, while the students in the control group who received conventional counselling had pre-test mean score of 101.47 and post-test mean score of 99.15 with mean loss 2.32. Therefore, CRT was effective on mathematics test anxiety of junior secondary school students.

### Research Question two

What is the difference in pre-test and post-test scores of male and female junior secondary school students who are exposed to cognitive restructuring therapy (CRT)?

**Table 3: Pre-test and post-test mathematic test anxiety mean scores of male and female students treated with CRT**

Source of Variation	N	Pre-test Mean	Post-test Mean	Mean lost	Remarks
MALE	30	99.83	69.07	30.76	
FEMALE	30	100.93	65.57	35.36	More Effective

Research question two revealed that male students treated with CRT had pre-test mean score of 99.83 and post-test mean score of 69.07 with a mean loss 30.76, while the female students in the group had pre-test mean scores of 100.93 and post- test mean score of 69.57 with a mean loss of 31.36. Therefore, CRT was more effective on the mathematics test anxiety of female students than their male counterparts.

### Hypotheses One

There is no significant difference between junior students treated with cognitive restructuring and those in the control group.

**Table four: ANCOVA on the pre-test and post-test mathematics test anxiety mean scores of students treated with CRT and those who received conventional counselling**

Source of Variation	Type III Sum of Squares	Df	MS	Cal. F	Crit.F	P ≥ 0.05
Corrected Model	35619.687 <sup>a</sup>	2	17809.844			
Intercept	1993.733	1	1993.733			
Pretest Scores	153.279	1	153.279			
Treatment Models	34677.678	1	34677.678	380.848	3.89	S
Error	10653.304	117	91.054			
Total	933965.000	120				
Corrected Total	46272.992	119				

Table 4, showed that at 0.05 level of significant, 1df numerator and 119df denominator, the calculated F 380.848 is greater than the critical F 3.89. Therefore, the first null hypothesis is rejected. So, there was significant difference in the effects of CRT on mathematics test anxiety of students when compared with those in control group.

### Hypotheses two

The effect of CRT in reducing students' test anxiety in mathematics will not differ significantly due to their gender.

Table five: ANCOVA on the pre-test and post-test mathematics anxiety mean scores of male and female students treated with CRT

Source of Variation	SS	Df	MS	Cal. F	Crit.F	P ≥ 0.05
Corrected Model	35619.687 <sup>a</sup>	2	17809.844			
Intercept	1993.733	1	1993.733			
Pretest Scores	153.279	1	153.279			
GENDER	34677.678	1	34677.678	380.85	3.89	S
Error	10653.304	117	91.054			
Total	933965.000	120				
Corrected Total	46272.992	119				

Table 5, showed that at 0.05 level of significant, 1df numerator and 119df denominator, the calculated F 380.85 is greater than the critical F 3.89. Therefore, the second null hypothesis is rejected. So, there was significant difference in the pre-test and post-test test anxiety mean scores of male and female students treated with CRT.

## Discussion of Findings

The findings in research question one showed that Cognitive restructuring therapy (CRT) was effective on Mathematics test anxiety of junior secondary school students in the treatment group when compared to those in control group. The reason for this effect is as a result of the students' exposure to CRT treatment for six weeks while control group were placed on conventional counselling. The finding also indicated that the magnitude of the mean difference between the experimental and control group was significant in posttest. The result in hypothesis one also indicated a significant difference in the effects of CRT on mathematics test anxiety of students when compared with those in control group. The result of the study could be attributed to the treatment package. CRT based its ideology on the extinguishment of behavioural problems by identifying the irrational thought leading to maladaptive behavior. After the treatment, the students were able to make self-discovery of how irrational their perception have been, which resulted into mathematics test anxiety. The result from the study confirmed the findings of previous studies such as Olubusayo (2014); Ernest-Ehibudu and Wayii (2017) and Ahmed (2016) among others who reported the efficacy of CRT on mathematics test anxiety of students in experimental group compared to control group.

The findings in research question two indicated that the difference in the post-test mathematics test anxiety mean scores of male and female students treated with CRT was significant. In particular, the decrease in mathematics anxiety level of female students was higher than that of male students after they had participated in CRT treatment. This suggests that although both male and female students benefited from the treatment, female students benefited more from CRT than male students. 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. The study is consistent with the findings of Olubusayo (2014) who reported significant different on the effect of cognitive restructuring on mathematics anxiety due to due to gender.

### **Conclusion**

The study investigated the effect of cognitive restructuring on junior secondary school mathematics test anxiety in Oshimili South L.G.A of Delta State. In accordance with the findings of this study, the following conclusions have been drawn:

- That CRT is really an effective treatment in reducing mathematics test anxiety of junior secondary school students. As such, its usage should be encouraged.
- The decrease in mathematics test anxiety of female students was more than male students after the treatment. The study also found significant difference in the mean post-test score of male and female students.

### **Recommendation**

Based on the findings, the following recommendations are hereby made:

1. Schools' Guidance Counselors should be empowered to make good use of the cognitive restructuring technique, in counseling students who find it difficult to comprehend mathematics skills.
2. The teachers should refer the mathematics anxious students to the counselors as quickly as possible instead of using cane or force to make them perform better in mathematics.
3. The Delta State post-primary school board should provide on-the-job training to school-based counsellors in Delta State secondary schools on the use of cognitive restructuring

technique in treating mathematics test anxiety through workshops, seminars, conference and symposia.

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