

**CHANGING SELF-PERCEPTIONS IN
MATHEMATICS ANXIETY**

By

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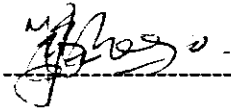
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DECLARATION

I hereby declare that this is my own work and all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

A handwritten signature in black ink, appearing to read 'T.A.B. Mashego', is written over a horizontal dashed line.

T-A.B. MASHEGO

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ABSTRACT

In this study difficulties relating to mathematics problem solving were linked to the way people see themselves as problem solvers.

Following this line of reasoning, Mathematics anxiety is viewed as a product of the student's distorted perception of his/her ability to do mathematics. It was further argued that negative beliefs about oneself were at the root of poor performance in mathematics problem solving.

A cognitive restructuring method designed to change such distorted perceptions, and a subsequent change of behaviour was explored. On the basis of the promising results of this study, a recommendation is made that students with mathematics anxiety should be identified early and advised to seek psychological help before they lose hope completely.

OPSOMMING

In hierdie studie is probleme wat individue met die oplos van wiskundige probleme ervaar in verband gebring met die manier waarop hulle hulself as probleemoplossers beskou.

Volgens hierdie redenasie is wiskunde-angs beskou as 'n produk van die student se verwronge beeld van sy/haar eie vermoë om wiskunde te doen. Verder is aangevoer dat 'n negatiewe selfbeeld grondliggend is vir swak prestasie in wiskunde*probleemoplossing*.

'n Kognitiewe herstruktureringsmetode is ontwerp om sodanige negatiewe persepsies te verander en 'n gevolglike gedragsverandering is ondersoek. Op grond van die belowende resultate van hierdie studie, word aanbeveel dat studente met wiskunde-angs vroeg geïdentifiseer moet word en aangeraai moet word om sielkundige hulp te kry voordat hulle heeltemal moed verloor.

CHAPTER 1

INTRODUCTION

People are often unaware of what they say to themselves because of the habitual nature of beliefs and expectations. It is likely that such thinking processes and images become automatic and seemingly involuntary like most learned acts (Patterson, 1980).

If an individual accurately processes information from the environment, his thoughts, emotions and general behaviour will be adaptive and if the information is distorted, then the subsequent behaviour becomes maladaptive.

Research in behaviour therapy on cognitive factors highlights the importance of environmental factors as determinants of behaviour. However, what the client says to himself about those events, is more important (Patterson, 1985). Problems related to mathematics problem-solving could be linked to this - the way people see themselves as problem solvers.

1.1 STATEMENT OF THE PROBLEM

Perceptions students have of mathematics as a difficult and almost impossible subject, can operate as a barrier preventing them from developing their full potential in mathematics problem-solving.

Mathematics anxiety is by definition : "... feelings of tension and anxiety that interferes with the manipulation of numbers and the solving of problems in a variety of ordinary life and academic situations"

(Richardson & Suinn, 1972, p.551).

The basic assumptions underlying this study are that:

- mathematics anxiety is learned and
- it is a self-perpetuating phenomenon

propagated by negative self-talk that an individual is always having within, and has self-defeating consequences (Mitchell, 1984).

The causes of Mathematics anxiety differ from one orientation to the other. A lot of literature points out that women are more mathematics anxious than men (Fennema & Sherman, 1977; Tobias, 1978; Siegel, Galassi & Ware, 1985; Fox, 1980, etc.). It has, however, not been found to be biologically or genetically connected (Tobias, 1973).

Studies argue that it is in the way the society perceives mathematics that brings about this discrepancy. Boswell (1985) explained this as a function of three factors, namely, the external structural barriers which is overt sexual discrimination against women in the sciences, social pressures from significant others and internal barriers. Many additional factors all indicate that these types of pressures ultimately cause anxiety. This has, according to statistics, lead to fewer women in mathematics related majors and fields (Sells 1978). Crawford (1980) argues that poor mathematics instruction at some point in one's background, is responsible for mathematics anxiety as it creates doubt in one's own competence.

Kogelman, Warren and Crawford (in Shodahl & Diers, 1984) argue that, depending on the way that textbooks are written, they can create anxiety in students. In these authors' opinions, textbooks are not geared towards explanation of processes involved in problem solving, rather, there is a tendency of encouraging rote learning and memorization which is not

conducive for any creativity which is a great necessity in mathematics education. *Memorization works only up to a certain point in mathematics education* and it becomes a real problem in advanced mathematics and thus contributes significantly to anxiety in mathematics.

Mallaby (in Shodahl & Diers, 1984) argues that the transition from concrete to formal operation level is not natural as Piaget thought. He argues that classroom instruction will always be a source of anxiety if the level of development of students is ignored. Renner (in Shodahl & Diers, 1984) argues that only 50% of students who enter college, are not yet Piagetian formally operational and this hinders their performance.

Anxiety as a form of arousal can be helpful in learning. However, too much anxiety, especially when combined with real and/or perceived lack of ability, can be very debilitating and hinder learning. Anxiety can thus immobilize a person, thereby rendering him/her less enthusiastic and hamper creativity during mathematics problem solving. This study aims inter alia at controlling mathematics anxiety.

High anxiety is associated with a person focussing on the self and his/her inadequacy and self-depreciating thoughts; low anxiety with more positive beliefs about oneself (Meichenbaum, in Patterson 1980).

To reduce anxiety, (an indicator symptom in this study), focus should be on changing perceptions about one's ability. It is hypothesized that this should lead to a change in behaviour towards more appropriate action for problem solving.

1.2 MOTIVATION

Mathematics can no longer be avoided in many careers. The mathematics anxious need to be helped to cope with their feelings about the subject. This can help control drop-out rates in mathematics and related fields.

Beliefs in mathematics problem solving have not received much attention in research (McLeod 1989) and the present study should open an area that could prove helpful to mathematics problem solving. The researcher's experience with teaching school mathematics and statistics to social science students over a period of 15 years, lead to the realization that many students are not as weak in mathematics as they think they are at the beginning of the course.

Investigating the dynamics underlying these students' behaviour in statistics *and developing a method to help them in future, is the motivating factor for this study.*

A pilot study was conducted at the University of Massachusetts. Following from the result obtained from the pilot study, the present research will aim at changing the perceptions of the mathematics anxious. The aim was to investigate the effect of desensitization therapy on the level of anxiety, enthusiasm and creativity during problem solving for the mathematics anxious.

The study was based on traditional behaviour modification theory of learning by association and conditioning. Mathematics anxiety was defined as a construct learnt by association of traumatic mathematics encounters and real mathematics problem solving.

A mathematics anxiety rating scale (MARS) was used to identify anxious subjects. The hypotheses tested were the effect of desensitization and 'self-image thinking' on the subjects' enthusiasm, level of anxiety and creativity in problem solving. Self-image thinking was used to add visualization to therapy since desensitization alone was reported not to have long term effects (Hyman, 1973).

The results of the pilot study (obtained through a 1-100 self rating scale) showed a decrease in anxiety (from $\bar{X}=37.5$ to $\bar{X}=30.8$) an increase in enthusiasm ($\bar{X}=38.75$ to $\bar{X}=56.75$), an increase in creativity ($\bar{X}=20$ to $\bar{X}=36.75$) and an increase in relaxation (from $\bar{X}=30$ to $\bar{X}=70.75$). The size of the sample used did not permit the use of tests of significance ($N=4$). The changes were analysed for each individual.

The following shortcomings were noted in the pilot study

- the use of an ABAB design: this design has an inability to show internal validity of treatment since the initial baseline is not easily attainable with clinical problems (Thorpe & Olson, 1990)
- inability to test for significance due to the use of a small sample size
- the use of the traditional behaviour modification theory of counterconditioning which is currently being modified and shifting towards cognitive trends.

These shortcomings motivated the present study. The aim of which is to employ current trends in behavior modification and to mend the above mentioned shortcomings for greater generalizability of findings.

1.3 AIMS OF THE STUDY

1.3.1 GENERAL AIMS

The aim of this study is to develop a psychological service towards solving problems inherent in the teaching and learning of mathematics.

1.3.2 SPECIFIC AIMS

To investigate the effect of "Self-image Thinking" on

- (i) the individual's perceptions of his/her ability in mathematics problem solving; and
- (ii) anxiety reduction during problem solving.

1.4 HYPOTHESIS

Change in perception about one's perceived inability during mathematics problem solving, reduces anxiety, leading to an improvement in confidence and ability to handle the task.

The study is presented in five chapters with the following outlay:

Chapter 1 which has already been covered, focusses on the statement of the problem, motivation to do the study, aims and the hypothesis of the study.

Chapter 2 will dwell on the literature review. This will place the concept of mathematics anxiety into perspective, a discussion of research done in the area and the background to the present study.

Chapter 3 discusses the concepts dealt with in the study, by giving *operational definitions of the concepts*. *Formulation of the hypothesis to be tested* and discussion of the methodology which includes the sample, sampling procedure and rationale, method of data collection, the instruments used, the procedure and how data will be analysed.

Chapter 4 deals with data analysis. This will cover the description of the sample chosen, demographic information of the participants, pre-test and post-test scores of the dependent variables, pre-test/post-test verbal descriptions of the participants analysed in themes, graphical representation of the pre-test/post-test scores. Qualitative and quantitative analysis of the results will also be included and the results given in tabular form.

Chapter 5 will cover the discussion of results, the conclusion in which a summary of the problem premise, what was done, the problems encountered and recommendations will be made.

The following chapter presents a literature review in order to give background to the study.

CHAPTER 2

CONCEPTUALIZING MATHEMATICS ANXIETY: LITERATURE REVIEW

THE CONCEPT MATHEMATICS ANXIETY

This construct refers to "... feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematics problems in a variety of ordinary life and academic situations" (Richardson & Suinn, 1972, p.551).

The tension referred to in the definition above, interferes with mathematical problem solving. Research argues that this is some form of blockage which manifests itself in many ways in the mind of the mathematics anxious.

The mathematics anxious have feelings of frustration and incompetence which make them reluctant to deal with mathematics. At the root of their self-doubt and uneasiness, is a fear of making mistakes and of appearing stupid in front of others. These mistakes are not things to learn from, but as put by Tobias (1981) they are considered "blemishes, something to be erased quickly and expelled from the page" (p.37).

Review of literature suggests that anxiety arises from four sources commonly found in traditional mathematics classes. According to Tobias (1981) these are:

Time pressure: Where people are pressured to finish, speed is considered important, thus making thinking impossible.

Humiliation: For a weak student, the act of solving a problem before other students in class can be a humiliating experience. This approach by teacher might eventually result in the loss of a few students.

Emphasis on the right answer: It is wrong to focus on accuracy all the time. Credit should be given also for finding different ways to solve a particular problem. Anger and panic that result from answers that do not tally contribute to growing anxiety brought on by performing mathematics tasks.

Work isolation: Emphasis laid on "not to cheat "in mathematics, makes mathematics problem solving a difficult task filled with stress and anxiety.

Mathematics anxiety is a fairly common problem in college student populations. Tobias (1972) does attest that students do sign up for mathematics anxiety workshops, however, she suggests that the intents of these sign-ups have to be well explained because people find it easier to avoid mathematics than be labelled mathematics anxious. Over one third of the students responding to a behaviour therapy program in Colorado indicated that their problem centred around mathematics anxiety (Suinn, 1970). Students in the social sciences are not keen on statistics. Reports of statistophobia shown by high scores on the MARS occurred more among statistics students than mathematics students (Birenbaum & Eylath, 1994). This calls for intervention to help the social science students cope with the major subjects that require statistics.

A relationship was found between statistics and mathematics anxiety. *Inductive reasoning ability was found to be related more to statistics anxiety than to mathematics anxiety.* The common variables between the two constructs were *numeric ability and high school mathematics grade, both of which are negatively correlated with anxiety.* The two constructs share the

position of not having any effect on performance (Szetela, 1973). Eysenck (in Birenbaum, 1994) holds that anxiety experienced in statistics does not affect the product as much as it affects the efficiency of the process. Students with anxiety could be working harder to obtain the same grade as their less anxious counterparts. This position justifies working with statistics students in a study of mathematics anxiety.

Anxiety is conceptualised as intrusive thinking i.e. an increase in anxiety is associated with an increase in intrusiveness. McLeod (1989) holds that successful problem-solving involves bringing cognitive and affective processes under control to allow metacognitive processes to direct effort towards solution finding.

Buxton (1984) explains inability to solve problems in a model structure. He holds that an individual engaging in problem-solving operates through 'delta one' and 'delta two' models of operation. By 'delta one' he refers to the outside world and 'delta two' to the internal world. He holds that interference at 'delta one', interferes with the processing of information, planning and solving problems at 'delta two'. It is thus important to leave the gateway to 'delta two' clear of interruptions for planning during mathematics problem-solving. He experimented on teachers to see the effects of time constraint and fear of authority on problem-solving. He took an authoritative stand and instructed them to prepare to work on some task within a very short time. The task was not stated to them but the reaction was very intense. Panic struck the teachers even before the task was given. They were asked to write one word that explained their feelings following the instruction. Only two teachers out of twenty did not panic, the rest recorded various levels of concern. Buxton explains this reaction in terms of 'delta one' and 'delta two' models and holds that 'delta two' that deals with

building schemata and planning goals, did not have the expectation of being able to do the task without even seeing what the task was.

Situations like this make individuals develop a block by immediately reflecting on themselves and their ability to work on problems. This is sometimes due to previous failure or lack of belief in themselves. Tobias (1972) explains this situation as being characterised by engaging in negative self talk which interferes with one's listening and performance.

Two possibilities may have arisen: the teachers could have panicked because of fear for Maths, or because of fear of being evaluated. The fear of being evaluated has been of focus in some mathematics anxiety studies. Evidence suggests that individuals with maths anxiety have test anxiety, which is fear of being evaluated (Betz in Kostka & Wilson, 1986).

Wine (Kent & Jambunathan, 1989) argues that test anxiety involves attentional processes which are aroused in evaluative settings. He holds that low anxiety subjects turn their attention to the task whilst the high anxious subjects attend to their internal responses and any environmental cues which could be given a threatening interpretation. Sarason (Kent & Jambunathan, 1989) hypothesised that such 'misdirection' of attention could interfere with one's performance.

Test anxiety was found to have two components, viz. worry, and emotionality. Worry is a cognitive concern about performance. Emotionality is a physiological and affective arousal and is much less affected by cognitive considerations (Morris, Kellaway & Smith, 1978). The worry component was found to have an effect on performance in mathematics. Equating math anxiety to testing anxiety one can see that it is the worry

component and not the whole construct that has an effect on performance. Morris, Kellaway & Smith (1978) hold that math anxiety only indirectly affects performance. Worrying during tests interferes with performance by distracting attention from the task (Wine 1971; Sarason 1975).

It may thus be useful to look into mathematics anxiety cognitively where one will be indirectly preventing the worry component when improving performance in mathematics problem solving.

In the findings of the study conducted by Clark, Clark & de Silva (1985), subjects who reported many anxiety related cognitions find them more frequent, and are more emotionally intense. Such cognitions are according to the subjects difficult to remove, are less acceptable and accounted for 43% in anxiety change levels. Another study by Kent & Jambunathan (1989) found that an increase in negative thoughts increased anxiety. This is in support of an earlier view that cognitions which have been shown to be at the basis of math anxiety should be focussed on for anxiety reduction.

Group instruction was found to have a potential for anxiety prevention and also seems to offer benefits to some students who would not seek help for fear of being 'labelled'. A study conducted by (Sime, Ansorge, Olson, Parker & Lukin 1987) found that it was more worthwhile to engage students in group intervention as long as adaptations for high versus low anxiety and motivations are made.

Hendel & Davis (1978) conducted a study to investigate the effectiveness of an intervention strategy for reducing mathematics anxiety where they combined curricular-counselling intervention strategies for reducing math anxiety. The results showed that maximum effectiveness was achieved

when participants attended mathematics course in a support group setting.

Hyman (1973) found that group treatment using desensitization was more effective than individual treatment in mathematics anxiety reduction. It is evident from these studies that group support is an important factor in reducing math anxiety. The use of group support and group instructed techniques in the present study was chosen on that basis.

Counterconditioning as a method of treating maladaptive anxiety was formulated by Joseph Wolpe (1958). The basic process entails elicitation of a response that is antagonistic to anxiety in the presence of the stimuli that evokes it. The suppression of anxiety weakens the bond between the stimuli and anxiety. For anxiety to be suppressed students should assume a relaxed state. The pilot study was based on this theory. Mathematics anxiety was assumed to be a learned construct that could be unlearned by counterconditioning.

There has been a shift in behaviour modification theory to focus on cognitions to bring about change in human behaviour. Beck (1970) took the position that a cognitive model explains therapeutic changes more adequately than counterconditioning. He reported case history evidence of the influence of fantasies on people's affect, motivation and overt behaviour.

He holds that when a patient repeats his/her fantasy (which he believes is the essence of systematic desensitization), the patient becomes better able to discriminate between that fantasy and reality. This is, according to him, an insight which is a form of cognitive restructuring which leads to changes in affect and overt behaviour.

The pilot study was limited in that it did not take into cognisance the role

of cognitions in behaviour modification.

Since the advent of systematic desensitization, those researchers who emphasize the importance of cognitive faculties have shown that the success of desensitization really depends on cognitive variables as evidenced by Hyman's (1973) two studies on cognitive strategies. In both studies, cognitive treatment was found to be more effective than desensitization alone. In one of these studies it was hypothesised that successful treatment of anxious subjects is due to the component of threat-reducing coping strategy in the treatment variable. The study compared the effectiveness of systematic desensitization, relaxation, cognitive rehearsal and no training. Cognitive rehearsal consisted of visualizations without relaxation. It was found that subjects that improved more in dealing with a threatening situation in a film were those in a cognitive rehearsal group. The group that received relaxation alone did not show improvement. This shows the effect that cognitions have in mathematics anxiety reduction research.

Lazarus (Thorpe & Olson, 1990) recommended that clinicians attend to seven modalities of client functioning viz. Behaviour, Affect, Sensation Imagery, Cognition, Interpersonal Relations and Drugs (given the acronym BASIC ID). He gave the cognitive modality prominence. In dealing with cognitions the client should be helped to deal with errors in the form of thinking and not just the subject content. He stressed the need to correct misinformation and illogical thinking for the client to understand the error and how to correct it. Wolpe (in Thorpe & Olson, 1990) refers to this form of cognitive restructuring as 'correcting misconceptions'. Cognitive restructuring procedures are said to give the client responsibility for self management and not to be treated as a passive consumer.

Goldfried (1980) criticises the use of systematic desensitization for placing the client in a passive role. He holds that the client should not be protected from anxiety but rather be encouraged to accept anxiety and learn to cope with it in the real world.

Desensitization as used in the pilot study, as explained above, does not seem to be sufficient when applied on its own. Therefore, the cognitive therapy approach used in the present study can be a valuable extension of such a relaxation technique for more success in dealing with the construct in question.

Mitchell (1984) categorises causes of anxiety into physical, cognitive and psycho-behavioural aspects. On cognitive aspects he argues that what one thinks, depends on one's beliefs and expectations and this influences behaviour. Similarly Bateson (in Searight & Openlander, 1972) states that all human beings have a world view which determines what is perceived and guides behaviour. An individual's subsequent behaviour at a given time, is thus determined by his/her perception of an event and the meaning attached to the event and not by the event itself (Bateson, in van Staden, 1989). Following this supposition, the inability to think and function creatively during mathematics problem solving could be viewed as the result of negative perceptions about one's ability.

A change in an individual's belief system is likely to result in an altered and *more appropriate set of behaviours*. Constructivist theory holds that each of us carries within himself/herself world views and beliefs that not only organise the "raw reality", but organise our behaviour on the assumptions that "things are the way they are" (Sluski, 1983).

The strength of beliefs in directing action was illustrated by Furman & Ahola (1988) in their "seven illusions" in therapy. They argue that most therapists feel that their ideas have objective validity, and much as they can agree with their colleagues that there is no one way towards solving a problem, therapists nevertheless tend to cling to their beliefs when it comes to treating particular clients.

In changing behaviour according to the above constructivistic perspective, psychologists need to focus on changing people's beliefs. According to Kelly (Efran & Lukens, 1988), change is possible as "whatever exists can be reconstrued". Bateson (1972) in his "self-healing tautology" holds that substantial change can occur with a relatively innocuous shift in an individual's construction of reality. He likens that to the effect of a key change on a musical composition (a minor adjustment to a dramatical alteration of the entire sound and playing of the melody).

Meichenbaum (1977) holds that the only way to change cognitive structure is to learn a new "world-skill" such as listening to one's own internal dialogue. He maintains that behaviour change occurs through a sequence of mediating processes that involve interaction of inner speech, cognitive structures and behaviour. The outcome of this interaction is manifested in three phases:

1. self-observation
2. starting of a new internal dialogue
3. learning a new skill.

Meichenbaum (1977) maintains that the internalization of inner speech makes an individual become capable of thinking before acting. This is done in the place of automatic behaviour that would otherwise occur as a result

of held beliefs. Internal dialogue thus equips an individual with coping skills that are generalized to all situations.

A study on cognitions reveals that high and low mathematics anxious people differ in their overall evaluation or set towards mathematics and not in actual cognitions towards mathematics. This study further suggests that intervention should be focussed on a change in overall evaluation rather than concentrate on specific statements uttered during the problem solving process (Fulkerson, Galassi & Galassi, 1984).

An increase in overall self-confidence and the ability to manage anxiety in a variety of situations, were reported to be high among a group that underwent a course on "mathematics without fear" (Shodahl & Diers, 1984). The researchers postulate that the ability to manage anxiety happened as a result of students' realization of their emotional "block", particularly as it relates to the immobilising feelings of anxiety.

The technique followed in this present study aims at helping the mathematics anxious develop coping skills which might help improve their outlook towards mathematics and other related fields of study. The mathematics anxious will likely listen to their destructive self talk, to discuss the implications thereof and to restructure those statements in order to reduce their anxieties and thus engage in more appropriate learning behaviours. Maturana (in Efran et.al., 1985) holds that no one can change an organism, but an environment can be created in which individuals can thrive and change themselves. In this study, a non-threatening environment was created by visualizing the supportive others during imagery and group sharing sessions.

Research has established that some individuals tend to perform better when they experience some anxiety. This emerged from "inverted-u" research which holds that too much or too little anxiety can impair performance while an optimal level of stress, can enhance performance. When performance is graphed against levels of stress the "inverted-u" or bell-shaped curve is observed for most individuals. So, as a consequence of too much anxiety an individual might experience a mental block (forgetting the content) or confusion (inability to co-ordinate thought). Furthermore, the individual might experience or be hindered by physiological difficulties such as rapid/shallow breathing, vomiting, trembling, cold and sweaty hands, muscle tension, heart pounding, fast heart rate, inappropriate laughing and even experience black-out (Rossi, & Seiler, 1990).

Techniques found to be useful in reducing anxiety are cognitive-restructuring, systematic desensitization, biofeedback, hypnosis and assertiveness training. The choice of a particular technique to be used should be made in accordance with specific individual needs and personal characteristics. Research indicates that whilst any method can bring about change, the results can be significantly increased by using a therapeutic treatment most effective in dealing with the particular needs of a person (Rossi & Seiler, 1990).

Hypnosis, whether individually or group instructed, primarily meets the needs of an individual on the terms that they themselves propose. A person's attention is fixated through adequate respect for and utilization of their method of presenting the problem to their own inner processes of mental functioning (Erickson in Rossi, 1990). Self image thinking is a hypnotic technique which specifically focused on individual needs in the present study.

This study is aimed at addressing the individual's mathematical world view, i.e. the perspective with which he/she approaches mathematics and mathematical tasks (Schoenfeld in McLeod, 1989, p.77). The individual, in this case, is thought to be unable to solve problems because of the presence of non-cognitive and metacognitive factors that inhibit the appropriate utilization of his/her knowledge (McLeod, 1989).

Tobias (1978) postulated that people who have difficulty in mathematics problem solving engaged in negative self-talk which is assumed to interfere with learning mathematics, arouses anxiety and inhibits problem solving.

In summary, an individual who is experiencing mathematics anxiety is assumed to be the victim of his/her own negative beliefs. This anxiety can possibly be reduced by a change in those beliefs that led to the anxiety. The technique to be used is aimed at equipping the client with skills that can be applied to specific needs.

Literature reviewed holds that beliefs direct actions making people unaware of what they say to themselves. Belief systems can be changed with relative ease, thus leading to a positive change in one's perception. Non-threatening and supportive environments were found to be important factors for such change in perception.

Chapter 3 will focus on the operational definitions of the concepts used in the study, formulation of hypotheses and the method of enquiry.

CHAPTER 3

3.1 INTRODUCTION

Mathematics anxiety is a construct that can be dealt with therapeutically, using clinical intervention (Mitchell, 1988). Evaluation of the effectiveness of such intervention is more valid if it is done in a single case experimental design (Kazdin, 1990). Flaws with such a design, however, can be avoided by using pre-test/post-test design (Haimson & Eheuben, 1985).

This study was aimed at addressing psychological problems inherent in the teaching and learning of mathematics. These problems have received less cognisance in the past since problems in mathematics learning have always been associated with mental ability in handling mathematics (McLeod, 1989).

This study focussed on changing the perception individuals have of their ability in mathematics problem solving. Use was made of self-image-thinking enhancement, cognitive restructuring with further assessment of anxiety reduction. The latter was hypothesised to be an outcome of the envisaged treatment.

3.2 DEFINITION OF CONCEPTS

The following are operational definitions of concepts as used in the study:

3.2.1 MATHEMATICS ANXIETY

This refers to a "block" experienced during mathematics problem-solving

assumed to be a learned construct that can be unlearned. Operationally anxiety is the expressed fear to deal with numbers and mathematics situations as expressed on a mathematics anxiety rating scale (MARS). A high score indicates high anxiety associated with perceptions about one's mathematical ability.

3.2.2 SELF-IMAGE THINKING

This is a technique used to enhance individual self-image thinking by drawing strengths from the experiences in the past. This can be used to reconstruct one's perceptions about oneself during mathematics problem-solving.

3.2.3 LEVEL OF ANXIETY

Self-reported rating about feelings of physical tension experienced by subjects when confronted with a mathematics situation. The mathematics anxiety rating scale score will be an indicator for such anxiety.

3.2.4 INDIVIDUAL PERCEPTIONS

These refer to beliefs an individual has about him/herself that may affect his/her behaviour during mathematics problem-solving.

3.2.5 MATHEMATICS ABILITY

Following the constructivistic perspective, mathematics ability in this study is construed as referring to the individual's perceptions of his/her ability to do mathematics. This will be assessed through level of confidence in handling a mathematics problem, as inferred from self reports and non-verbal behaviour during problem-solving.

3.3 FORMULATION OF HYPOTHESIS

The hypothesis tested states :

"change in perception about one's perceived inability during mathematics problem-solving reduces anxiety, leading to an improvement in confidence and ability to handle the task".

3.4 METHODOLOGY

3.4.1 THE SAMPLE

Students enrolled for a statistics course in psychology who voluntarily seek help with problems experienced in statistics, were used in the study. Forms of consent to participate were signed by each participant.

3.4.2 SAMPLING PROCEDURE AND RATIONALE

An independent variable with a classification factor (mathematics anxiety) could not be avoided since the researcher had an ethical obligation to use individuals who had anxiety prior to the study and not to expose people to anxiety just for the sake of the study (Huysamen, 1985).

Volunteers among individuals identified as mathematics anxious were used in the study. These were identified, using a rating scale and verbal descriptions.

3.4.3 METHOD OF DATA COLLECTION

3.4.3.1 The Process

Data was collected using pre-test/post-test treatment design.

- (a) Pre-test : data was collected as baseline scores to give pre-test verbal descriptions of the participant's feelings towards mathematics during problem-solving. Data was also collected for level of anxiety and confidence prior to the treatment.
- (b) Treatment process : data collected during the treatment process include self-reports about one's perception of oneself during problem-solving at different stages of treatment.
- (c) Post-test : data was collected as post-treatment scores on verbal descriptions, level of anxiety and confidence.

3.4.3.2 Instruments

A *Assessment Instruments*

A1 *Mars*

This is a mathematics anxiety rating scale developed by Richardson & Suinn (1972). Subjects are required to rate themselves on a 1-5 point scale on the level of anxiety they would experience when dealing with a given life situation requiring the use of numbers. A high score of 150 and above indicates anxiety.

Suinn & Edwards (1972) report a split half reliability of .90 and internal consistency of .96 on the instrument. Construct validity is also reported adequate. The Mars is hence viewed as being adequately reliable to measure anxiety. There are 98 items covering diverse aspect pertaining to anxiety in dealing with numbers. This makes the scale very appropriate for use with the kind of sample in this study (that is people who experience fear that emanates from lack of confidence in handling figures which disappears with time as they come to realise that they can handle figures afterall).

B *Therapeutic Techniques*

B1 *Self-image thinking*

This is a hypnotic technique. The subjects are directed to imagine scenes in their past in which they were successful at some task. The participants are then directed to pick on a significant person from that scene. An anxiety provoking situation will follow and the subjects will be directed using indirect suggestions to use the support of the "*significant other*" that they picked whilst imagining a pleasant scene. This is aimed at using the pleasant imagined support provided by the 'significant other' to counteract the unpleasant feelings of anxiety. The subjects can hence learn to associate anxiety reduction with the presence of the supportive other and internalise that skill for generalisation to other similar situations. Use is also made of positive self-talk statements to boost the image of the participant during imagery.

B2 *Cognitive restructuring*

Discussion focusses on feelings of individual subjects about their ability to solve mathematics problems. All subjects are asked to write their responses about their feelings towards handling problems in mathematics. Subjects are then asked to indicate in the next session how they view the effect of those feelings during a mathematics problem-solving process, i.e. whether as being a hindrance or a facilitative or reflection of their abilities.

The aim of the imagery exercises is to replace negative statements with positive ones.

3.5 *PROCEDURE*

SESSION 1

1. Identification of the mathematics anxious was done as follows :

- (i) Self-reports of feelings of anxiety and use of the criterion set by Cope (1988) who identified the mathematics anxious by the use of emotional words in describing their feelings when the word "mathematics" is mentioned in contrast to the use of mathematical words by the non-anxious.
- (ii) *Mathematics anxiety rating scale* - a high score indicates anxiety. Administration takes 30 minutes.

2. A mathematics problem was then presented and the following noted through a one-way mirror and video :

- first reaction
- whether the subject first reads to understand
- making of diagrams
- number of times a new method is tried
- perseverance
- solution
- time taken

The participants were interviewed on their perceived feelings and views about their ability to solve the problem. The subject gave the answers as requested in the problem.

3. Self-report forms were completed on :

- participant's rating of his/her confidence whilst handling the problem;
- the participants' self observation.

SESSION 2

1. Review of the self-observation form was done by the participants. They completed the second column, indicating how they feel and what each statement does to their progress in solving the problem.
2. Imagery session was conducted with the focus on training in relaxation and imagery. This session concentrated on the enhanced image and the use of the significant other to reduce anxiety. (See Appendix B).

SESSIONS 3 AND 4

1. Imagery session

Repetition of step 2 of session 2 was done for more practice in muscle relaxation training and imagery.

SESSION 5

1. Imagery session with focus on restructuring of thoughts.

SESSION 6

1. Imagery session as in session 5
2. Group session
3. Imagery session with restructuring

SESSION 7

Post-testing

1. Problem-solving session as in session 1 step 2 was conducted.
2. Self-report forms about confidence were completed.
3. MARS was then administered.

3.6 ANALYSIS OF RESEARCH RESULTS

A pre-test/post-test experimental design was employed. A t-test for matched pairs was used on the MARS scores and on a (1-20) self rating scale for confidence. Each individual was used as his/her control thereby enhancing internal validity.

The aim was to investigate the possibility of any significant differences in the level of anxiety and self-confidence before and after treatment.

The difference was construed as an indication that the technique used increased ability thus confirming the effect of anxiety reduction during problem-solving. .05 level of significance was used.

Chapter 4 follows with a focus on data analysis. This is a descriptive outlay of data followed by qualitative and quantitative analysis of the results.

CHAPTER 4

DATA ANALYSIS

4.1 THE SAMPLE

The sample consisted of 12 volunteers from a statistics course for psychology at the University of Zululand. The participants were all identified mathematics anxious. The independent variable is a classification factor. The participants are, for ethical reasons, selected from the category of anxious people prior to the study and not mechanically exposed to anxiety provoking situations in order to qualify for participation (Huysamen, 1987).

4.2 DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

Demographic information about the participants are summarized in the following table :

Table 4.2.1			
Participant	Gender	HLOE in Math	MARS pre-test
A	F	Std 8	365
B	F	Std 8	213
C	F	Std 8	277
D	F	Std 8	260
E	M	Std 8	278
F	F	Std 8	250
G	F	Std 10	349
H	M	Std 8	377
I	F	Std 8	292
J	F	Std 8	279
K	F	Std 8	260
L	F	Std 10	266
(HLOE - Highest level of education)			

For purposes of quantitative analysis, a mathematics anxiety rating scale was also used to set up a baseline for the level of anxiety before treatment. A score of 150 is indicative of anxiety as obtained using American norms (Richardson & Suinn, 1972).

Baseline scores were recorded the level of confidence and beliefs about oneself in problem-solving (table 4.2.2).

Pre-test descriptions of one's beliefs about doing mathematics were recorded (Section 4.3) and qualitatively analysed by themes (Table 4.2.3).

Table 4.2.2				
Participant	MARS	Confidence rating	Beliefs about self	Beliefs seen facilitatives as hindrance
A	365	4	Negative	H
B	213	13	Negative	H
C	277	4	Negative	H
D	260	15	Negative	H
E	278	11	Negative	H
F	250	5	Negative	H
G	349	3	Negative	H
H	377	7	Negative	H
I	292	4	Negative	H
J	279	6	Negative	H
K	260	5	Negative	H
L	266	6	Negative	H

TABLE 4.3 : PRE-TEST VERBAL DESCRIPTIONS BY THEMES	
THEMES	PARTICIPANTS THAT EXPRESSED THE FEELING
Lack of confidence	A, E, I, L
Poor self-concept	C, H, J, L
Anxiety	A, B, D, E, F, G, H, I, J, L
Overgeneralization	B, C, D
Self-doubt	D, E, H
Seeking solutions	E, H, K

4.3 SUMMARY OF PRE-TEST VERBAL DESCRIPTIONS

The participants expressed feelings of discouragement, fear and defeat. The common themes that emerged can be summarised as follows :

4.3.1 THEME : LACK OF CONFIDENCE

Participants A, E, I, L expressed lack of confidence as a feeling experienced in dealing with mathematics. This can be substantiated in the following quotations:

Participant A *".....The very first thing that comes to my mind when I hear the word statistics, is 'you cannot do it'".*

Participant E *".....Willingness to study statistics is ??? but the basic problem is that I do not become sure about what I studied. In the first test I answered some questions well, but I was not satisfied about how I answered".*

Participant I *"I can't pass statistics because*
- I did not do it up till Standard 10
- I do not know mathematics
- It is difficult
- I take time to grasp....."

Participant L *".....I think I lost my confidence when I failed matric*
for the first time in life due to my poor performance in
mathematics".

This shows that the participants feel that their performance is affected by their lack of confidence.

4.3.2 THEME : ANXIETY

Participants A, B, D, E, F, G, H, I, J, L expressed anxiety. Most participants, as noted above, expressed anxiety as a feeling they have when mathematics is mentioned to them.

Participant A *"Each time I work out problems and commit an error,*
anxiety builds up more than ever and confuses me".

Participant B *"The fear makes everything strange to me, even the*
lecturer becomes very strange."

Participant D *"I become scared when I have to write tests and I*
confuse formulas".

Participant E *"This makes me anxious that will I reach the*
lecturer's expectations? I would like to remove the

feeling that I won't reach my performance expectations.....".

Participant F *"Anything with figures make me scared. Whenever I come to the lecture I become scared. I worry about whether I will understand what will be taught that day.I was always afraid of figures - hence I took general stream"*

Participant G *"My major problem is fear because of what the voice says to me it always tells me I won't make it in a statistics class".*

Participant H *"What stresses me is the mentioning of test dates. As the days go nearer, the bigger my body is engulfed by stress".*

Participant I *".....I can't pass it because it deals with numbers and counting to which I am poor".*

Participant J *"Mathematics, the very word sends shivers up my spine".*

Participant K *"I still tell myself or fear that in a test I won't make it. I just fear that I might not be able to work out those problems in a test."*

4.3.3 THEME : OVERGENERALIZATION

This was expressed by participants B, C and D.

Participant B *"I do not like the way we were divided according to*

streams in Mathematics and general. I had liking for Mathematics. It was killed. Even now I am like that."

Participant C *"Up to now I avoid anything that would need me to calculate or anything that has to do with numbers".*

Participant D *".....I am convinced that it is not easy for me to understand because I do not have mathematics background".*

4.3.4 THEME : SELF-DOUBT

This was expressed by participants D, E, and H.

Participant D *".....I doubt myself that I can perform well in statistics".*

Participant E *".....Will I reach the lecturer's expectations the way I answer?*

Participant H *".....I believe that mine (problem) is more complicated than theirs."*

4.3.5 THEME : SOLUTIONS

Participants E and H, K expressed their needs to have solutions to the problems they experience with mathematics.

Participant E Expressed usefulness of having exchange of ideas in group discussions

Participant H Suggests use of tutorials to deal with his fears

Participant K Suggests use of honours students for tutorials

4.4 TREATMENT SCORES

Participants were given a problem to solve (Appendix C) and were asked to express their feelings as manifested in self-talk at the sight of the problem, how they perceive that feeling and the positive self-talk statements they think would be helpful. The self-talk statements are recorded in the table below.

TABLE 4.5.1 : COGNITIVE RESTRUCTURING OF SELF-TALK STATEMENTS				
Participant	Negative self-talk statements	Perception of feeling	Restructuring statement	Perception Restructuring of statement
A	I am not in a position to attempt problems without fear.	Hindrance	I think I can attempt the problem without fear.	Facilitative
	I seem not to be sure as to whether I am answering the question.	Hindrance	I think I should read the question many times to be sure what is asked and thus answer relevantly.	Facilitative
	I always get nervous if I read the question and not understand what is required or asked.	Hindrance	I should read with understanding so as not to be nervous.	Facilitative
	I am always anxious and panicking when solving problems.	Hindrance	I know what is asked and there is no reason to be nervous and panicking.	Facilitative

Participant	Negative self-talk statements	Perception of feeling	Restructuring statement	Perception Restructuring of statement
B	I am forgetful	Hindrance	I am not forgetful	Facilitative
	I am inaccurate	Hindrance	I am accurate	Facilitative
	I am careless	Hindrance	I am careful	Facilitative
	I am a slow learner	Hindrance	I am a slow/fast??? learner	Facilitative
	I am not fast in writing	Hindrance	I am fast in writing	Facilitative
C	Foolish failing to do simple things	Hindrance	I should give no room for the failure	Facilitative
	Dull	Hindrance	I am not dull	Facilitative
	Poor in figures	Hindrance	I am good in figures	Facilitative
	Not coping with my work	Hindrance	I am going to do a lot of practice	Facilitative
	I hate myself for being a failure	Hindrance	I love myself for being a good achiever	Facilitative

Participant	Negative self-talk statements	Perception of feeling	Restructuring statement	Perception Restructuring of statement
D	Convinced that problems in statistics is difficult	Hindrance	Full dedication will make me able to solve problems in statistics easily	Facilitative
	I am dull in calculating numbers	Hindrance	Intrinsic motivation can help me calculate and numbers	Facilitative
	I am not good in sums that include x and y	Hindrance	I must overcome anxiety in dealing with x and y	Facilitative
	I have negative attitude towards problems dealing with numbers	Hindrance	I must be positive towards problems dealing with numbers	Facilitative
	I am not intelligent	Hindrance	I am intelligent	Facilitative
E	I doubt myself	Hindrance	I don't doubt myself	Facilitative
	I am anxious	Hindrance	I am not anxious	Facilitative
	I am not competent	Hindrance	I am competent	Facilitative
	I am not sure that I'll pass the way I want	Hindrance	I am sure I will pass the way I want	Facilitative

Participant	Negative self-talk statement	Perception of feeling	Restructuring statement	Perception Restructuring statement
F	I fear of being wrong all the time	Hindrance	I feel I could be right even if not always	Facilitative
	I fear not being able to do something about a problem	Hindrance	I think I can do something about a problem	Facilitative
	I am wrong	Hindrance	I could be right	Facilitative
	I am not competent	Hindrance	I feel I need to be competent	Facilitative
	I am scared	Hindrance	I am not scared	Facilitative
	I am not in control	Hindrance	I am in control	Facilitative
	I have a blocked mind	Hindrance	My mind should be alert to reproduce what I have been taught	Facilitative
	I am dull	Hindrance	I am brilliant	Facilitative

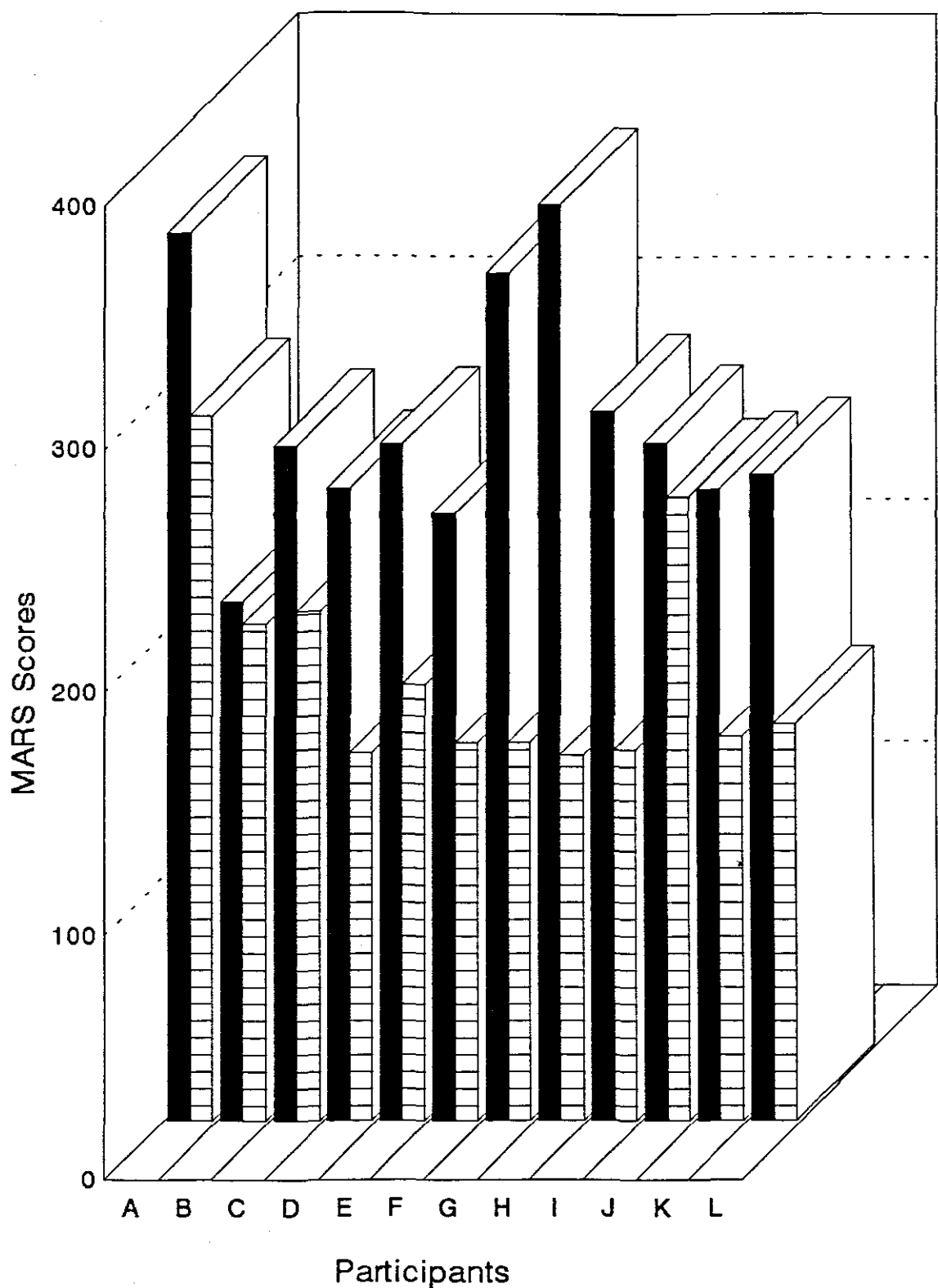
Participant	Negative self-talk statements	Perception of feeling	Restructuring statement	Perception Restructuring of statement
G	I am scared of statistics - calculation is a good problem	Hindrance	I must get rid of this anxiety and relax	Facilitative
	When confronted with statistics, I am never sure of myself	Hindrance	I must learn to be confident	Facilitative
	<i>This cause me anxiety</i>	<i>Hindrance</i>	<i>I must relax and master statistics like I have mastered History because I want to continue with Psychology</i>	Facilitative
H	Fearful	Hindrance	I wish I could stop fear that attacks me	Facilitative
	Stupid	Hindrance	I wish I could have a lot of confidence	Facilitative
	Hopeless Unsure - never get it right	Hindrance	I wish I could have more hope of working out problems	Facilitative
	Guilty of failing to cope	Hindrance	I wish I could not be guilty and see myself as a failure	Facilitative

4.5 POST-TEST SCORES

Scores for the post-test on anxiety, confidence and beliefs about oneself during problem-solving, are recorded in the table below (Table 4.5.1).

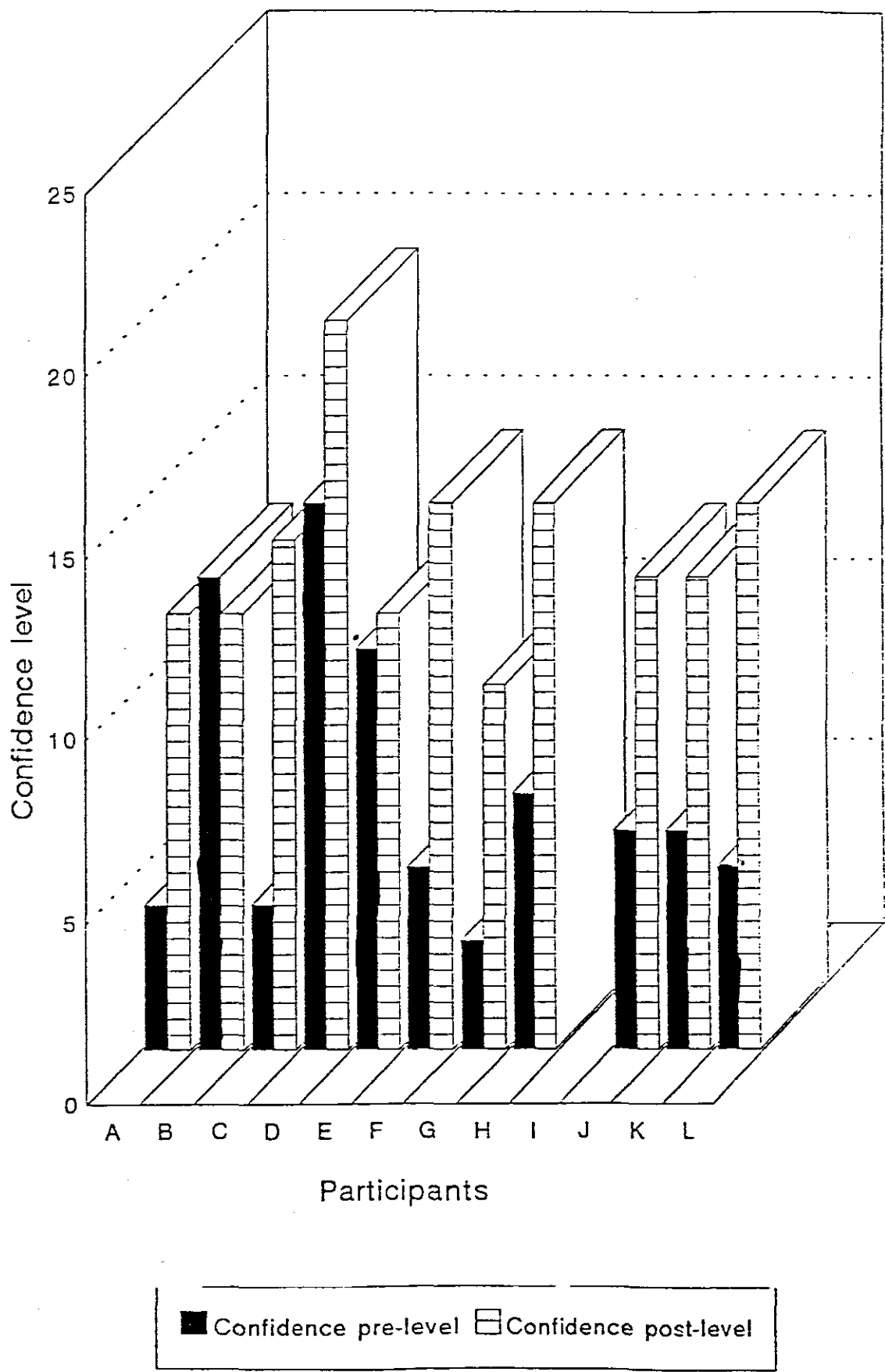
The change in anxiety and confidence are further illustrated graphically (figures 1 and 2).

FIGURE 1 - GRAPHICAL ANALYSIS (ANXIETY)



■ Mars Pre-test □ Mars Post-test

FIGURE 2 - GRAPHICAL ANALYSIS (CONFIDENCE)



The post-test verbal descriptions are recorded in Appendix D and further analysed by themes on table 4.5.2.

**TABLE 4.5.1 : POST-TEST SCORES FOR ANXIETY,
CONFIDENCE AND
BELIEFS IN ONESELF DURING PROBLEM-SOLVING**

Participants	MARS	Confidence	Beliefs	Beliefs seen as facilitative or as hindrance
A	290	12	+	F
B	226	12	+	F
C	208	14	+	F
D	151	20	+	F
E	179	12	+	F
F	155	15	+	F
G	155	10	+	F
H	150	15	+	F
I	152	12	+	F
J	257	13	+	F
K	158	13	+	F
L	163	15	1	F

Table 4.5.2 POST-TEST VERBAL DESCRIPTIONS BY THEMES	
THEMES	PARTICIPANTS
Confidence	A, B, C, D, F, G, H, I,
Reduced anxiety	A, D, E, G,
Coping and being in control	B, F, L
Comparatively better	B, E, G
Thankfulness	A, B, C, D, E, H, J, L
Change in attitude	A, B, C, D
High sense of achievement	C, H

4.6 SUMMARY : POST-TEST VERBAL DESCRIPTIONS SUMMARISED BY THEMES AND SUBSTANTIATED

The participants expressed general satisfaction and attainment of coping strategies. They attribute that to the program they went through. The following are the common themes that emerged and examples quoted to substantiate.

4.6.1 THEME : CONFIDENCE

Participants A, B, C, D, E, F, G, H, I expressed feeling of confidence which developed after undergoing the program.

For example :

Participant A *".....These days I feel much better and more confident when working with figures. I no longer feel anxious when I cross-check my additions".*

Participant B *"I have no ability problem but my previous learning environment had made me unsure of myself. I have now regained confidence".*

Participant C *"I have confidence in everything I do. I can attempt any problem in mathematics."*

Participant D *"I have developed self rightness due to self-confidence. Before this program I was very anxious to do anything in front of people. Actually I lacked confidence. Now I am much better".*

Participant F *"Presently I feel I can take another mathematics class and cope. After all, working with figures is interesting".*

Participant G *"I enjoy working with figures - it is very interesting and challenging. It is easy to see when you have lost the right track as long as you know what you are doing".*

Participant H *"Also my confidence was boosted as I was not alone on that program".*

4.6.2 THEME : REDUCED ANXIETY

Participant A *"I no longer feel anxious".*

Participant D *"..... "As I am writing examination I am not scared since I know and convinced that I am intelligent. Anxiety is no longer a hindrance to my success".*

Participant E *"I see that my anxiety has disappeared".*

Participant G *"I am now no longer afraid of numbers as it was before. I could participate in this program. I was very much scared of numbers, the moment I see them, I could shiver and sometimes cry."*

Participant J *"I no longer feel anxious when I have to do calculations".*

4.6.3 THEME : COPING AND BEING IN CONTROL

Participants B, F, L expressed the feeling of being in control and having developed ways of coping with their anxiety.

Participant B *"I am now in control of my feelings."*

Participant F *".....but then I learned how to control my anxiety. I learned that anxiety can be controlled by one doing thorough preparation for the tasks that lay ahead."*

Participant L *"..... Before I start, a little of anxiety develops, but the minute I remind myself to relax and not to panic, I find everything easy."*

4.6.4 THEME : COMPARATIVELY BETTER

Participants B, E, G expressed feeling better as compared to the first semester.

Participant B *"I am better than last semester."*

Participant E *"..... I got better test grade as compared with the first semester."*

Participant G *"..... I am now even able to calculate my change after buying something; before I could not."*

4.6.5 THEME : THANKFULNESS

Participants who expressed feelings in this theme, were thankful to have had an opportunity to undergo such a program and thus attribute their change of feelings to the program.

Participant A *"I must sincerely say that everything that I now have in statistics in particular, is due to the program I have undergone."*

Participant B *"Thank you for the opportunity we were given to express our feelings about anxiety concerning statistics. I thank you for the hand you have given to lift me up."*

Participant C *"Thank you for the therapy given to us."*

Participant D *".....Such programs should be promoted to help students with anxiety. Thank you for the good program which uplifted my style of life and performance."*

Participant G *"..... you were so helpful and wonderful to me - thank you very much."*

Participant H *"Now I am fine. What we did last semester, helped me a lot."*

Participant J *"First of all I would like to thank you, Mrs. Mashego. By attending the program, really helped me a lot."*

Participant L *"Yes, all the improvements are because of the programme I undertook."*

4.6.6 THEME : CHANGE OF ATTITUDE

Participants A, B, C, D expressed feelings of change in attitude towards figures. They expressed it differently as follows :

Participant A *"I believe that my attitude towards statistics has improved a lot as I usually want to try sums on my own and feel great when I get them right."*

Participant B *"My attitude has become positive towards calculations."*

Participant C *"..... I am just positive with mathematics and I don't think I would ever have negative feelings in anything."*

Participant D *".....Since I started this program, my attitude and behaviour changed."*

4.6.7 THEME : HIGH SENSE OF ACHIEVEMENT

Participant C *"Really, I have achieved a lot."*

Participant H *"I don't feel as much anxiety as I used to. Of course I still experience it, but like a normal person and finally I conquered it."*

4.7 QUALITATIVE ANALYSIS

The pilot study was lacking in that it did not use verbal descriptions of the participants which is captured in the present study. This was useful in that it brings to the reader the actual verbalizations of the participants making their feelings openly known.

The verbal descriptions provided the qualitative analysis and this is summarised in Sections 4.3 and 4.6 and Tables 4.2.3 and 4.5.2.

4.8 QUANTITATIVE ANALYSIS AND RESULTS

The present study used twelve subjects and only four were engaged in the pilot study. This made it possible to do test for statistical significance, which was not possible in the pilot study. The present study was in that sense statistically superior to the pilot study.

The following results were obtained in the quantitative analysis of data.

Table 4.5.3 QUANTITATIVE ANALYSIS

	ANXIETY		CONFIDENCE		BELIEFS	
Participant	Pre-test	Post-test	Pre	Post	Pre	Post
A	365	290	4	12	-	+
B	213	204	13	12	-	+
C	277	209	4	14	-	+
D	260	151	15	20	-	+
E	278	179	11	12	-	+
F	250	155	5	15	-	+
G	349	155	3	10	-	+
H	377	150	7	15	-	+
** I	292	152			-	+
J	279	257	6	13	-	+
K	260	158	6	13	-	+
L	266	163	5	15	-	+
X	288.8	185.25	7.18	13.73	-	
t _x	5.76*		1.93*			

** Participant I dropped out.

* Significant at $\alpha = 0.05$.

ANXIETY

The results show that there is a significant difference in the level of anxiety before and after the treatment ($t(11) = 5.76$ $p < 0.05$).

CONFIDENCE

A significant different was found in the level of confidence before and after treatment ($t(11) = .1.93$, $p < 0.05$).

The discussion of these results is done in the next chapter (Chapter 5). It will cover the discussion of the results, the conclusion and recommendations that will include what can still be done for the future research.

CHAPTER 5

ON THE QUESTION OF TREATMENT EFFICACY

5.1 SUMMARY OF FINDINGS

The findings of the study show that there is a significant difference between the pre-test scores of the dependent variables (anxiety, confidence and beliefs about oneself) and the post-test scores.

The treatment techniques used were found to be effective. These techniques increased the participants' confidence, beliefs about themselves and their level of anxiety (Table 4.5.2 (post-test scores); on the graphs (Figure 1 and Figure 2) and verbal descriptions in Section 4.6). The participants at first saw themselves as being stupid, unable to cope and helpless. The participants rated themselves higher on the (1-100) point scale for confidence and low on the anxiety scale after treatment (anxiety: $t(11) = 5.76$, $p < 0.05$ and confidence : $t(11) = 1.93$, $p < 0.015$).

The participants beliefs were positive after the treatment program - these were changed from being seen as a hindrance to being facilitative. For example, from the qualitatively analysis participants G writes (pre-test verbalisation) "... whenever I am in a mathematics class or statistics, the voice tells me that I won't make it in such a way that I develop a negative attitude towards statistics ... moreover my major problem is fear because of what the voice says to me"; and in the post-test he writes : "... I enjoy working with figures, its very interesting and challenging, it is easy to see when you have lost the right track and you can start afresh and correct your

mistake within a very short space of time as long as you know what you are doing. I was very much scared of numbers, the moment I see them I could shiver and sometimes cry but now I look at them with a positive attitude. I am now even able to calculate my change after buying something. Before, I could not."

The other responses (Appendix D), all show a positive change from feelings of helplessness to being in control after treatment.

CONCLUSION

PROBLEM PREMISE

The problem investigated in this study is the role of negative perception on students' abilities to perform in mathematics problem-solving. Specifically, the focus of the study was on the fact that beliefs and cognitions determine behaviour. Negative beliefs about oneself seem to be at the root of poor performance in mathematics problem-solving.

Cognitive restructuring was used to help participants change their negative beliefs regarding mathematics and other figures-related subjects, through looking at these beliefs hindering and/or facilitative nature. The program used was effective in changing the beliefs and that effected change in problem-solving.

In a single case experimental design used in the pilot study, the subject is tested over a period of time, and allowed to relax in between the experimentation sessions. The baseline score after relaxation period should ideally be similar to the initial baseline. This is not easily attainable without

carry-over effect (Kazdin, 1990). Such confounding by the carry-over effect was dealt with in this study by using pretest-posttest design.

The use of qualitative gathering of data and analysis provided actual verbal descriptions of the participants. These were validated quantitatively in that changes described were found to be statistically significant. A combination of these two methods of analysis was found useful in validating the results.

The time at which the study was done, was opportune because the students had already experienced the anxiety on the course and the treatment received was done prior to the mid-year exams and this was tested immediately. Following are posttest responses which express the participants' feelings in the course too:

Participant D: "I thank this program and the lecturer concerned because she helped me to perform better in June examinations inspite of the low DP's I had.

Participant B: This year in statistics I have turned a new leaf. I am now in control of my feelings. I hope I'll pass this semester.

Participant A: I believe that my attitude towards statistics as such has improved a lot as I usually want to try sums on my own and feel great if I get them right. I must sincerely say that everything that I have in statistics in particular is due to the program I have undergone.

Participant J: "Yes all the improvements are because of the programme I undertook. It shows that there is nothing mysterious in statistics once you calm down and tell yourself that you'll work it out, it does happen and

you are able to remember what you have practiced thoroughly.

Verbal descriptions were validated by student's performance in the final year examinations. All the participants showed improvement in their statistics examination marks with means ranging from $\bar{X} = \pm 40$ to $\bar{X} = \pm 53$. These marks were not included in the study and are only used in here to show the little change that occurred in the students performance. Studies cited in the literature review report no significance of correlation between mathematics anxiety and performance (Szetela, 1973). Improvement in this study may be attributed to some other factors which were not controlled for in this study, for example the exam was not the same for pre and post testing. This may be looked into for future research. Perhaps the use of longitudinal-study to follow up on the subjects can be employed.

The drop in MARS scores is an indication of anxiety reduction (Suinn, 1972). Subjects used in this study were well-above 200 in Mars pretest ($\bar{X} = 288.8$) and below 200 in MARS post-test ($\bar{X} = 185.25$).

MARS is said to be a valuable assessment instrument for use in psychotherapy research and mathematics anxiety in particular (Richardson & Suinn, 1972). These authors hold that any significant reduction in MARS scores following a treatment intervention is not due to retesting or the influence of intervening events. In the three studies they conducted a decrease in mathematics anxiety following behaviour therapy was shown. In the first study the decrease was from $\bar{X} = 238.73$ to $\bar{X} = 179.12$. In the second study the mean for pre-therapy score was 284.09 and the post-therapy score was 185.58. In the third study the decrease was from 256.87 to 193.29. All the decreases were statistically significant for construct validity for MARS. Subjects in this study, as noted above, had

a mean decrease in MARS from $\bar{X} = 288$ to $\bar{X} = 185.25$

The use of the cut-off score of 150 obtained using American norms (Richardson & Suinn, 1972) can be misleading with this sample; focus should rather be on whether there is a decrease from pre-test to post-test score as suggested in the validation of this scale above. Norms for the present sample could be developed and could be useful for future research.

RECOMMENDATIONS

The use of cognitive restructuring is a useful technique for change of cognition in mathematics problem-solving. The cognitions held by students affect behaviour and only when these cognitions are positive, is an individual able to function maximally in problem-solving.

It is recommended that identification of students with anxiety be part of mathematics/related subjects teaching. These students should be advised to seek psychological help and be made to understand the dynamics involved in their state and performance in the subject. Students need to be well informed on how mathematics anxiety can affect people's learning in ways that are that are negative and counter-productive. The treatment program needs to run concurrently with the course being offered so that there can be direct application of the learned behaviour restructuring.

Mathematics clinics have been proposed as a way to deal with mathematics learning problems - with special reference to mathematics anxiety. The goal is to promote maximal mathematics learning (Engelhardt, 1985).

Tobias (1979) alleges that to deal with math anxiety one has to 're-enter' mathematics. Use can be made of videos, workshops and laboratories at the different centres that provide clinics for math anxiety. Full details about such clinics can be obtained from Tobias' (1979) work.

Ben-Jacobs (1986) organised a workshop during which he identified aspects that make people anxious. It was found that many people are affected by situations where they have to count change, balance the cheques, etc. Such situations make some people experience palpitations, sweaty palms and shaky hands. On the basis of these aspects, the workshop was constructed to provide proper learning environments which entailed relaxation, group support and mathematics skill training. The evaluation of the program by the participants showed increased interest in mathematics and suggestions were made for the inclusion of more mathematics skill training in the program. This showed that people can learn mathematics given proper learning environments.

It is efforts of this nature that are highly recommended towards helping people or students exhibiting fear for mathematics. Poor performance due to affective factors can thus be alleviated. This study advocates for such help *either in a structured clinic or informally run with the course.* This should help the teacher become involved in the students' holistic learning and participation in the course, and in this way promote better understanding of the course which brought nightmares in their academic lives.

For future research it would be useful to ascertain the state of the brain or general physiological well-being of the individuals during the process of changing from anxiety to being in control. It was hypothesised that only when the body becomes relaxed does the mind become creative, and this

occurs because the brain is synchronised (Elliot, 1983). Cognitive restructuring changes peoples' negative beliefs about themselves in performing certain tasks to being positive, and perhaps this might bring about calmness as they indulge in their learning. Future research could focus on the state of the brain during relaxation and cognitive restructuring and correlation of that state to creativity during problem solving.

The old disciplinarian method of using a stick when students experience difficulties with mathematics problem-solving has merely reinforced their negative perceptions of the subject. This research project indicates that teaching with sensitivity is by far a more appropriate method when teaching for success.

This study serves as a prelude towards a better understanding of the learning problems experienced by students of all backgrounds. The enquirer acknowledges and realises that much work still remains to be done as the study only scratched the surface.

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APPENDIX A

MATHEMATICS GAME PROBLEM : (TO SOLVE AND CREATE)

PROBLEM TO SOLVE

I am going to present to you a problem given in steps for you to solve. This is done by trying to guess what three numbers I am thinking of. There are clues to help you : *however, not all clues are true and this you have to figure out yourself and eliminate some of the clues if necessary to come up with a solution.*

Problem 1

1. All three numbers are factors of 60.
2. Two numbers are even and one is odd.
3. The sum of the three numbers is even.
4. The sum of the numbers is greater than 105.
5. The sum of the numbers is 47.

Problem 2

1. All three numbers are factors of 12.
2. None of the numbers is both even and prime.
3. All three numbers are odd.
4. The sum of the three numbers is 7.
5. One number is neither prime nor composite.
6. One number solves the equation : $x + 8 = 10$.
7. All of the numbers are greater than 2.
8. One number is 16.
9. One number is the smallest natural number.
10. Two of the numbers are even and one is odd.

PROBLEM TO CREATE

Create your own problem of the same type as those given above.

Write down your feelings about the task; everything should be written from the time you received the assignment until you submitted it.

Thank you very much for your cooperation.

APPENDIX B

IMAGERY SESSION

Close your eyes and fully experience the following scenes in your imagination :

1. Think of a day in the past when you had your image enhanced, when you felt good about yourself. Live that moment, explore the surrounding where it occurred, experience it fully, bring it back to the here and now and live it once more. Watch everything that happened around it, the people who came around and the discussions you might have had. Relax and completely enjoy it
2. Now focus on any person who was significant to you during the occasion you have just experienced, it can be anyone, a relative or an animal that is very close to you; it can be anything. Focus on that and experience the feeling you always have with that person around. Re-live the day, imagine the smell around and just relax and fully experience that.
3. Now I want to let that scene pass and allow the next scene to fill your imagination. I want you to think of a time when you were confronted with a problem in mathematics which you could not solve; explore that and imagine all the negative feelings you might have had about your inability, think about the situation again, all the negative feelings you might have had about your inability, think about the situation again, all the details around the occasion; the people around you, the books you had and everything that was happening around you. I want you to move a little further; imagine you are with a significant person you imagined earlier in this session; think of the support he/she would give you during this episode; think of the feeling he/she may instil in you; explore that slowly and experience it at the fullest. Now whilst experiencing that, I want you to focus on the problem

you were solving in mathematics and with the supportive other around you, think of how you can go about it, think of the support he would give you to work on the problem; focus more and more on the problem and the presence of the supportive other. If you think you are starting to feel more confident in solving the problem than you did in the beginning, raise your hand and continue to explore the situation.

4. If you are ready, I want you to try and come back to the here and you do not have to rush it; just take your time whilst being still fully relaxed to come to the here and now as I count from 5 to 1; whenever you are ready, 5.....4.....3.....2.....1. You may open your eyes.

APPENDIX C

PRE-TEST VERBAL DESCRIPTIONS

KEY FOR THE THEMES

THEMES	KEY
Lack of confidence	I
Poor self-concept	II
Anxiety	III
Overgeneralization	IV
Self doubt	V
Seeking solutions	VI
Negative attitude	VII

Participant	Verbal description	Theme
A	<p>The very first thing that comes to my mind when I hear the word "statistics" is "You cannot do it."</p> <p>I have a very negative attitude towards the subject but at the same time I think I was made not to believe in myself. I had a very nasty experience as a standard 4 pupil. I had this teacher who always used to compare me with my younger brother in as far as performance in class was concerned. She used to give me all the difficult sums to do on the board when the whole class was watching and I never got a single sum correct. Worst of all she would beat me and she finally left me disformed on one leg because of the beatings I used to receive. As such I have grown a phobia towards figures and formulas as such. Worst of all I realise that it sometimes occur that I become blocked when the lecturer is busy with a lesson. This leaves me more frustrated as I sometimes loose track of what the whole lesson was all about.</p>	I
	<p><i>I have also developed a negative low self-esteem. I do not have trust in myself and I never believe I can achieve anything good especially in statistics. I always need reassurance and moral support and what worries me most is that this will not be possible when writing tests and examinations. Because of this I tend to</i></p>	II
	<p><i>misunderstand or misinterpret questions as I tend not to understand at all. I also keep on worrying about at least obtaining a pass mark and this makes me more anxious than ever. Each time I work out problems and commit</i></p>	III

Participant	Verbal description	Theme
B	<p>an error, anxiety builds up more than ever and this confuses me. I sometimes feel it could be better for me to know how a question would be structured so that I can know exactly what is required of me after having memorized the formulas.</p> <p>I was made to believe that I am not good in figures and that I was hopeless. So I see statistics as difficult at times not interesting especially when I start to experience problems. I would be grateful.</p>	
	<p><i>I am confident naturally, but there is only one germ that made me inbetween; in my secondary school days I was not happy about the way we were divided according to streams of mathematics and general. We simple wrote a test and those who scored from 40% and below were told to do functional mathematics and general subjects, the rest mathematics. In standard 8 I was the only one who got a D symbol in Functional Mathematics. In standard 9 and 10 we did History and Geography. I had the liking of mathematics but it was killed. Even now I am like that.</i></p> <p>At times we loose better chances because of the way we are treated in our schools. Since then I had that fear which resulted in now knowing I can do better in calculations and solving problems. The most biggest problem is that I am not a fast absorber, I need a lot</p>	<p>IV</p> <p>III</p>

Participant	Verbal description	Theme
C	<p>of time to master any problem, for instance when I wrote the optional test I found myself better than I was then I was writing the first test.</p>	
	<p>The fear makes everything strange to me, even the lecturer becomes very strange. I feel the frank talk that has been stated, will make me feel part and parcel of statistics.</p>	III
	<p>To begin with as from high school level I got very much discouraged with my results in mathematics. As a result I ended up hating everything that involves statistics.</p>	
	<p>Up to now I avoid anything that would need me to calculate or anything that has to do with numbers. Most unfortunate enough I find it very difficult to wipe away the attitude I have with numbers. This leads me to hate Psychology as a whole. Numbers worried me and on top of everything I am now even worried that my Psychology would be left behind.</p> <p>I would suggest that if statistics should be optional to accommodate those who are poor in statistics like myself. I think research methodology should be the option.</p>	II

Participant	Verbal description	Theme
D	<p>I think statistics is the course to be done by people who have done mathematics up to standard 10. In fact I do not have negative attitudes towards it but I become scared when I have to write tests and I used to confuse formulas not because I do not know them. I used to remember all the formulas and do not know where and when to use them.</p>	III
	<p>I used to tell myself that the test is too difficult to pass it. This confusion of formulas leads to poor performance. I am convinced that it is not easy for me to understand because I do not have mathematics background. On top of that I am not familiar with figures. I tell myself that anything associated with figures is difficult.</p>	I V
	<p>Refusing to the above example I doubt myself that I can perform well in statistics.</p>	II
E	<p>Before attending a statistics class I thought that this study has less and more simple calculations. I told myself that I may encounter some problematic areas in the study. Then I told myself that I have to get assistance so as to feel comfortable with all that I do.</p>	

Participant	Verbal description	Theme
	<p>The mathematics background contributes in making me feel anxious but I don't accept that anxiety.</p>	
	<p>Willingness to study statistics is there but the basic problem is that I do not become sure about what I studied. Just as in the first test I knew that there are questions I answered well but the problem was that I was not satisfied about how I answered.</p>	II
	<p>I do not accept that I cannot understand but the problem is that will I reach the lecturer's expectations the way I answer. Therefore this makes me anxious in this study. I also do not like to hide to others that I do not understand well and pretend as if I understand. I study first and then tell someone about what I studied. Then that person can also contribute by telling me what he knows. That means I learn a lot by sharing knowledge with others.</p>	V I VI
	<p>I do not reject the study of statistics because of its relevance in the social sciences especially in social work.</p>	
	<p>I would like to remove the feeling that I won't be able to reach my performance expectations in this study. I know that I can perform well.</p>	III

Participant	Verbal description	Theme
	<p>What I want is to be competent and also to remove anxiety.</p> <p>I therefore recommend group work where I believe I can learn more. In class I understand somehow. I also understand when I am with someone who can discuss with me. I do not understand and if I perform well or bad I tell a friend or a class colleague about my performance. I am also able to predict my performance immediately after writing a test or exam. I hope that I will gain a lot in this program and come with a new feeling about myself and the study as such.</p>	VI
F	<p>I always referred anything with figures as Mathematics. Anything with figures made me scared. Whenever I come to a statistical lecture I get scared. When the lecture begins I always ask myself whether what we are going to be taught that day is it what I am going to understand and be able to tell other people?</p> <p>I am always optimistic when it comes to writing essays and telling other people anything I want to tell them except things that pertains to figures.</p> <p>When I was in high school I took the general stream</p>	III

Participant	Verbal description	Theme
G	because I was always afraid of figures. This does not mean I had an attitude towards figures but I was only scared to attempt anything with figures.	III
	What I really feel now is that if other people did it why can't I do it because it is not a question of knowing mathematics to be able to pass statistics but it is a matter of being optimistic and practice.	
	Whenever I am in a mathematics class or statistics class the voice tells me that I won't make it. In such a way that I have now developed a negative attitude towards statistics. When I am in statistics class I feel abandoned and neglected when it comes to tests and exams I just get confused the moment I see figures.	VII
H	Moreover my major problem is fear because of what the voice says to me.	III
	<i>When the word "statistics" huggers in my mind, my body starts shaking like leaves on a tree. All that comes into my mind is non other than figures, which is of course associated with mathematics.</i>	III
	I presume that there are many students who have problems in as far as statistics is concerned, but I think and I believe that mine (problem) is more complicated than theirs. To demonstrate or to substantiate my point, I have generalised this fear to other things	

Participant	Verbal description	Theme
	<p>associated with statistics, for example, the class whose statistics is taught the pedagogue who is teaching statistics and those students who are mastering this course I feel intimidated by the way they "smash" statistics.</p>	V
	<p>Besides the abovementioned problems, the other thing that put a lot of stress on me is the mentioning of test dates. As the days go nearer to the test date, the bigger my body is engulfed by stress. Should it happens that I perform well in the test, I won't believe its me who achieved the good marks. It is like as if I have been coping although this never exist in my frame of reference.</p>	<p>III</p> <p>III</p> <p>II</p>
I	<ol style="list-style-type: none"> 1. I tell myself that I cannot do it well because I did not do it up until standard 10. 2. I can't pass statistics because I do not know mathematics. 3. I can't pass it because it is difficult. 4. I can't pass it because I take time to grasp. 5. I can't pass it because there are those who are quick in grasping and the teacher lecture go with them and this makes me shy to say I am not with them because they will ask me where did I lost to which I cannot tell. 	I

Participant	Verbal description	Theme
J	6. I cannot pass it because I am in a large class where the lecturer can't see that I am not following.	I
	7. I can't pass it because it deals with numbers and counting to which I am poor.	I
	"Mathematics", the very word send shivers up my spine. Why is that? I guess it is because during my high school days I never could understand or pass mathematics well. It was either I understand it in class but never could pass the test or I just fail to understand at all.	V
	This lead to my having a negative attitude towards mathematics. This situation was intensified of the fact that most of my friends were doing well, and I was now the odd man out. So I decided to call it quits in standard 8 but here I am again faced with figures and I say, Oh God, have mercy on me. Anyway, I told myself that I better drop this attitude of mine regarding mathematics.	III
	The attitude is now gone and I find myself really enjoying mathematics. Hold on then, here comes the test and I flunked. I was so discouraged, asked myself why, but I could not come up with any answer. I just said, my failure means I did not study well enough.	II

Participant	Verbal description	Theme
K	<p>Sometimes in class I do really grasp what is being said but if I give myself time and study really hard, I do understand. My problem is with how to answer questions. I come in, with all this stuff in my head and I just fail. Maybe I become excited, panic seeing, the question paper with many questions I had studied before. In that state of excitement all the little I know just blows out of my mind. If I can overcome that, I <i>would really be grateful.</i></p> <p>One suggestion I would like to put across is that of tutorials. Because many of us are not used to calculations, I think having tutorials would help a lot. In psychology there are many honours students and they can help with tutorials and they could serve as our practicals since we do not have them anyway.</p>	<p>III</p> <p>III</p> <p>V</p>
L	<p>Naturally, I am not a dull person. But I think I lost my confidence when I failed matric for the first time in my life due to poor performance in mathematics. From then I think I was not good or capable of working with figures. So now I am engaged in statistics. I still do not believe in myself. Even if I manage to do well at the exercises, I still tell myself or fear that in a test I won't make it. I just fear that I might not be able to walk out those problems in a test its something strange that I will see.</p>	<p>VI</p> <p>I</p>

APPENDIX D

POST-TEST VERBAL DESCRIPTIONS

KEY USED FOR THE THEMES IN THE APPENDIX

THEME	KEY USED
Confidence	1
Reduced anxiety	2
Coping and being in control	3
Comparatively better	4
Thankfulness	5
Change in attitude	6
High sense of achievement	7

Participant	Verbal description	Theme
A	<p>These days I feel much better and more confident when working with figures I no longer feel anxious when I cross-check my additions. Subtractions as any other problem. I believe that my attitude towards statistics as such has improved a lot as I usually want to try sums on my own and feel great if I get them right. If I fail to get everything right I do not panic but try to correct steps from where I went wrong. My level of anxiety has dropped in stead I usually tell myself that I can do better.</p>	<p>1</p> <p>2</p> <p>6</p>
	<p>I must sincerely say that everything that I have in statistics in particularly is due to the program I have undergone.</p>	<p>5</p>
B	<p>I am better than last semester. My attitude has become positive towards calculations. I remember the case when I left Geography. I last year I had a negative attitude towards using of numbers, such that in the first practical exercise I got 38% then I <i>withdraw feeling that I was not capable</i>. This year in statistics I have turned over a new leaf. I have said to myself I will never tell myself that I am capable again. I really feel guilty about withdrawing from Geography because I have discovered the opposite of what I knew.</p>	<p>4</p> <p>6</p>
	<p>I said thank you for the opportunity we were given to express our feelings about anxiety concerning</p>	

Participant	Verbal description	Theme
	<p>statistics. I am now in control of my feelings. I hope I will also pass this semester. I feel such a fruitful program should be started earlier and be continued. It has revealed itself that I have no ability problem but my previous learning environment had made me unsure of myself. I have now refrained confidence. I thank you for the hand you have given to lift me up.</p>	<p>5</p> <p>1</p> <p>5</p>
C	<p>First and foremost, I would like to thank you for the therapy given to us. I hope the others have the same feelings. It did not solve only the mathematics problem but my entire problem got solved. I can say it faithfully that I am a Psychology III student with statistics involved in my course. Really I have achieved a lot. I am just positive with mathematics and don't think I would ever have a negative feeling in anything. I have confidence in everything I do. I can attempt any problem in mathematics.</p>	<p>3</p> <p>1</p> <p>1</p>
D	<p>Since I started this program of relaxations my attitude and behaviour changed. Before the program I was very anxious to do anything in front of people. Actually I lacked self-confidence. Now I am much better and I am no longer afraid of people as it were before. I have developed self-rightness due to self-confidence. I thank this program and the lecturer concerned because she helped me to perform better in June examinations in spite of the low DP's I had.</p>	<p>1</p> <p>1</p>

Participant	Verbal description	Theme
	As I am writing examination I am not scared since I know and convinced that I am intelligent and my performance is good due to this program. So anxiety is no longer a hindrance to my success. Such programs should be promoted and motivated to help those students who have anxiety that will deteriorate their performance. Thank you for a good program which uplifted my style of life and performance.	5 5 5
E	I feel better now and everytime when I work with figures I see that my anxiety has denegted. I became motivated. I got a better test grade as compared with the first semester.	2 4
F	When I first started attending this workshop, I was really afraid of anything that had figures. I was not comfortable to be faced up with an evaluation where figures were used in the course, I was really interested, and I have overcome the anxiety. Initially I would get very anxious and the whole proceßs of <i>learning would be slowed down by the blockage that I experienced.</i> But then I learned how to control my anxiety. I learned that anxiety can be controlled by one doing thorough preparation for the tasks that lay ahead. I even feel that for one to enjoy and learn have to work with figures one has to do continuous practice and enough time to get hold of anxiety.	2 3 3

Participant	Verbal description	Theme
G	Presently I feel I can take another mathematics class and cope. After all working with figures is interesting.	6
	I enjoy working with figures its very much interesting and challenging it is easy to see when you have lost the right track and you can start afresh and correct your mistake within a very short space of time as long as you know what you are doing. I am no longer afraid of numbers as it was before because I could participate in this project. I was very much scared of numbers; the moment I see them, I could shiver and sometimes cry but now I look at them with a positive attitude. I am now even able to calculate my change after buying something; before at first I could not. You were so helpful and wonderful to me, thank you very much.	6 1 5
	About myself in connection with anxiety, I don't feel much of it like it used to happen. Of course I do experience it but like normal person and finally I conquered it.	2 3
	What I would say generally is that now I am fine. What we did last semester helped me a lot.	5
H		

Participant	Verbal description	Theme
I	First of all I would like to thank you for your kindness Mrs. Mashego. To tell you the truth, I no longer feel anxious when I have to do calculations. In attending your program really helped me a lot. I know that I may not be good with calculations but I can tag along with others. Also my confidence was boosted as I was not alone on that program.	5
		2
		1
		1
J	Before I start a little of anxiety develops, but the minute I remind myself to relax and not to panic, I find everything easy. So to act very comfortable and capable of working easy with figures. Yes, all the improvements are because of the programme I undertook. It showed that there is nothing mysterious in statistics once you calm down and tell yourself that you will work it out, it does happen and you are able to remember what you have practiced thoroughly.	3
		5
		3