EFFECTS OF MODELING AND ONGOING PSYCHOLOGICAL STRESS ON LEARNING PERFORMANCE AND STATE ANXIETY OF HIGH TEST ANXIOUS SUBJECTS

by

Douglass R. Bloomfield

Dissertation submitted to the Graduate Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY
in
Psychology

APPROVED:

A. M. Prestrude, Chairman

E. S. Geller

G. A. Clum

D. E. Hutchins

M. D. Tessnear

May 1978

Blacksburg, Virginia

ACKNOWLEDGEMENTS

I would like to express my deep appreciation to those who directly and indirectly made this dissertation possible. In particular, my thanks go to Dr. Richard W. Cravens who was present at the creation of this study, serving as its chairman, and to Dr. Albert M. Prestrude, who took the reins mid-course and guided the dissertation to completion.

To Drs. Oliver Bjorksten, Robin C. Tucker, and Brian E. Warren and Ms. Pat Lamb, I am especially indebted; they helped me become myself during the course of this research.

Finally, I would like to thank Mrs. Bernie Curtis who, at the eleventh hour, undertook the final logistics of preparing this manuscript for the graduate school.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Introduction

Since the early 1950's, the United States, as an academic society, has become more similar to its European counterparts in its reliance on a national testing system to identify those academically suited for higher education. Seymour Sarason (1959), a major early contributor to theory and research on test anxiety, observed that "we live in a test-conscious, test-giving culture in which the lives of people are, in part, determined by their test performance" (p. 26).

Charles Brown (1938) focused on the problem of test anxiety on college campuses nearly 40 years ago. He stated the complicity of test anxiety in two student suicides at the University of Chicago:

> One of these was definitely due to worry over an approaching examination and the other presumably was. . . . These incidents show that students are taking their examinations more and more seriously, and that the emotional reactions of students before an examination are an important problem (1938, pp. 11-12).

Some forty years later, the problem of test anxiety now permeates the secondary schools as well. Recently, concern about test performance of high school students on Educational Testing Service examinations has reached a new saliency. Scores on the Scholastic Aptitude Test, a major milestone in the educational progress of a student bound for college, are at a 14 year low (Time, November 14, 1977).

It is not coincidental, then, that research on the theory and the treatment of test anxiety has accelerated in recent years.

Highly test anxious persons perform more poorly on tests than do low test anxious persons, particularly when tests are administered under stressful, evaluative conditions. The literature reviewed in this introduction suggests that this performance difference is largely due to a difference in the attentional focuses of high and low test anxious persons during task performance. The highly test anxious person is internally focused on self-evaluative, self-deprecatory thinking, and the perception of his autonomic responses. Since the difficult tasks on which the test anxious person does poorly require full attention for adequate performance, he cannot perform adequately while dividing his attention between internal and task cues.

Wine (1971), in her review, chose Marlett and Watson's (1968) summary of the high test anxious person's responses. This encapsulation still fits rather well:

> The high test anxious person spends a part of his task time doing things which are not task oriented. He worries about his performance, worries about how others might do, ruminates over choices available to him, and is often repetitive in his attempts to solve the task. Any effort to overcome the self-defeating kind of behavior which the high test anxious person exhibits should concentrate on allowing him to perform without the constraints which maximize the negative effects of the avoidance behavior (p. 203).

As noted there has been interest in examination stress since the 1930's. Spielberger, Gonzalez, Taylor, Algaze and Anton (1978) noted that in Germany, Neumann (1933) published the first book on test anxiety and other researchers concentrated on test anxiety etiology (Redl, 1933; Stengel, 1936) and treatment (Bergler, 1933; Weber, 1934). At that time, test anxiety was conceptualized in a psychoanalytic framework and attributed to traumatic childhood experiences.

C. N. Brown and his colleagues at the University of Chicago published a series of six articles on test anxiety between 1938 and 1949 (Brown, 1938a, b; Brown & Gelder, 1938; Fiedler, 1949; Hastings, 1944; Waite, 1942). Brown (1938a) can be credited with developing the first test anxiety questionnaire. He noted that questions dealing with "subjective feelings of nervousness" and being irritable and worried about examinations were the most highly correlated with scores on his scale. Brown concluded that ". . . students who become excited before examinations tend, on the whole, to do a little poorer in the examination than those students who are calm before the examinations" (Brown, 1938b, pp. 30-31).

Test anxiety theory was presented by Mandler and Sarason (1952) in their article which introduced the Test Anxiety Questionnaire (TAQ). In contrast to general anxiety scales such as the Taylor Manifest Anxiety Scale (Taylor, 1953), the TAQ was constructed as a measure of anxiety in a specific kind of stressful situation - the testing situation. The TAQ then may be considered as a measure of state anxiety. Mandler and Sarason expected that items which related

specifically to the subject's reactions to testing situations would be more predictive than general anxiety scales of his behavior in the situations.

Mandler and Sarason postulated that two kinds of drives are evoked in the testing situation. The first of these are learned task drives which are reduced by "responses or by response sequences which lead to the completion of the task" (Mandler & Sarason, 1952, p. 166). The second kind is a learned anxiety drive which can elicit two classes of responses: ones related to task completion which are anxiety reducing, and ones which interfere with task completion. This latter response class is the one which the TAQ was designed to measure:

> These responses...may be manifested as feelings of inadequacy, helplessness, heightened somatic reaction, anticipation of punishment or loss of status or esteem, and implicit attempts at leaving the test situation. These responses could be classed as self rather than task centered (p. 166).

The task relevant responses are ones which are specific to the task, and must be learned during task performance. The self-oriented responses are a class of generalized responses which are readily evoked in a task situation, and interfere with the learning of specific task relevant responses. This conceptualization, then, describes test anxiety as in part facilitating and in part debilitating test performance.

The TAQ, a 37-item questionnaire in a rating format, is designed to measure these self-oriented responses. The items refer to the kinds of internal responses typically experienced immediately before and during examinations and tests (e.g., "Before taking a group achievement test, to what extent do you worry?" Or, "While taking a course examination to what extent do you experience an accelerated heartbeat?").

I. Sarason (1958) constructed a 21-item measure of test anxiety, which he labelled the Test Anxiety Scales (TAS). It is based largely on items taken from Mandler and S. Sarason's TAQ rewritten in a true-false format. The TAQ and the TAS are highly correlated, the product moment correlation being .93 (I. Sarason, Pederson, & Myman, 1968). In addition, I. Sarason has restated the interfering response hypothesis, emphasizing that it is a habit interpretation of anxiety:

> This interpretation, briefly put, states that subjects scoring high and low in anxiety differ in the response tendencies activated by personally threatening conditions. Whereas low scoring subjects may react to such conditions with increased effort and attention to the task at hand, high scoring subjects respond to threat with self-oriented, personalized responses (1960, p. 405).

As Sarason notes, the attentional focuses of high and low anxious subjects differ when under threat. The low anxious subjects turn

their attention to the task, while high anxious subjects attend to their internal self-oriented responses.

Alpert and Haber (1960) also constructed a test anxiety questionnaire, the Achievement Anxiety Test (AAT), which yields two measures. One of these is a 10-item Debilitating Anxiety (DA) scale, a construct similar to that measured by the TAQ and TAS. Total scores on the DA scale correlated .64 with total TAQ scores. The other measure is labelled Facilitating Anxiety (FA). Mandler and S. Sarason (1952) had theorized that test anxiety is debilitating of performance only among subjects who had learned an habitual class of interfering responses to the test anxiety. Among persons without this class of interfering responses, test anxiety elicits task-relevant responses leading to task completion. Persons scoring low on the TAQ were implicitly assumed by Mandler and Sarason to be high in the facilitating kind of anxiety. Alpert and Haber's AAT measures separate the two constructs of anxiety and their associated responses. The nine items on the Facilitating Anxiety scale are based on "a prototype of the item--'Anxiety helps me to do better during examinations and tests' (p. 213)." The Facilitating and Debilitating scales correlated -.48 with each other (Alpert & Haber, 1960). This negative correlation would then further indicate the existence of two separate constructs, debilitating and facilitating anxiety.

The Suinn (1969) Test Anxiety Behavior Scale (STABS) was specifically designed to measure test anxiety in conjunction with behavior therapy research. This scale consists of 50 items that describe test-related behavioral situations that are assumed to arouse different levels of anxiety during examinations. Subjects are required to rate the amount of anxiety they experience in each situation on a five point scale from "Not at all" to "Very much". The test-retest reliability of the STABS ranges from .74 to .78 over a four to six week period. Scores on the STABS correlate around .06 with I. Sarason's TAS and -.24 and -.28 with academic performance criterion measures such as errors in course examinations and final course grades (Spielberger, Anton & Bedell, 1976).

Most recently, Spielberger, Gonzales, Taylor, Algaze, and Anton (1977) have published preliminary data on the Test Anxiety Inventory (TAI), a relatively brief, objective, self-report scale with total scores that are highly correlated with widely used measures of test anxiety. TAI total scores correlated .82 and .83 with the TAS for males and females, respectively, suggesting that the TAS and TAI are equivalent measures of test anxiety. Except for the TAI Emotionality subscale, the TAI measures correlated negatively and significantly with study skills for males and females.

Personal Characteristics of Test Anxious Persons

Wine (1970, 1971) identified several cogent concepts that have emerged in the experimental study of test anxiety. The first concept is that high test anxious persons are more self-deprecatory,

more self-preoccupied, and generally less content with themselves than low test anxious persons (Sarason, 1960). This concept is based on the results of studies which examined the relationships between scores of test anxiety scales and other paper and pencil personality measures. In general, these investigations indicate that persons who score high on test anxiety scales describe themselves in negative, self-devaluing terms on other paper and pencil measures of anxiety as well.

For example, in a study by Doris and Sarason (1955) subjects differing in TAQ scores were arbitrarily failed on a number of tasks. Following the tasks, the subjects were required to rank order "blame statements" which included "self-blame" and "other than self-blame" items. Highly anxious subjects blamed themselves for their failures more than did low anxious subjects.

Meunier and Rule (1967) reported results leading to similar conclusions regarding a test anxious person's tendency to devalue his own performance. The effects of positive, negative or no feedback on subjects' confidence in their judgement of the length of lines were investigated. On no feedback trials, highly test anxious subjects rated their confidence level as low and comparable to their confidence on trials with negative feedback. In contrast, low test anxious subjects expressed high confidence in their judgement on no feedback trials and this level of confidence corresponded to the level expressed on positive feedback trials.

I. Sarason has completed several studies which further indicate the self-deprecatory, self-ruminative tendencies of highly anxious subjects (Sarason & Koenig, 1965; Sarason & Ganzer, 1962). In each of these studies, an unstructured verbal conditioning paradigm was used with college students who scored at the extremes of the TAS. The subjects were required to describe themselves orally for approximately one-half hour. Nonreinforcement, reinforcement of negative self-references and reinforcement of positive self-references have been compared. Some of the conclusions from these experiments are: (1) Regardless of experimental condition, highly test anxious subjects generally describe themselves in more negative terms than do low test anxious subjects. (2) High test anxious subjects are extremely responsive to reinforcement when the response class being reinforced is negative self-references. (3) However, when the response class being reinforced is positive self-references, high anxious subjects do not condition. That is, they do not produce more positive self-references as a result of being verbally reinforced for them.

The conclusion that high anxious persons are generally self-deprecatory and self-preoccupied seems quite evident in light of the research evidence cited.

Although not stated explicitly by Wine or others, high test anxious subjects appear to have a lower level of self-esteem. Several more recent studies have born out this assumption, i.e.,

that a consistent negative relationship exists between the measurable construct of self-esteem and the corresponding construct of test anxiety (Many & Many, 1975; Shafiabady, 1974; Jonisch, 1975; Goldberg, 1973).

Whether or not these low self-esteem tendencies are specifically activated in a testing situation is the focal point of the following four studies.

Mandler and Watson (1966) administered a series of digit symbol tasks to extreme low and high TAQ groups. A post-task questionnaire included the question, "How often during the testing did you find yourself thinking how well, or how badly, you seemed to be doing?" On a 10-point rating scale, high test anxious subjects indicated markedly greater occurrence of such thoughts than did the low test anxious group. In a partial replication of this study, Neale and Katahn (1968) reported identical results on this questionnaire item.

Marlett and Watson (1968) reported a similar result. Ninth grade males in high and low extreme groups on the children's form of the Alpert-Haber Achievement Anxiety Test (Stanford, Dember, & Stanford, 1963) were arbitrarily failed for twelve trials on a button-pressing task. A post-task questionnaire included the question, "How often did you think about how well or badly you were doing?" The ends of the rating scale were labelled "I didn't think about it," and "I thought about it so much I couldn't concentrate." The scores of high test anxious subjects indicated

that they were significantly more disturbed by such self-focused thoughts.

More direct evidence for the activation of negative self-oriented attentional tendencies among high anxious subjects in test situations is provided in the study reported by Ganzer (1968). The effects of audience presence and test anxiety (TAS) on the serial verbal learning of female subjects were examined. Tabulations were made of the frequency and content of all of subjects' task irrelevant comments while they were working on the task. "High TAS scorers, especially in the Observed condition, omitted more task irrelevant responses than any other group. Content analysis revealed that the comments were mostly of a self-evaluative or apologetic nature (p. 194)."

Most recently, consensual validation of this facet of test anxiety theory has been demonstrated by I. Sarason (1978) who used the oblique approach of subjects' estimation of the passage of time prior to and during evaluation. In a series of three experiments, Sarason evidenced that high TAS subjects tended to overestimate, to a greater degree than others, both the time during which their performance is being evaluated and the period during which they are waiting for the evaluation to take place. Further, high test anxious subjects performed at significantly lower levels on anagrams and digit symbol tasks than did low and middle test anxious subjects when emphasis was placed on evaluation implications of their

performance. Sarason's high test anxious subjects, more than middle or low scorers, attributed to themselves preoccupations about how poorly they were doing, how other subjects were performing, and what the examiner could possibly be thinking about them.

In summary, there is abundant evidence that the test anxious person is more self-preoccupied and self-deprecatory than his low test anxious counterpart. It is also clear, in view of the research reviewed, that these self-focusing tendencies are activated by the pressures of the testing situation.

Situational Conditions and Test Performance

A second concept in the experimental study of test anxiety as outlined by Wine (1970, 1971) is the situational test conditions and resultant task performance of high and low test anxious subjects. Wine cited the two initial studies published by the authors who originated test anxiety theory (Mandler & S. Sarason, 1952, and S. Sarason, Mandler & Craighill, 1952) as prototypes of the many subsequent investigations of situational stress variables and test anxiety. The general predictions of test anxiety theory with regard to situational stress variables are:

> When a stimulus situation contains elements which specifically arouse test or achievement anxiety, this increase in anxiety drive will lead to poorer performance in individuals who have task-irrelevant responses in their response repertory. For individuals without such response tendencies, these stimulus elements will raise their general drive level and

result in improved performance. (Such elements would be any reference that the individual is being judged, a statement of expected performance, etc.) (Sarason, Mandler & Craighill, 1952, p. 561)."

Mandler and Sarason (1952) examined the effects of feedback and no feedback on the performance of subjects scoring at extremes on the TAQ. As predicted, the two feedback conditions, both success and failure, facilitated the performance of low TAQ subjects, and interfered with the performance of high TAQ subjects. In the second study (Sarason, Mandler, & Craighill, 1952) similar predictions were made concerning an instructional manipulation. In the stressful "ego-involving" instructional condition, subjects were told that they should easily complete the test within the time limit, when it was, in fact, made impossible for them to do so. This "expected-to-finish" condition can be described as an advance failure manipulation. The nonstressful instructions, "not-expected-to-finish," informed subjects that no one could expect to finish within the time limit. In general, the high TAQ subjects did better following the "not expected to finish" than the "expected to finish" instructions; while the reverse was true for the low anxious subjects.

The many subsequent investigations of stressful situational conditions and test anxiety have generally provided data consistent with the predictions of test anxiety theory (Cox, 1966, 1968;

Ganzer, 1968; Harleston, 1962; I. Sarason & Marmatz, 1965; I. Sarason & Minard, 1962; and I. Sarason & Palola, 1960). Most of these studies have investigated the effects of feedback or instructional manipulations, though three were concerned with the effects of audience presence on task performance (Cox, 1966, 1968; and Ganzer, 1968). Considering audience presence as a source of threatening evaluation, the results of all three studies support the predictions of test anxiety theory. Audience presence debilitated the task performance of high test anxious subjects, and facilitated the performance of low test anxious subjects.

Instructional variations, other than those discussed above, have most frequently involved comparisons of: (1) "ego-involving," "highly motivating" instructions which inform the subject that his task performance will reflect his ability, (2) minimal task instructions, and (3) instructions which assure the subject that his task performance will not be anonymous. He may be instructed that the experimenter is interested only in properties of the task, or that his performance is important only so that the experimenter may complete the study.

The results of studies varying instructional conditions have generally reported an interaction between level of test anxiety and evaluation emphasis: (1) highly test anxious subjects perform more poorly following highly evaluative "ego-involving" instructions than non-evaluative "anonymous" instructions while the reverse is true for low test anxious subjects. (2) Following highly evaluative instructions low test anxious subjects perform better

than high test anxious subjects; following non-evaluative instructions high test anxious subjects perform better than low. (3) Following minimal task instructions high and low test anxious subjects perform at about equivalent levels, intermediate between their performances in the highly evaluative and nonevaluative conditions.

All of the situational conditions which differentially affect the performance of high and low anxious subjects vary on an evaluative dimension -- the degree to which a subject believes that he is being or will be evaluated on the basis of his task performance. Conditions at the extremes of the dimension affect the performance of high and low test anxious persons in opposing ways. It might also be noted that situational conditions varying on this evaluative dimension have opposing effects on the direction of attention of high and low test anxious persons. Highly evaluative conditions cause the highly test anxious person to direct his attention internally rather than to the task. The same conditions cause the low test anxious person to increase his "attention to the task at hand (I. Sarason, 1960, p. 405)." Nonevaluative situational conditions do not elicit the highly test anxious subject's self-directed interfering responses, thus it is possible for him to direct his full attention to the task. Conversely, nonevaluative testing conditions presumably do not excite the nonanxious subject's motivation and interest. Though it cannot be said that he therefore turns his attention inward; it is probable that his low interest in the task is accompanied by less than full attention to it.

I. Sarason (1958b) has investigated another instructional variation, which he labelled a "reassurance" condition. These instructions, like the nonevaluative ones discussed above, were designed to improve the performance of high test anxious subjects rather than interfere with it. In spite of the "reassurance" label, these instructions can most accurately be described as neutral with respect to the evaluative dimension, since there was no reference in them to evaluation of the subject's performance. Their nature might more accurately be described as information-giving and attention-directing. The subject's task was to learn a serial list of nonsense syllables. Following the standard serial learning task instructions, the subject was warned that many people become tense when learning this kind of task, and that he should expect his progress to be slow. He was further told that he should concentrate on the list rather than worrying about how he was doing. When the set of instructions was compared to standard, or minimal task instructions, high test anxious subjects performed better following the reassurance instructions. The reassurance condition was detrimental to the performance of the low test anxious subjects, in comparison to the standard task instructions. Sarason's study suggests that it may not be necessary to resort to removing evaluative emphasis in order to improve the highly test anxious subject's performance. Rather, it may be sufficient to substitute task-relevant responses for the self-orienting ones by means of rather straightforward attention-directing instructions.

Test Anxiety and Cue Utilization

A third concept within the test anxiety research as visualized by Wine (1970, 1971) concerns the area of test anxiety and the range of cue utilization. The previous concept concerning situational conditions and test performance indicated that evaluative testing conditions have opposite effects on the attentional focuses of high and low test anxious subjects. Under evaluative conditions, the high test anxious person focuses his attention inward while the low test anxious person focuses more fully on the task. The implication is that the high test anxious person attends to fewer task cues than does the low test anxious person. This attentional interpretation of the effects of test anxiety on task performance is consistent with an empirical generalization advanced by Easterbrook (1959) concerning the relationship between arousal level and task variables. He reviewed a large body of research which indicated that emotional arousal consistently narrows the range of cue utilization in task performance.

Examples of the research Easterbrook cited to support this generalization are: (1) Studies of the effects of experimentally manipulated drive level on response to a focal task, and simultaneous response to peripheral, and only occasionally relevant stimuli. Arousal reduces responsivity to the peripheral stimuli, while maintaining or improving central performance (Bahrick, Fitts, & Rankin, 1952; Bursill, 1958; Davis, 1948; and Easterbrook, 1953); and

(2) Studies of the effects of emotional arousal on measures of incidental learning. Again arousal reduces the amount of incidental learning, while having no effect on or improving intentional learning (Aborn, 1953; Bahrick, 1954; Bruner, Matter & Papanek, 1955; Johnson, 1952; Kohn, 1954; Silverman, 1954; and Silverman & Blitz, 1956). These are only a few of the studies cited by Easterbrook in support of his formulation.

Easterbrook's definition of emotional arousal is very broad; it is:

> ....the innate response to a state of biological deprivation or noxious stimulation, which underlies or occurs simultaneously with overt action and affects its strength and course. This emotional arousal is greater in neurotic than in normal subjects, greater than usual in subjects under stress or threat or in frustration, and in general greater in animals that have been "motivated" by any of the usual deprivations, noxious stimulations, or other incentives than it is in unmotivated or resting animals of the same species (p. 184).

Anxiety is one aspect of this emotional arousal dimension, and several of the studies reviewed by Easterbrook indicate that narrowing of the range of cue utilization accompanies anxiety arousal.

Since Easterbrook's review, Wine (1971) cited several studies which have reported the effects of experimentally aroused anxiety

on range of cue utilization in task performance (Agnew & Agnes, 1963; Bruning, Capage, Kozuh, Young, & Young, 1968; Tecce & Happ, 1968; and Wachtel, 1966, 1968). The results of these investigations have been generally consistent with Easterbrook's formulation. Stressful situational conditions tended to reduce the range of cue utilization, in comparison to nonstressful conditions. No measures of individual differences were used in these studies.

Zaffy and Bruning (1966), West, Lee and Anderson (1969) and Wachtel (1966, 1968) reported relationships between scale-measured anxiety level and range of cue utilization. Zaffy and Bruning selected subjects from extreme scorers on the Taylor Manifest Anxiety Scale (MAS). Rather than varying range of cues they made the available cues either relevant or irrelevant to task performance. The subjects' task was to learn a correct position for each of 19 presentations of 5 zeros, presented by a memory drum. In the relevant cue condition the zeros were numbered in order with subscripts from 1 to 5; the same subscripts were used in the irrelevant cue condition but in random order. These conditions were compared to a no-cue control condition. The performance of the low MAS subjects was affected more by the presence of the cues, whether relevant or irrelevant, than was the performance of the high MAS subjects. Within the low MAS anxiety level, there were differences significant beyond the .001 level in all three of the comparisons of the three conditions, with superior performance in the relevant cue condition, intermediate performance in the no-cue condition,

and poorest performance in the irrelevant cue condition. The performance levels of the high MAS subjects followed the same order, but there was a significant difference only between the relevant and irrelevant cue conditions ($p < .025$).

More pertinent to the purposes of this introduction are the studies reported by West et al. (1969) and Wachtel (1966, 1968), since they selected subjects on the basis of their scores on measures of test anxiety. West et al. used 6th and 8th graders who were high or low scorers on the Test Anxiety Scale for Children (S. Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960). The task was made up of arithmetic problems. There were two conditions determined by the nature of the information given in the problems. In one condition only information essential to solution of the problems was given; in the other condition the same relevant information was provided, but additional irrelevant information was given in each problem. The interaction between anxiety level and condition was significant. Both high and low TASC groups performed more poorly in the irrelevant information condition. No tests of significance for individual pairs of means were reported; but the means for the groups indicate that the performance level of the low TASC group was affected more by the addition of irrelevant cues than was the performance level of the high TASC group; low TASC, relevant information only M = 27.3, relevant plus irrelevant M = 24.4. The low test anxious children were more sensitive to the addition of irrelevant cues than were the high test anxious children.

Wachtel's study (1966, 1968) reported relationships between test anxiety level and range of cue utilization in task performance on a central continuous tracking task, and reaction times to two occasional peripheral lights. A control condition with minimal task instructions was compared with three experimental conditions: (1) subjects were told that unavoidable electric shock would be administered during task performance; (2) an unavoidable shock condition in which the subjects were informed that they could avoid shock if their combined performance on the central and peripheral tasks remained high; (3) a personality diagnostic condition in which the task was presented as a means of evaluating the subject's personality; the subject was told that the peripheral lights would go on only if his performance fell below an acceptable level.

Though Wachtel's study was primarily focused on the effects of experimentally manipulated stress on performance and his instructional manipulations are somewhat less than convincing, he reports interesting relationships between subjects' TAQ scores and task performance. The "avoidable shock" and "personality diagnosis" conditions were the only ones in which test anxiety was appropriately engaged through threatening the subject with evaluation of his performance. In both of these conditions there was evidence of narrowing of attention to task cues as a result of test anxiety. In the avoidable shock condition there was a nearly significant correlation of -.35 ($p < .10$) between speed scores (reciprocals of reaction times to

the occasional peripheral lights) and subjects' TAQ scores, and a significant positive correlation between TAQ scores and scores on the central tracking task ($r = .58$, $p < .01$). In the "personality diagnosis" condition the correlation between speed scores and TAQ scores was $-.44$ ($p < .04$), though the correlation between TAQ scores and tracking scores in this condition was only .02. When all subjects in these two conditions were combined, the correlation between TAQ scores and speed scores was $-.40$ ($n = 30$, $p < .01$). Thus, in these two conditions test anxiety reduced responsiveness to the peripheral lights. In the other two conditions, in which test anxiety was not appropriately aroused, there were no significant r's between TAQ scores and task performance.

A proposition offered by Wachtel to explain the effects of experimentally manipulated anxiety and test anxiety in this study combines Easterbrook's attentional formulation and the interfering response hypothesis of the test anxiety theorists: "....when an individual is anxious, attention is diverted inward to perception of his anxiety and therefore less attention is available for external stimuli (Wachtel, 1966, p. 2149)."

Research since the early 1970's on test anxiety and cue utilization has been rather sparse. One study, Nottelman and Hill (1977) related test anxiety in children and their frequency of off-task behavior in evaluative conditions. Fourth and fifth grade boys and girls classified as high, medium or low test anxious (as defined by the Test Anxiety Scale for Children)

performed anagram tasks in the presence of an experimenter who was also working anagrams. Both performance on the anagrams and off-task glancing away from the anagram task were found to be related to test anxiety. High test anxious children had the lower performance scores and exhibited substantially more off-task glancing behavior than low or middle test anxious children. The authors concluded that a highly test anxious child's performance could be improved by increasing his or her own task orientations through task inherent direction and task relevant feedback. Such an interpretation is consonant with Wine's (1970) attentional interpretation of test anxiety and its treatment.

Worry and Emotionality in Test Anxiety

Wine's (1971) final focus within the literature dealt with the two plausible components of test anxiety, Worry and Emotionality. Liebert and Morris (1967) are cited by Wine as being the first to propose this two factor theory of test anxiety. The Worry (W) component is described as cognitive concern over performance, and Emotionality (E) is the autonomic arousal aspect of anxiety. Liebert and Morris devised a brief situational measure of W and E based on TAQ items. Further the results of a series of studies (Doctor & Altman, 1969; Liebert & Morris, 1967; Morris & Liebert, 1969, 1970; and Spiegler, Morris & Liebert, 1968) suggest that scores on the two components vary predictably with temporal relationships to classroom examinations and with performance expectancies. The scale has been administered several days before

an examination, immediately before and immediately after. Scores on W tend to be fairly constant across time; while E scores reach a peak immediately before an examination, falling off rapidly immediately after the examination. W scores are significantly and negatively correlated with subjects' preexamination ratings of performance expectancy, while E scores are not related to performance expectancy.

Three studies in this series have yielded results on the relationship between Worry and Emotionality and task performance (Doctor & Altman, 1969; and Morris & Liebert, 1969, 1970). Morris and Liebert (1969) devised another paper and pencil measure of the two anxiety components, this one composed of items from the Taylor Manifest Anxiety Scale. The performance measure was a total of five WAIS subtests. A 2 x 2 factorial design was used: half of the subjects completed only the easy items in each subtest, half completed the difficult items; half of the subjects were aware of being timed, completed half were not. There were significant interactions between Worry scores and both task difficulty and timing in their effects on total WAIS scores. There were no significant results involving Emotionality and task performance. The authors suggest that ". . . it is worry, not 'anxiety', which affects performance on intellectual-cognitive tasks and which interacts with the relevant variables of the test situation (pp. 243-244)."

Doctor and Altman (1969) examined the relationships between W and E scores on the Liebert and Morris (1967) scale and final

examination grades in an introductory psychology course. Worry scores were found to be significantly and negatively related to exam performance. E scores were negatively related to performance only among subjects below the group median W score. When W was high, the addition of E had little or no effect on performance.

Morris and Liebert (1970) reported similar results in two studies, one involving college undergraduates, the other high school students. Partial correlations were computed between Worry, and Emotionality scores on the Liebert-Morris (1967) scale, which was administered immediately before a course final examination, and examination grades. In both studies, partial correlations between Worry scores and final examination grades were negative and significant. Partial correlations between Emotionality scores and grades were nonsignificant.

The Worry component has been described as a "preoccupation with performance (Doctor & Altman, 1969)." Liebert and Morris (1967) describe Worry as "cognitive concern about the consequences of failing, and the ability of others in relation to one's own." Spiegler, Morris and Liebert (1968) refer to worry as cognitive or intellectual concern about one's own performance.

In addition, Worry level has been shown to increase with ego involving stress (Morris & Liebert, 1973) and with lowered performance expectations (Spiegler et al., 1969), but not to increase with the threat of shock (Morris & Liebert, 1973) or temporal proximity to examinations (Spiegler et al., 1968).

Variables which delineate Emotionality then seem to be less clear. As stated, Emotionality was not related to performance expectation in three studies (Liebert & Morris, 1967, Morris & Liebert, 1970; Spiegler et al., 1968). On the other hand, Emotionality was either unrelated (Morris & Liebert, 1969, 1970; Morris & Perez, 1972), complexly related (Doctor & Altman, 1969) or inversely related (Morris & Liebert, 1970) to performance expectations. Fluctuations in Emotionality appeared to be a function of temporal proximity to exams (Doctor & Altman, 1969; Spiegler et al., 1968) or threat of shock (Morris & Liebert, 1973), as opposed to a function of evaluative stress expectations (Doctor & Altman, 1969; Morris & Liebert, 1970; Morris & Perez, 1972; Spiegler et al., 1968).

Deffenbacher (1977) made the point that the Worry and Emotionality component distinction has been studied only in the classroom examination situation or under experimental conditions. To circumvent this, he chose to investigate the effects of Worry and Emotionality on performance on the Miller Analogies Test, a real-life examination with important consequences. Specifically, Deffenbacher predicted that Worry and state test anxiety would correlate negatively with performance and that the correlation between Worry and performance would be stronger than the correlation between Emotionality and performance. Eighty-two students took the 10-item Worry-Emotionality Inventory (Liebert & Morris, 1967) prior to taking the Miller Analogies Test. Deffenbacher's results

successfully extended the Worry-Emotionality distinction to performance on the MAT. Both state test anxiety and Worry were negatively related to performance while Emotionality was not when the common variance between Emotionality and Worry was controlled. Worry was broadly related to performance such that high worriers did less well than low worriers. The effects of Emotionality, however, varied as a function of Worry. At low levels of Worry, Emotionality was unrelated to performance, but at high levels of Worry, Emotionality was debilitative. That is, the negative effects of Emotionality were nested within the upper range of Worry; while Worry contributed more pervasively to the relationship between anxiety and performance. While making the points that this study used a somewhat different population (college seniors and graduate students), an anology content versus a multiple choice format, and little opportunity to practice, Deffenbacher interpreted his results as having some implications for test anxiety treatment. That is, since the combination of high worry and emotionality was most debilitative, treatments which included both rational restructuring and relaxation were indicated to be most successful (e.g., Hahnloser, 1974; Little & Jackson, 1974; Meichenbaum, 1972).

One study, however, should be cited in light of all the above research on Worry and Emotionality. Richardson, O'Neil, Whitmore and Judd (1977) factor analyzed TAQ scores of 1,200 undergraduates. Two factors emerged from the rotations. The first factor, which

accounted for 53.4% of the total variance, was clearly defined by (A) cognitive concern and worry about oneself and one's performance on tests and (B) the apparent consequences of intense worry, e.g., interference with effective cognitive functioning and a variety of physical and emotional reactions. Except for rapid heartbeat, all items describing physical or autonomic reactions loaded substantially on this factor. The second factor to emerge, which accounted for 31.5% of the total variance, seemed to reflect a reaction of emotional distress or aversion to the stress of tests that does not involve cognitive worry, interference with performance, or excessive autonomic arousal.

Richardson et al. constructed a 16-item Factor 1 subscale and a 14-item Factor 2 subscale using items that correlated .35 or higher with either factor. The two resultant subscales showed a significant -.24 correlation. The authors interpreted their results as not supporting the two component theory of test anxiety. Because Worry and Emotionality items loaded on the same factor, the 16-item scale had a very high reliability ($r = .90$) and was recommended for future test anxiety research.

It should be noted that women consistently score higher than men on measures of test anxiety (I. Sarason, 1978; Taylor, 1977). Therefore, an important limitation of the Richardson et al. study, as in all factor analytic studies of test anxiety is that data for males and females were included in the same factor analysis. Taylor (1977) examined the factor structure of the TAS. A resultant

factor I reflected both Emotionality and Worry on important tests for males and females. Factor II, for males was clearly a Worry factor, but for females reflected emotionality. Factor III was weak for both sexes, describing tension and confusion while taking tests for males, and concerns about failure and inadequate test performance for females. Thus, Taylor's results provide clear evidence of the factorial complexity of the TAS, and suggest that the factor structure of the TAS may be different for men and women.

Test Anxiety and Its Relationship to Other Factors: Intelligence and Study Habits

One final concept within the test anxiety research seems to be surfacing since Wine completed her review. That area appears to be the degree to which the construct of test anxiety appears to be overlapped by the constructs of intelligence and study skills. A study by Denny (1966) resulted in an interaction between Manifest Anxiety (MAS) and intelligence in predicting scores on a concept formation task. High anxiety (HA), highly intelligent persons (HI) performed better than low anxiety (LA), HI persons. On the other hand, LA, low intelligent persons performed better than HA-LI persons.

Mazzel and Goulet (1969) attempted to replicate Denny's study using the TAQ instead. They, too, found an interaction but the relationship was different. LA-HI persons performed better than HA-HI persons; HA-LI persons performed better than LA-LI persons.

Fischer and Awrey (1973) attempted to resolve the conflicting results and lay to rest the issue of the influence of intelligence on test anxiety. Using both the MAS and the TAQ and two levels of intelligence in a 2 x 2 design, they found an interaction using the MAS and using the TAQ. Specifically, high test anxious-low intelligence persons performed significantly better than low test anxious-low intelligence persons, and low test anxious-high intelligence people performed significantly better than low test anxious-low intelligence people. Fischer and Awrey concluded that they have found support for Mazzel and Goulet's results. Further, they concluded that intelligence seemed more important for low anxious persons as opposed to the high anxious persons as Denny had concluded.

The issue lay dormant for several years. However, a concomitant study by Boor (1972) leaves the issue open to debate. Boor, using the TAS, Alpert and Haber's Debilitating and Facilitating Anxiety Scale, and the WAIS Information and Vocabulary subtests as measures of intelligence concluded that the relationship of the TAS, FAT, and DAT measures to undergraduate examination performance can most parsimoniously be accounted for by their common relationship to the variable of intelligence. In his study Boor indicated that all his test anxiety measures correlated negatively and significantly with the intelligence measure. Further, when the variance attributed to intelligence alone was partialed out, the resulting partial correlations between the test anxiety measures and examination

performance were nonsignificant. Boor recalled that Alpert and Haber (1960) had cautioned that when the effects of test anxiety are investigated, "one must take cognizance of the relationship between the anxiety measures and intellectual ability because interest is centered in a scale which predicts performance variance attributable to something other than aptitude." (p. 215). The data from Boor's study indicate that Alpert and Haber's admonition was well founded.

Caffrey and Brainerd (1978) have further added to the overlap of test anxiety and intelligence. Noting that Spielberger (1978) indicated that Emotionality correlated with TAI scores .00 and -.13 for males and females respectively, while Worry correlated -.35 and -.47 for males and females, Caffrey and Brainerd attempted to replicate the same result using an undergraduate class of experimental psychology students. Females scored higher than the males in the class. Therefore, separate norms were used for males and females to classify them as low, moderate or high on the Worry and Emotionality scales. Females scored higher on the Emotionality subscale (mean, 19.8) compared to males (mean, 18.4), but both groups were not significantly different on the Worry subscale, 15.4 (females) and 15.1 (males). For the Emotionality data, a distinct U-curve was evident for both groups, subjects scoring moderately on the Emotionality subscale having lower grade point averages than either low or high Emotionality subjects. In addition to noting that the U-curve goes against the hypothesis that the effect

of anxiety on performance should be in the form of an inverted U-curve, Caffrey and Brainerd postulated that Spielberger's failure to find a linear relationship between Emotionality and grade point average was perhaps due to the curvilinear relationship that they demonstrated. To date, however, no further research has focused on the overlap of the constructs of test anxiety and intelligence.

Other areas which on the surface appear to relate to test anxiety are student study habits, and reading ability. There is a growing body of research which has drawn study skills and/or reading ability into the rubrick of test anxiety. Some studies (Allen, 1971; Katahan, Strenger & Cherry, 1966; McMannus, 1971; Mitchell & Ng, 1972) indicate that the treatment of test anxiety in college students by desensitization and relaxation is effective only when done in combination with some form of study skills counseling. These findings indicate that persons high in test anxiety may have poor study skills that contribute to their poor performance (Desirato & Koskinen, 1969). Further, study skills counseling alone apparently is not effective in improving performance on cognitive tasks (Cornish & Dilley, 1973; Doctor, Aponte, Burry & Welsh, 1970; Mitchell & Ng, 1972; Osterhouse, 1972). An examination of the treatment of test anxiety will follow in the next section. The above research should, however, be sufficient to indicate that, in addition to the construct of intelligence the construct of test anxiety may be also confounded

with an issue involving poor study skills.

In sum, test anxiety has been described in terms of several parameters vis-a-vis the test anxious person. Briefly, test anxious persons are generally more self-preoccupied and have a lower self-esteem than low test anxious persons. Test instructions appear to affect high test anxious persons differently, compared to low test anxious persons: high test anxious persons perform more poorly with ego-involving and/or highly evaluative instructions. When taking the task, it appears that the test anxious person attends to fewer task cues than does the low test anxious person. Further, highly test anxious persons are encumbered by cognitions which interfere with task performance (Worry) and by interfering heightened autonomics reactivity (Emotionality). Finally, there is some evidence that high test anxious persons may be of lower intelligence than their low test anxious colleagues and, at the same time, be deficient in study skills.

Treatment

To date, test anxiety has been treated by a multitude of approaches: systematic desensitization, implosion therapy, rational-emotive therapy, cognitive restructuring, study skills modeling, and biofeedback. A complete review of all studies involved would result in a vertable compendium of partially useful information. Consequently, only the more salient studies representative of each area will be discussed in this section. It is understandable that the contemporary treatment of test anxiety initially began with

systematic desensitization or variations thereof. Systematic desensitization, until recently has been shown to be the most effective treatment for reducing test anxiety (Spielberger, Anton & Bedell, 1976). Positive evidence of successful reduction of test anxiety using systematic desensitization was reported in 27 of 31 studies in a recent review of the test anxious literature (Gonzales, 1976). Some representative studies would include: Cohen, 1969; Donner and Guerney, 1969; Emery and Krumboltz, 1967; Garlington and Cotler, 1968; Johnson and Sechrest, 1968; Katahn, Strenger and Cherry, 1966, Kondas, 1967; Laxer, Quarter, Kooman and Walker, 1969; Snider and Oetting, 1966; and Suinn, 1968.

In most of the above studies, high test anxious subjects are given one of the standard test anxious measures before treatment and retested after treatment. The treatment usually consists of an application of Wolpe's (1958) classical desensitization procedure. Relaxation training and visualization of situations that evoke anxiety, i.e., anxiety hierarchy items, while the subject is relaxed is generally regarded as the core of Wolpe's treatment program. Beneficial effects of treatment have been reported on the self-reported measures of test anxiety, and, in some cases, on scholastic performance, i.e., course grades or grade point average (Cornish & Dilley, 1973; Crighton & Jehy, 1973; Emery & Krumboltz, 1967; Johnson & Sechrest, 1968).

The treatment process itself has not generally been an object of scrutiny. Some studies have attempted to clarify the

essentials of the desensitization treatment (Aponte & Aponte, 1971; Davidson, 1968; Rachman, 1965). These investigations compared desensitization to relaxation alone, and found the former to be more specific. On the other hand, Johnson and Sechrest (1968) working specifically with test anxiety, found no difference between desensitization and relaxation, while Shemberg (1970) concluded that "relaxation alone may not be a totally ineffective treatment procedure." Only three studies (Aponte & Aponte, 1971; Donner & Guerney, 1969; Garlington & Cotler, 1968) have attempted to examine the processes which mediate the reductions of test anxiety.

More recently, studies by Anton (1957) and Bedell (1975) have examined both process and outcome variables in the systematic desensitization of test anxiety in an attempt to seal up the area of test anxious treatment via this method. Anton (1975) compared the effectiveness of systematic desensitization and group counseling as methods of treating test anxiety. Four outcome measures were used: (1) the TAS (Sarason, 1972); (2) the STAI A-Trait Scale (Spielberger, Goruch, & Lushene, 1970); (3) changes in the grade point average and (4) a measure of test hierarchy aversiveness. Of 54 undergraduate students, 32 were assigned to the desensitization condition (D), 8 to the group counseling condition (C), and 14 to the no-treatment control condition. The latter were told that they could not be accomodated at that time, but that they would be treated at the earliest opportunity. Group treatment subjects (C) were treated in the same room as

condition (D) subjects and were urged to focus on ways they coped with test A. TAS scores of the three groups were essentially the same prior to treatment. After treatment, D groups' TAS scores dropped markedly, C group scores decreased slightly, while NT group scores showed a slight increase. A significant Condition x Time interaction indicated that only the desensitization group showed a significant TAS score reduction; changes in scores of the other group were nonsignificant. Similar results for the three groups were observed for the anxiety aversiveness scores. There was no significant change, pre-treatment to post, among the treatment groups when compared regarding scores on the STAI A-Trait Scale. In none of the groups was there a significant change in grades or academic achievement. Anton (1975) alluded that had cognitive performance measures been administered before and after treatment, group differences here may have emerged. Bedell (1975) focused on this and other issues.

Bedell (1975) compared the relative effectiveness of systematic desensitization and relaxation in the treatment of test anxiety. However, noting the above weakness in Anton's study by including two cognitive-intellectual outcome measures, the Wonderlic (1973) Personnel Test and the arithmetic section of the Wide-Range Achievement Test were matched.

In a pretreatment session, all subjects were given the Wonderlic Test, the Wide Range Achievement Test, the TAS, the STAI A-Trait Scale, in the order presented. Four treatment

groups composed of ten subjects each were created, equated as closely as possible by the Wonderlic and the TAS. A control group was created from students unable to meet scheduling requirements and who were treated after the study was completed. The four experimental groups consisted ofcombinations of desensitization or relaxation treatment and instructions with high or low (neutral) expectancy of possible therapeutic gain.

Results indicated that all experimental subjects when considered as a whole improved during the course of the study, i.e. their TAS scores dropped. The no-treatment subjects showed no significant change. An analysis of variance of STAI A-Trait scores showed no change over the course of the study, consistent with Anton's (1975) results. Similarly, Wonderlic scores from pretreatment to posttreatment showed no significant change. WRAT scores changed only slightly and significantly; Bedell attributed this finding to a practice effect. Differences between the experimental groups were far from dramatic. TAS scores for all groups dropped from pre- to posttreatment. STAI A-Trait scores remained unchanged as did Wonderlic scores. A slight change in WRAT scores from pre- to posttreatment for all groups was attributed to a practice effect.

The results of Bedell's study were, thus quite similar to those of Anton. In both studies, relaxation training and desensitization both produced marked reductions in test anxiety, as assessed by the TAS. In Bedell's study, relaxation proved as effective as desensitization. Contrary to expectations, while

desensitization and relaxation treatments reduced test anxiety, improvements in grades were not observed in Bedell's study, nor was better performance indicated in Bedell's cognitive-intellectual measures.

Although systematic desensitization continues as a major thrust in test anxiety treatment, other alternatives have also come to the forefront. Oliver (1975) has contended that Ellis's system of psychotherapy, rational emotive therapy (RET) is an effective treatment for test anxiety. It is evident that experimental studies are not Ellis's forte; the 1975 study is not experimental but an application of RET philosophy to test anxiety, and a "how to" essay. Specifically, Oliver cites some irrational beliefs, the elimination of which the foundation of RET, which she indicates maintain test anxiety: fear of failure, self-downing perfectionism, need for approval, anxiety about being anxious, etc. For treatment of test anxiety Oliver suggests various cognitive strategies. To wit, thought-stopping, rational emotive imagery, self-reinforcement, among others are suggested. Albeit the above reference is not experimental in nature, it should still remain cited. The literature specific to the cognitive modification treatment of test anxiety often cites Ellis as an integral part of its own foundation.

Cognitive modification is a variant of traditional behavior therapy. It specifically addresses itself to the juncture between the stimulus and response which traditional early behaviorists avoided, i.e., the subject's thinking or cognitions. Principal in the

development of this system of therapy is Meichenbaum (1977). After reviewing the literature on desensitization, Meichenbaum (1977) concurred with Rachman (1965) that the major contribution of relaxation to the desensitization process is a matter of mental, rather than physical, relaxation. What evolved from this cognitive emphasis of desensitization was Meichenbaum's coping imagery (as opposed to the mastery concept of traditional desensitization). The coping imagery procedure requires that while visualizing a scene from his anxiety hierarchy, the client is to see himself coping with anxiety by slow deep breathing relaxation, and self-instructions. That is, in the coping imagery procedure, the client visualizes both the experience of anxiety and also ways to handle and reduce this anxiety.

Several investigations (Debus, 1970; Kazdin, 1974; and Meichenbaum, 1972) have demonstrated that the coping imagery procedure is more effective than the mastery based procedure. Further, clients after coping imagery training reported that their experience of anxiety as positive rather than debilitating.

Studies done by Wine (1970) and Meichenbaum (1972) proffer evidence that the coping procedure can be effectively applied to test anxiety. Meichenbaum's study compared cognitive modification with group desensitization and a waiting list control group. The first component of the cognitive modification treatment attempted to make test anxious subjects aware of their thoughts, self-verbalizations, etc. which they emitted prior to and during a

testing situation. Meichenbaum (1972) cites Ellis (1963) and Meichenbaum, Gilmore and Fedorvicius (1971) as demonstrating that such an "insight" procedure was successful in reducing speech anxiety because both the therapist and the client operationalize the "Worry" component for the speech anxious subject to a set of self-statements likely to be emitted during a speaking situation. The second component of the cognitive treatment procedure used by Meichenbaum was a modification of systematic desensitization to include the coping imagery procedure described previously. Implicit in the coping imagery procedure, is the assumption that when desensitized subjects are instructed to imagine hierarchies of fearful stimuli, they are in fact acting as models for their own behavior. Further, Meichenbaum (1971) has demonstrated that models who demonstrated initial fearful behaviors, then coping behaviors, and finally masterful behaviors were significantly more efficacious than models who exhibited no fear but masterful behavior throughout. In addition, coping models who self-instructed themselves outloud were even more effective.

Meichenbaum's (1972) results indicated that the cognitive modification group was most effective in reducing test anxiety as assessed by (a) test performance obtained in an analogue situation (digit symbol test and Raven's Matrices test), (b) self-reports immediately after treatment and at a one month follow-up (Alpert-Haber Scale and Anxiety Adjective Checklist), and (c) grade point average. Further, posttreatment performance measures indicated

that high test anxious students in the cognitive modification group did not significantly differ from low test anxious students on both performance measures and self-report measures.

Wine (1970) reported that high test anxious subjects given six hours of attentional training by means of modeling and behavioral rehearsal to self-instruct in a task relevant manner improved significantly on performance and self-report measures which included the Alpert-Haber Anxiety Test. The attention self-instruction group improved significantly compared to the "insight" group who concentrated on the exploration of self-relevant variables, namely the thoughts they had during evaluative situations. Although her numbers were small, Wine's results suggest that an insight procedure which concentrated on making subjects aware of anxious provoking self-statements without exploring and practicing the use of incompatible self-instructions and behaviors is ineffective in reducing test anxiety and likely to reinforce a deteriorative process.

William (1976) hypothesized that Meichenbaum's cognitive modification procedure would be superior to traditional desensitization using mastery imagery, desensitization using coping imagery and Ellis Rational-Emotive Therapy. Self-report measures, digit symbol tests, and GPA's were used as outcome measures. The cognitive modification group, however, failed to demonstrate superiority on all but one of the seven measures. The RET group appeared to be the most potent by showing the most consistent and largest changes. William allowed that U.S.-Canadian subject differences may have

accounted for the failure to support the hypothesis. Subjects used by William were less anxious than their Canadian counterparts as assessed by self-report measures of anxiety and GPA's.

Most recently, Goldfried, Linehan, and Smith (1978) examined the components of Meichenbaum's (1972) cognitive restructuring package pointing out that Meichenbaum's success could be attributed to relaxation that was part of the package or to longer exposure times during the anxiety hierarchy presentation (cognitive modification subjects were instructed to maintain the image and cope with the anxiety). Consequently, Goldfried et al. implemented a treatment procedure, which they called systematic rational restructuring, which "essentially involves the use of an imaginally presented hierarchy item to provide individuals with practice in ferreting out unrealistic concerns and worries, affording them the opportunity to place each situation in a more realistic perspective, and then use their newly acquired skills to reduce anxiety in real life situations" (Goldfried & Davison, 1976). Goldfried et al.'s study compared the above procedure with a condition, hierarchy items were presented without any instructions or directions for coping cognitively. The systematic rational restructuring group showed greatest reductions in questionnaire measures of anxiety, followed by the group which had prolonged exposure to the hierarchy, followed by a waiting list control group which showed no change. Further, only systematic rational restructuring posted a significant decrease in subjective anxiety before an analogue test-taking situation, and

a greater generalization of anxiety reduction in social-evaluative situations. Goldfried et al. concluded that cognitive restructuring alone, as opposed to Meichenbaum's procedure which also included Rational-Emotive Therapy, self-instructions, and relaxation components, is effective in reducing test anxiety.

The third and final major thrust in the treatment of test anxiety involves the use of modeling. The model may be a third party observed by the subject or may be the experimenter. Sarason (1975) noted that the experimenter as a variable in psychological research has been considered from a number of psychological perspectives, among them as a source of a miscellany of uncontrolled variability, as a means of facilitating subject's performance through the building of rapport, and as a provider of cues used by the subject in performing the task before him.

Miller and Dollard (1941) opened up the area of modeling, or imitation learning as they referred to it, but the area lay fallow for over 20 years. Bandura and Walters (1963) formulated an imitation theory amenable to personality development. Without twisting the logic of inference, the theory can be used to explain how a model can affect a test anxious observer.

Bandura and Walters concisely listed three effects of a model on an observer. The first is called the modeling effect: the observer copies the responses that he has not made previously. This effect is responsible for the acquisition of new behavior,

which may be entirely novel responses or new, complex ones consisting of components already in the observer's repertoire. Another possibility is that the observer pairs old responses with new stimuli.

The second kind of effect posited by Bandura and Walters is one of inhibition on disinhibition. That is, the observer, when imitating a model, tends not to make a response that he might ordinarily make (inhibition), or, he might make a response that has been previously punished (disinhibition).

A third effect is the eliciting effect. Here, the observer, after imitation, makes responses that are already in his repertoire that have not been inhibited by punishment.

Bandura and Walters have suggested several variables that determine the extent of imitation. For example, the more salient the cues offered by the model, the better is the imitation by the observer. While reinforcement of the model for his behavior facilitates copying by the observer, Bandura and Walters do not include reinforcement of the observer's copying behavior as an important determinant of imitation. They believe that acquisition of an imitative response occurs by means of contiguity, whereas performance of imitative behavior is affected by reinforcement to the model (Bandura, Ross & Ross, 1963).

With this background of modeling theory in mind, a sequence of studies, using modeling solely or as part of a treatment package for test anxiety, should be reviewed. As noted, Wine (1970)

was the first to employ models in the treatment of test anxiety. However, as she allowed in her discussion, her videotaped models were part of a treatment protocol and, at that writing, she was not able to assess the effects attributed directly to the model.

Jaffe and Carlson (1972) were perhaps the first to use models solely as a treatment for test anxiety. In their study 30 test anxious subjects were tested by WAIS performance subtests (an anagram task, an anxiety self-report measure, and the TAQ). Also, their introductory psychology grades were noted. The subjects were divided into five groups, four of which viewed one of four videotaped models. Tape A was a performance of a calm, business-like model taking an intelligence test and who received positive feedback from the examiner. Tape B showed an anxious model who received positive feedback from the examiner. A calm model receiving negative feedback was demonstrated in Tape C. Tape D presented an anxious model who received negative feedback. Subjects in the fifth group viewed no model, but participated in pre- and posttesting. Subjects were then retested with different WAIS subtests, and the same anxiety self-report measures. In addition, each subject rated the videotape he (she) saw in order to verify that the four displays were distinct from one another and perceived as had been intended.

Results indicated that tapes with negative consequences were judged as significantly more negative than those with positive consequences. There was no interaction between model affect and

consequences when pre-post change scores on the performance indices were analyzed. There was a significant overall effect for the control of all the experimental groups. A priori tests indicated that subjects viewing the calm-negative, anxious-positive, and negative-anxious videotapes all improved significantly more than the control group. Neither of the experimental groups just mentioned differed from each other. Further no difference was found between the calm-positive and the control group. Subjects viewing tapes with negative consequences had a significant detrement in the TAQ.

Jaffe and Carlson therefore challenged the logical assumption that the most beneficial model is the one who is calm and experiences positive feedback. Rather, they proposed that a model experiences negative consequences in an implosive fashion, so that maximum extinction may take place, may be in fact the most effective model.

I. Sarason (1972) conducted a study which initiated a series of studies which further elucidated the effect of various model behaviors on subjects high in test anxiety. The 1972 study actually involved two experiments: In the first, Sarason showed the effect of a model who failed on a serial list task and expressed dissatisfaction with her performance, compared to a model who expressed no dissatisfaction, on subjects who were high, moderate, or low in test anxiety. Results indicated a significant inverse relationship for correct responses and TAS level. Further,

a main effect for treatments was evident: subject viewing no model had the least correct responses, followed by the model who expressed no dissatisfaction, followed by the self-derogatory model.

In addition, Sarason had expected a TAS x Treatments interaction. It had been expected that the opportunity to observe a model would have a facilitative effect on all subjects especially those high in test anxiety, but that the high TAS group would benefit less from the self-derogatory model. While there was an overall effect of the models, the derogatory model did not differentially affect the three TAS groups. Also, in a post hoc discussion, he surmised that self-derogation by the model might be different from the effect of a model who is failed by an authority, e.g. the experimenter. Again, subjects first observed models. In one treatment condition the model did not make self-derogatory comments but was informed by the experimenter that her performance was low and that her chances for academic success were questionable. A second model condition gave no such feedback, and a third was a control. Analysis of the number of correct responses revealed a significant treatments main effect, the two modeling conditions performing better than the no model condition, also, a significant TAS x Treatments interaction. High TAS subjects performed significantly lower when observing a failed model. Conversely, the low-TAS subjects performed significantly better after observing a failed model. The middle-TAS groups under the two modeling conditions did not differ significantly in their performance levels.

Sarason (1972) concluded that his results lend support to the conclusion that persons differing in test anxiety differentially attend and react to stimuli. Evaluative cues appear to motivate low test anxious persons, but, on the other hand, threaten high test anxious persons. Further, a habit or learning interpretation, of test anxiety was supported, according to Sarason.

Sarason's second test anxiety-modeling study (1973) dealt with the effect of a model who verbalized her cognitive strategies while performing an anagram task. One group observed an experimenter, who served as a model, solve problems first, prior to performing themselves. For a second group, the model not only worked on the anagram but verbally described the manipulations of the anagrams letters. In a third group, an additional component was added. The model also described underlying principles of successful solution of the anagrams. A control group worked anagrams without observing a model. Results showed that the low TAS group performed in a superior manner to the high-TAS group. Treatment groups which observed a model perform and verbalize or a model who performed, verbalized, and outlined her principles performed at a higher level than the groups who watched a model perform only or who watched no model. Most salient, however, was a significant TAS x Treatments interaction. Low TAS subjects performed at a superior level in every condition except under the condition where the model outlined her performance principles. In that condition, high-TAS subjects

took less time to solve anagrams than did low-TAS subjects.

Sarason's (1973) results support Doris and Sarason's (1955) conclusion that when high-TAS subjects perform in an inferior manner it is usually because they attend to covert, task irrelevant responses. Sarason further concluded that the model who verbalized her principles allowed the high-TAS subjects to adopt some useful cognitive strategy which allowed subjects to become less self preoccupied and anxious, enabling them to guide their behavior. The results are in consonance with those of Wine (1970, 1971) and Meichenbaum and Goodman (1971).

Sarason's last study involving test anxiety and modeling (1975) represented a confluence of the lines of research in test anxiety, modeling, and self-disclosure. Noting his results in his study of cognitive modeling (1973) and from literature which suggests that self-disclosure of persons who are experimenters, therapists and peers exerts influences over the self-disclosure of subjects, clients, and other peers (Cozby, 1973), Sarason (1975) examined the effects of evaluation threat and model self-disclosure on high test anxious subject performance on a serial list learning task.

A 2 (TAS, high and low) x 5 (Model Treatments) x 2 (Stress conditions) factorial design was used. The modeling factor was comprised of five conditions defined by the experimenter's (model) behavior. Prior to the subject's performance on the learning task, subjects observed an experimenter which acted in one of five conditions:

(a) As a coping anxious model, who described herself as high in test anxiety but also described how she was able to cope with it; (b) as a noncoping anxious model who described herself as high in test anxiety but did not mention how she coped with it; (c) as a low anxious model who described herself as typically being unworried about taking tests; (d) as a neutral model who avoided talking about test taking but talked of campus life instead. In (e), a control condition, the experimenter proceeded directly to administer the learning task.

In the High Stress condition, subjects were told that the research was being done to investigate the relationship between learning ability and intelligence. Further, subjects were led to believe that their performance was in part a predictor of academic and vocational success. In the Low Stress conditions no such explanation preceded instructions about how to perform the learning task.

Results of an analysis of variance on the correct number of responses indicated significant main effects for test anxiety and model treatment conditions, but not for stress. The low TAS groups made significantly more correct responses due primarily to coping model condition. A significant test anxiety x model conditions interaction indicated that the high TAS-coping model condition made more correct responses than all other high or low TAS groups. A test anxiety x stress interaction indicated that

low-TAS subjects' performance was facilitated by stressful achievement oriented instructions.

Sarason concluded that his results were consistent with the view that the experimenter provided high test anxious subjects with modeled information about adaptive cognitive tactics for coping with their test anxiety. He did allow that his 1975 study results could have been in part a function of subtle unseen demand characteristics. Further, examination of the function of the degree of subject stress at the time of model observation was thought to be in order.

To recapitulate, the treatment of test anxiety has proceeded along three major avenues. Initially desensitization was the mode and this approach appeared to be moderately successful. Upon closer scrutiny, however, it appears that the relaxation component is the most effective part of desensitization and that relaxation may be more cognitive than mental. Meichenbaum consequently demonstrated that his cognitive modification system can effectively reduce test anxiety. Sarason (1972b, 1973, and 1975) has produced the bulk of the research on test anxiety which added modeling to the treatment package. This segment of the test anxiety treatment literature indicates that modeling which provides cognitive modification opportunities is most effective. To date, however, most treatment studies have dealt with learning in the laboratory and have not focused on course grades and/or grade point averages. Finally, a thin but consistent thread, can be found throughout the test anxiety treatment literature. Systematic desensitization studies indicate that perhaps the relaxation may be more cognitive in nature than

physical. Keying in on this, Meichenbaum argues that with his cognitive modification treatment, the test anxious subject may in fact, by learning to cope effectively with his anxiety, may actually provide himself with a model for his own behavior in future stressful testing situations. Sarason's series of studies elucidate what facets of the model's behavior are most facilitative in reducing test anxiety.

It is to Sarason's (1975) query in his discussion that this study is addressed. Sarason pondered the effect of stress on high test anxious subjects at the time they observe a model. In the Sarason study just mentioned, subjects received stressful, evaluative instructions or neutral instructions after observing the experimenter (model) complete her self-disclosure. That is, the subjects were stressed in one condition after observing the model. No condition allowed for the assessment of subject performance when subjects were stressed prior to model observation; this would be ideal for assessing the effects of ongoing psychological stress if alternate conditions were included in which subjects received neutral, low stress instructions both before and after model observation, and a set of conditions in which no model is observed but either low or high instructions are delivered.

That psychological stress can be created and maintained in high test anxious subjects by instructions is evident in numerous studies, e.g., Sarason (1975), Sarason, Mandler, and Craighill (1952) and a pilot study by the present writer (1976).

The present study, then, is aimed at answering the question posed by Sarason (1975): were his results a function of model observations, the stress which followed the observation of model or both. Specifically, the following relationships are hypothesized to exist vis-a-vis the temporal relationship of stress and model observation by high test anxious subjects.

Hypothesized Relationships

1. High stress female subjects, given the opportunity to view the self-disclosing coping model before stressful instructions are administered (high stress, model → instructions; HSMI) will perform better than subjects stressed (high stress, instructions → model; HSIM) prior to the observation of the model. A-state anxiety data should reflect that the latter group will become more anxious compared to subjects stressed after model observation.

2. High stress control subjects who view no model but receive stressful instructions (high stress, no model; HSNM) should perform in an inferior manner on the learning task to groups HSMI and HSIM. They should indicate a greater change in anxiety from beginning to the end of the study compared to either the HSMI or HSIM groups.

3. Low stress subjects, given the opportunity to view the self-disclosing coping anxious model before nonstressful instructions are administered (low stress, model → instructions; LSMI) will not perform differently on the learning task than the group which receives nonstressful instructions first and then views the model (low stress, instructions → model; LISM). Both of these groups

(LSMI and LSIM) should perform better than all high stress groups (HSMI, HSIM, and HSNM). Changes in anxiety from beginning to end of the experiment should reflect the same pattern: group LSMI should not differ from LSIM, but both should be superior to all high stress groups (HSMI, HSIM, and HSNM).

4. Low stress control subjects who view no model but receive nonstressful instructions (LSNM) will perform better on the learning task and show less of an increase in their assessed anxiety over the course of the study compared to all high stress subjects (HSMI, HSIM, and HSNM). However, the LSNM group should not differ in learning performance or anxiety change from the other two low stress groups, LSMI and LSIM.

Method

Subjects

The subjects were 54 female undergraduate students from Introductory Psychology and Sociology classes at Virginia Polytechnic Institute and State University in the summer and fall of 1976. Prior to, and independent of the experiment, the subjects were administered the 37-item Test Anxiety Scale (TAS), developed by I. Sarason (1972). The subjects were drawn from the top third of all students tested. The range for the top third was 17 - 34 the mean 24.7. Females only were used to replicate Sarason (1975).

Apparatus and Materials

A serial learning task was administered by a Kodak Carousel Slide Projector connected to a Lafayette Repeat Cycle Timer. The slide projector was elevated above and behind the subject and projected an image on the wall of the darkened experimental room approximately three meters in front of the subject. The learning material presented by the projector was a list of 16 three-letter consonant-vowel-consonant (CVC) nonsense syllables of moderate association value (M = .50) taken from Archer (1960). Each list presentation was considered a trial. Each CVC was presented for two second duration with two second interval between CVC's. There was a six second interval between lists (trials). Each subject was presented the list of 16 CVC's up to a maximum of 16 times or until the list was learned. If a subject came to a criterion of two correct successive trials throughout the lists, he was awarded

16 correct responses per trial for the remaining trials up to 16. A total of 256 correct responses per subject were possible, i.e., 16 trials each with a maximum of 16 correct responses. Both the total number of correct responses and number of trials to a criterion of two successive correct trials each with 16 correct responses each were the learning material dependent variables.

To the subject's left, behind a partition on the same table that was in front of her, was a Lafayette Portable Datagraph (polygraph). The polygraph could not be seen by the subject. Skin conductance finger electrodes and a finger pulse monitor extended from the polygraph, under the partition, to the subject's nonpreferred hand. The datagraph was not operating, although the subject was led to believe that it was.

A five minute videotaped interview between the experimenter and a female undergraduate model, acting as a high test anxious coping person (Sarason, 1975) was also used. In the interview, the model described how she, in the past, worried about failing tests, thought about how others are doing on the same test, worried about being nervous when taking tests, had difficulty concentrating, and became upset when she missed items on a test. Subsequently, the model mentioned to the interviewer that she had developed some tactics to overcome the undesirable effects of test anxiety. These included: (a) reminding herself to stop concentrating on her own feelings and to think about the task at hand, (b) thinking about aspects of the task which may be especially interesting to her,

(c) not allowing herself to get upset by errors but keep working at a steady pace, and (d) forcing herself not to think about others and how they might be performing on the same task. A transcript of the interview is presented in Appendix A.

In addition, a four-item scale derived from the A-State Inventory (Spielberger, Goruch & Lushene, 1968) was administered to assess anxiety at three specific points in the experiment. In the present writer's pilot study (1976), this four-item scale predicted 95% of the variance of A-State scores. Three additional subjective rating scales were also used to assess anxiety. All seven scales are presented in Appendix B.

Dependent Variables

Both the total number of correct responses out of a possible 256 (16 correct responses each in 16 lists) and the number of trials (list presentations) to a criterion of two successive correct trials were the dependent variables.

In addition, the seven anxiety ratings on the questionnaire mentioned above were also used as dependent variables.

Experimental Design

Three factors were investigated. The first factor was high or low subject stress manipulated via the instructions used in the pilot study cited above. Those verbatim instructions are in detail in Appendix C. The second factor was the order of presentation of the stressful or nonstressful instructions in temporal relation to the opportunity to view the videotaped interview with a test anxious

coping model. Within each level of stress, i.e., high or low, were three groups. In the High Stress level, one group viewed the interview first and then received stressful instructions. A second group received stressful instructions first which were followed by viewing of the videotaped interview. A third group served as a control in that subjects in the group received only stressful instructions, but did not view the interview. Nine subjects were randomly assigned to each group. The same format was followed for the Low Stress level except that nonstressful instructions were used.

A third factor was the level of the subject's anxiety at specific temporal points within the progress of the experiment. The level of anxiety was assessed by the administration of the modified A-State questionnaire described in the materials and apparatus section (Appendix B). The A-State form was administered at three specific junctures: (1) prior to the subject's participation in the experiment, when she was waiting in a chair outside the experimental room, (2) after receiving stressful or nonstressful instructions, but before beginning to learn the serial list presentation, and (3) at the end of the last trial presentation, but before the debriefing was accomplished.

The factorial design of the study is outlined in Figure 1. The stepwise procedure for the High Stress, Model, Instructions group (HSMI) was as follows:

1. Subject fills out modified A-State form (Appendix B).

2. Subject is ushered into the experimental room and polygraph electrodes are attached to fingers of the left hand.
3. Subject views videomodel interview. (Appendix A)
4. Subject is asked to list anxiety coping tactics outlined in the interview.
5. Anxiety-coping tactics of #4 are summarized by the experimenter.
6. Subject receives stressful instructions. (Appendix C)
7. Second A-State questionnaire filled out by subject. (Appendix B)
8. Subject begins serial list learning task.
9. At the beginning of the eighth trial, the slide projector is stopped, and the experimenter informs the subject that her performance is inferior to that of previous subjects.
10. Subject resumes and completes learning task.
11. A-State questionnaire is again administered to subject. (Appendix B)
12. Subject lists the tactics for coping with anxiety mentioned by the model in the interview.
13. Subject is debriefed.

For the High Stress, Instructions-Model Group (HSIM), the procedure was the same except that subject received stressful instructions and completed the second A-State questionnaire before viewing the interview. That is, steps 6 and 7 were inserted before step 3. In the High Stress Control, No Model (HSNM) group steps 3, 4, 5, and 12 were omitted.

For the Low Stress groups, the procedures for each corresponded to their High Stress counterparts, except that nonstressful instructions (Appendix C) were given instead of stressful instructions.

A complete stepwise outline of the procedure for all six groups is given in Appendix D.

Insert Figure 1 about here

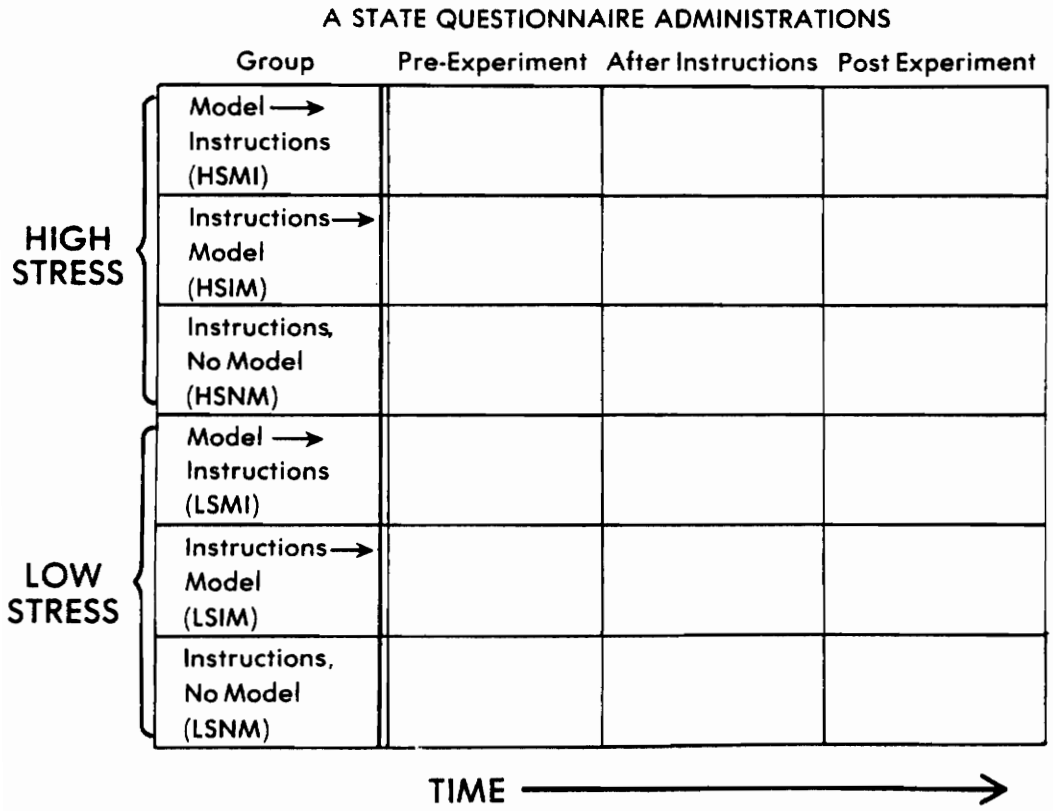

Figure 1 General Experimental Design.

Results

Learning Data

The number of correct responses across trials was analyzed by a 2(Stress) x 3(Model conditions) x 16(Trials) analysis of variance repeated on the last measure. Main effects of stress and model treatment were not significant. A significant main effect for trials was revealed, F (15,270) = 233.672, $p < .001$. Also, a significant stress x time interaction was indicated, F (15,720) = 2.185, $p < .01$. As the experiment progressed, Low Stress subjects made more correct responses, particularly after Trial 8, compared to High Stress subjects. The analysis of variance of the number of correct responses per trial is shown in Table 1. Means and standard deviations for the number of correct responses per trial are shown in Table 2. The data is depicted in Figure 2.

Insert Tables 1 and 2 about here

Insert Figure 2 about here

A Newman-Keuls Test for significant differences between cell means of the Stress x Time interaction indicated that Low Stress subjects made significantly more correct responses only on trials 12, 13, and 16 ($p < .05$).

To assess the effect of the stress manipulation across trials alone, without the effect of modeling, a Newman-Keuls Test for significant differences among cell means was conducted comparing

TABLE 1

Analysis of Variance
Number of Correct Responses Per Trial

Source	Sum of Squares	Mean Square	df	Error	F Ratio
Stress	221.029	221.029	1	1	2.112
Model Treatment	6.5995	3.2997	1	1	0.032
Stress x Treatment	280.794	140.397	2	1	1.342
Time	16,609.3	1107.29	15	2	297.343*
Stress x Time	153.260	10.2174	15	2	2.744**
Treatment x Time	54.1902	1.8063	30	2	0.485
Stress x Treatment x Time	139.825	4.6608	30	2	1.252

*p<.001
**p<.01

Error Terms	Sums of Squares	Mean Square	df
1	5023.45	104.655	48
2	2681.24	3.72394	720

TABLE 2

Means and Standard Deviations for Correct Responses Per Trial

(Trials 1-8)

Stress	Model Treatment	Trial 1		Trial 2		Trial 3		Trial 4		Trial 5		Trial 6		Trial 7		Trial 8	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
High	Model-Instruction	0.0	0.0	1.00	1.22	3.00	2.00	4.44	3.00	5.67	3.94	7.11	4.65	7.22	4.82	8.56	4.25
High	Instruction-Model	0.0	0.0	1.44	1.30	2.89	2.03	5.33	2.78	6.22	3.49	8.44	3.47	9.22	3.87	9.67	3.61
High	No Model	0.0	0.0	1.67	1.66	3.00	1.94	4.44	3.21	5.78	3.73	6.33	3.67	7.44	3.68	8.00	4.33
High	All Treatments	0.0	0.0	1.37	1.33	2.96	1.91	4.74	2.92	5.89	3.59	7.30	3.91	7.46	4.09	8.74	3.98
Low	Model-Instruction	0.0	0.0	1.67	1.32	3.11	1.27	4.78	3.07	6.11	3.14	7.33	3.74	10.00	3.72	11.11	3.52
Low	Instruction-Model	0.0	0.0	2.33	1.41	3.00	2.06	4.44	2.13	6.00	1.41	6.33	1.80	7.44	2.42	8.22	1.56
Low	No Model	0.0	0.0	2.22	1.48	3.89	1.76	4.78	2.91	6.44	2.70	6.22	3.15	9.22	3.07	9.67	4.30
Low	All Treatments	0.0	0.0	2.07	1.38	3.33	1.70	4.67	2.65	6.19	2.43	6.63	2.94	8.89	3.33	9.67	3.42
Grand Mean and Standard Deviation		0.0	0.0	1.72	1.40	3.15	1.87	4.70	2.79	6.02	3.04	6.96	3.44	8.43	3.72	9.20	3.70

TABLE 2 (Continued)

(Trials 9-16)

Stress	Model Treatment	Trial 9		Trial 10		Trial 11		Trial 12		Trial 13		Trial 14		Trial 15		Trial 16	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
High	Model-Instruction	9.44	4.13	9.67	5.17	11.22	5.26	11.22	5.45	10.56	4.85	12.11	4.94	12.33	5.17	12.78	5.31
High	Instruction-Model	10.89	4.14	12.33	2.92	12.26	3.47	12.44	2.19	13.33	3.32	14.11	2.42	13.56	2.56	14.33	1.66
High	No Model	9.00	4.89	9.67	4.74	9.67	3.84	10.44	3.88	10.89	4.45	11.78	4.41	12.44	4.10	12.44	4.16
High	All Treatments	9.78	4,31	10.56	4.41	11.15	4.27	11.38	3.99	11.59	4.29	12.67	4.05	12.78	3.96	13.19	3.94
Low	Model-Instruction	11.67	2.69	12.44	3.05	13.33	2.65	13.56	2.56	14.33	2.40	13.39	2.42	14.22	2.73	15.22	1.30
Low	Instruction-Model	9.89	3.18	10.33	3.43	11.56	3.05	12.11	2.15	13.22	3.31	13.89	3.33	13.78	2.77	14.78	2.39
Low	No Model	12.00	2.65	12.33	2.55	13.44	2.46	14.78	1.92	14.56	1.74	14.89	1.62	14.44	2.19	15.67	1.00
Low	All Treatments	11.19	2.90	11.70	3.07	12.78	2.76	13.48	2.41	14.04	2.53	14.22	2.50	14.15	2.49	15.22	1.65
Grand Mean and Standard Deviation		10.48	3.70	11.13	3.81	11.96	3.65	12.43	3.43	12.81	3.70	13.44	3.42	13.46	3.35	14.20	3.16

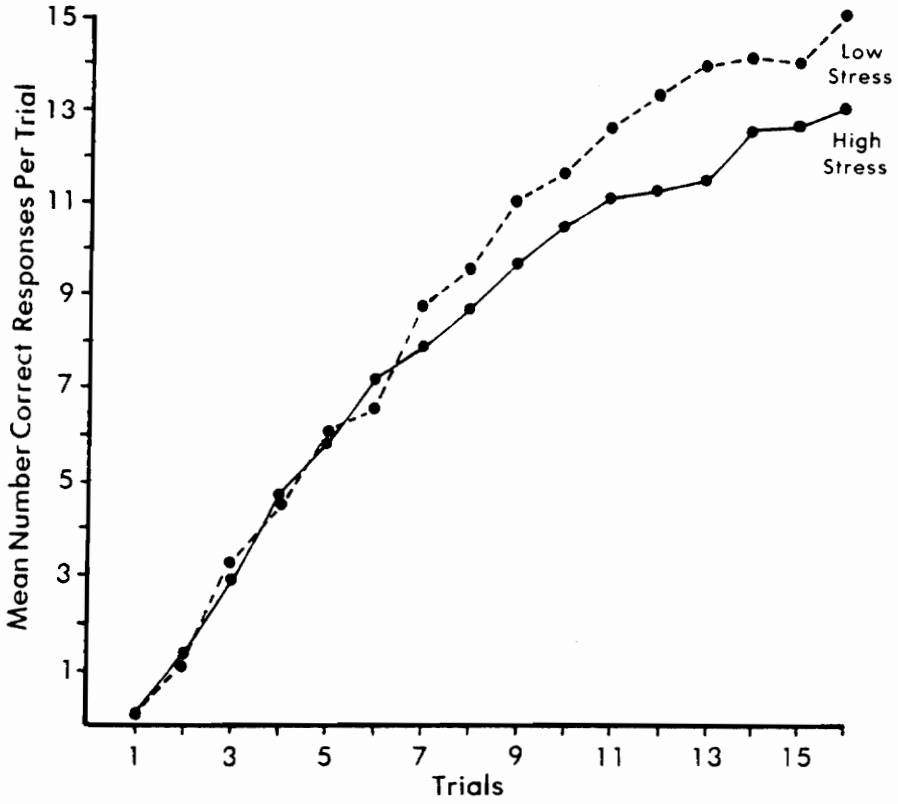

Figure 2 Mean Number Correct Responses Per Trial
High Stress and Low Stress Subjects

High Stress subjects who viewed no model to Low Stress subjects who viewed no model. Results indicated significant differences for trials 9 through 14, and at trial 16 Low Stress subjects performing better than High Stress subjects ($p < .05$). This performance is shown in Figure 3.

Insert Figure 3 about here

The dependent variable of number of trials to criterion was analyzed by a 2(Stress) x 3(Model conditions) analysis of variance. No significant differences were found for main effects of stress or model treatment, nor were any interactions significant. The means and standard deviation for the trials to criterion data are presented in Table 3. Likewise, the total number of correct responses for all 16 trials was analyzed by a 2 x 3 analysis of variance. No significant main effects were found. Means and standard deviations for the total correct responses data are also presented in Table 3.

Insert Table 3 about here

In summary, the experimentally manipulated stress was effective as a variable as the experiment progressed. Only in the latter trials were Low Stress subjects superior in performance. The order of presentation of the model, i.e., either before or after the stress manipulation, was not effective in improving learning performance.

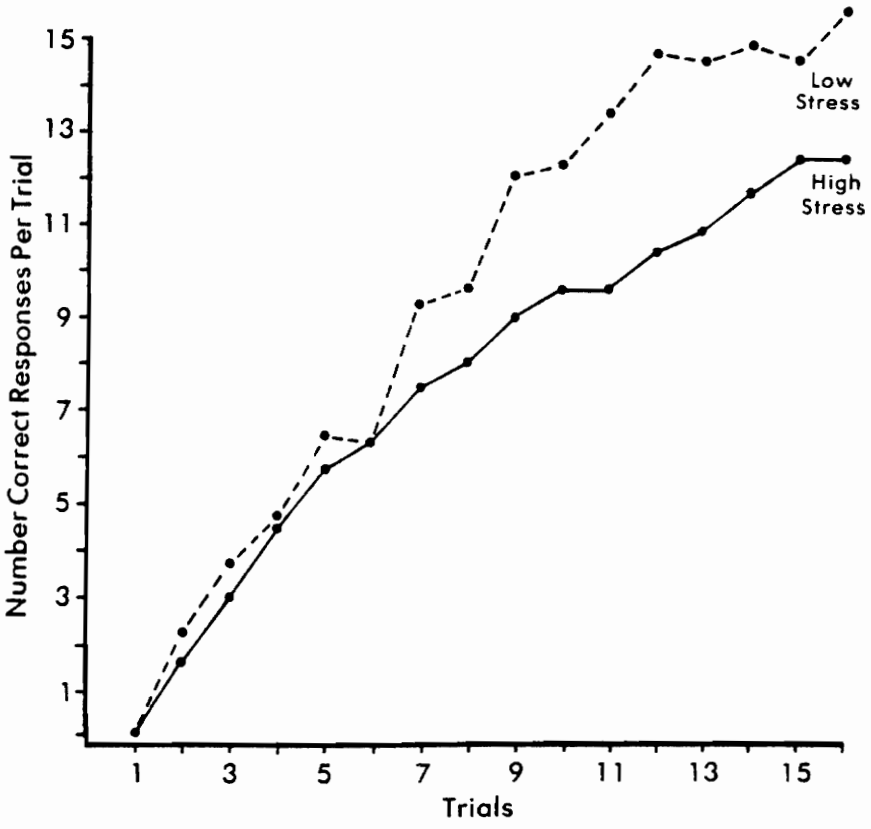

Figure 3 Mean No. Correct Responses Per Trial HSNM and LSNM Subjects

TABLE 3

Means and Standard Deviations for the Total Number of Correct Responses and Numbers of Trials to Criterion

Stress	Model Treatment	Total Number of Correct Responses		Trials to Criterion	
		X	SD	X	SD
High	Model-Instruction	112.11	50.61	15.11	2.32
High	Instruction-Model	130.78	28.79	15.00	1.73
High	No Model	114.56	46.23	15.56	1.01
High	All Treatments	119.14	42.09	15.22	1.72
Low	Model-Instruction	122.56	28.34	14.11	2.85
Low	Instruction-Model	134.00	25.04	15.78	0.44
Low	No Model	129.67	25.37	14.44	2.01
Low	All Treatments	128.74	25.84	14.78	2.08
Grand Mean and Standard Deviation		123.94	34.93	15.00	1.90

$\bar{X}$ = Mean

SD = Standard Deviation

Anxiety Data

When responses to the first four questions on the modified A-State questionnaire ("I am relaxed"; "I am upset"; "I am secure"; and "I feel pleasant") were analyzed as a total score by a 2(Stress) x 3(Model condition) x 3(Time of Questionnaire Administration) repeated on the last measure, significant main effects were found for stress, F (1,48) = 7.275, $p < .01$, and for sequence of administration of the questionnaire F (2,96) = 27.25, $p < .001$. Order of model presentation was not significant. High Stress subjects were more anxious than the Low Stress subjects. A significant Stress x Time, F (2,96) = 3.79, $p < .05$, indicated that as the experiment progressed High Stress subjects became more anxious than Low Stress subjects. A Newman-Keuls test for significant differences among cell means indicated that High Stress subjects were significantly more anxious at the end of the experiment compared to when they began the experiment ($p < .05$). Low Stress subjects, on the other hand, did not show a significant increase in anxiety from the beginning to the end of the experiment ($p < .05$). Results of the analysis of variance of the responses to the first four anxiety questions are presented in Table 4 and Figure 4.

Insert Table 4 and Figure 4 about here

The continuum scales of the questionnaire were also analyzed individually. The scale on which subjects rated themselves from "rattled and jittery" to "cool and collected" was analyzed in a

TABLE 4

Analysis of Variance
Total Anxiety Scores, Questions 1-4
(Secure, Upset, Relaxed, Pleasant)

Source	Sum of Squares	Mean Square	df	Error	F Ratio
Stress	68.055	68.055	1	1	7.275*
Model Treatment	40.530	20.265	2	1	2.166
Stress x Model Treatment	30.333	15.166	2	1	1.621
Time	164.309	82.154	2	2	27.251**
Stress x Time	22.481	11.240	2	2	3.729***
Model Treatment x Time	16.839	4.210	4	2	1.396
Stress x Model Treatment x Time	9.630	2.406	4	2	0.799

*p<.01
**p<.001
***p<.05

Error Terms

	Sum of Squares	Mean Square	df
1	449.038	9.355	48
2	289.416	3.015	96

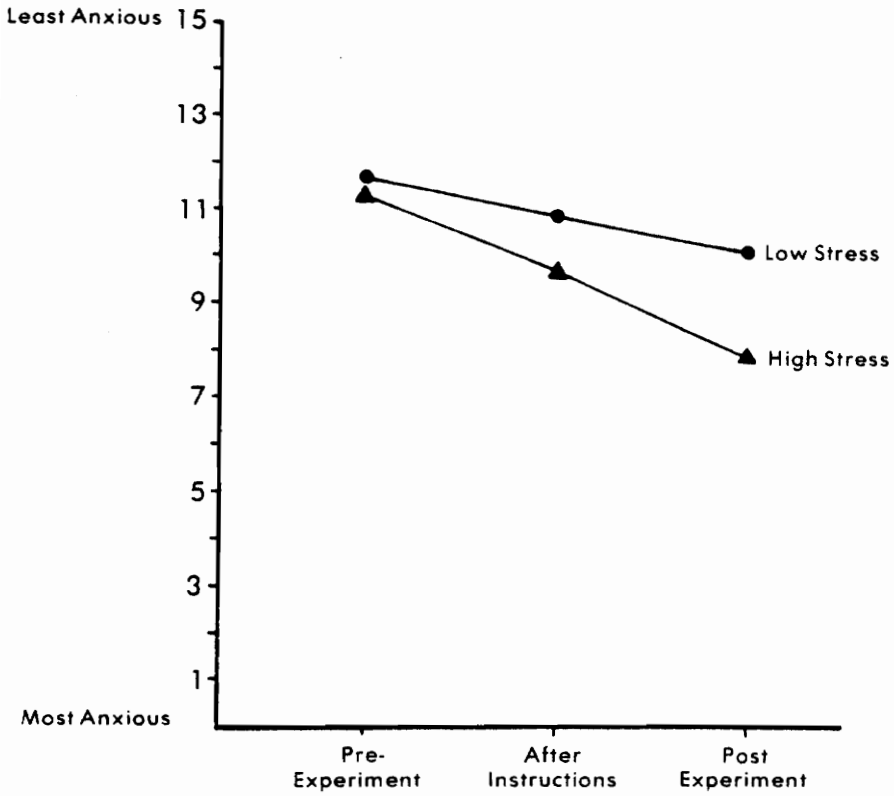

Figure 4 Total Anxiety Scores (All Treatments)

2(Stress) x 3(Model condition) x 3(Time of Scale Administration) analysis of variance repeated on the last measure. Stress and Model Treatments were not significant. However, a significant main effect for time of scale administration was evident, F (2,96) = 28.177, $p < .01$. That is, all subjects became less "cool and collected" and more "rattled and jittery" as they proceeded from the beginning to the end of the experiment. This main effect is presented in Figure 5.

Insert Figure 5 about here

The scale on which subjects rated themselves on a continuum from "calm" to "worried" was also analyzed by a 2(Stress) x 3(Model condition) x 3(Time of Scale Administration) analysis of variance repeated on the last measure. The results indicated no significant main effects for Stress or Model Treatment. A main effect for Time was significant, F (2,96) = 15.836, $p < .01$. That is, as the experiment progressed, subjects stated that they became more worried. In addition, a significant Stress x Time interaction was obtained, F (2,96) = 4,722, $p < .025$. This is presented in Figure 6. A

Insert Figure 6 about here

Newman-Keuls test for significant differences indicated that High Stress subjects were more worried at the end of the experiment than at the beginning. Low Stress subjects, on the other hand, did not significantly change their ratings on the calm-worried continuum from the beginning to the end of the study.

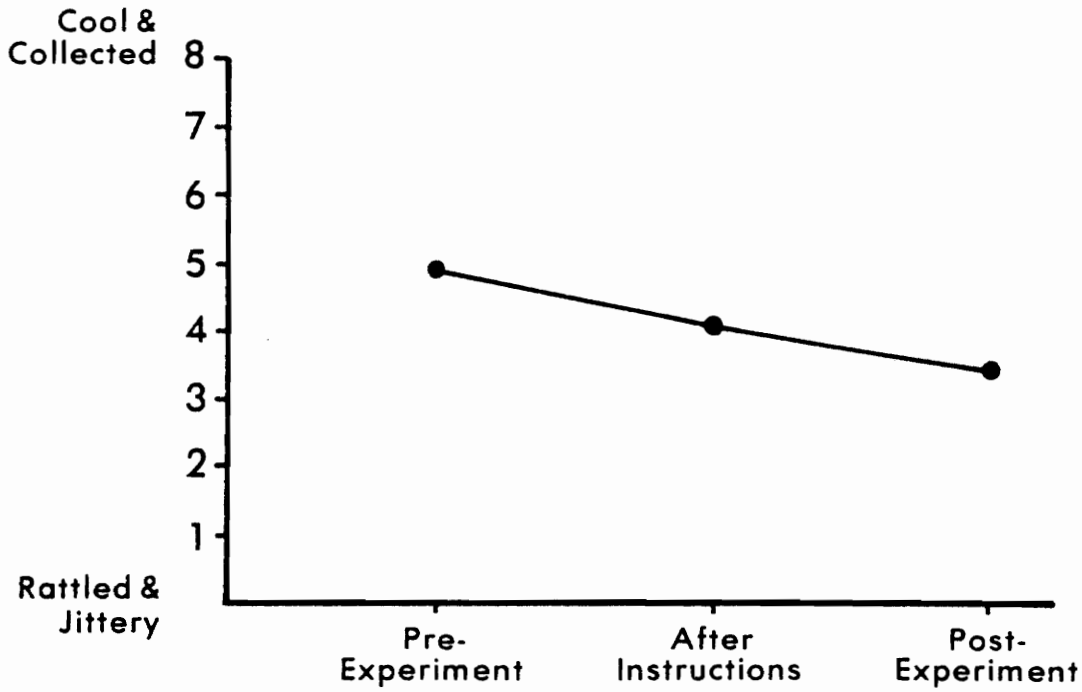

Figure 5 Continuum of "Cool & Collected to Rattled & Jittery" Main Effect For Time

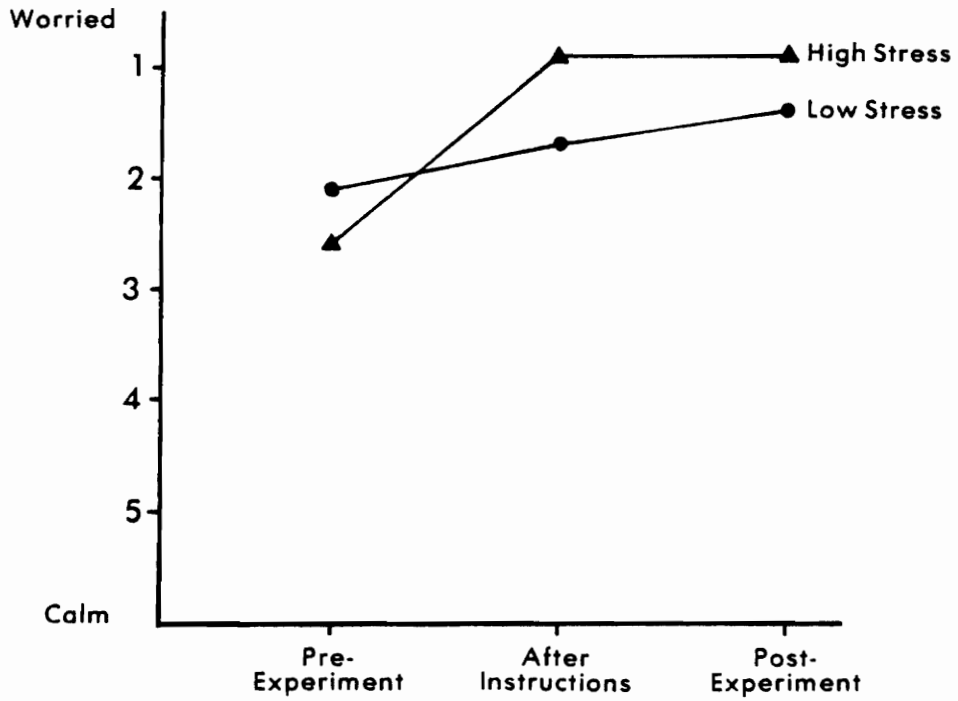

Figure 6 Continuum of "Calm" to "Worried"
Interaction of Stress & Time

Finally, the scale on which subjects rated themselves from "tense" to "relaxed" was analyzed by the same 2(Stress) x 3(Model condition) x 3(Time of Scale Administration) analysis of variance, repeated on the last measure. Results indicated a significant main effect from Time, F (2,96) = 19.961, $p < .01$; all subjects reported that they were more tense at the end of the experiment than at the beginning. This Time main effect is graphically demonstrated in Figure 7. Main effects for Stress and Model Conditions were not

---

Insert Figure 7 about here

---

significant.

To assess the effectiveness of the model, the number of coping tactics enumerated during the interview, and recalled by the subjects immediately after observation and at the end of the study, were analyzed. A 2(Stress) x 3(Model condition) x 2(Time of recall) analysis of variance, repeated on the last measure, was employed. A significant main effect for time of recall, F (1,32) = 15.891, $p < .001$, was indicated. Immediately after viewing the model, all subjects recalled a mean number of 3.02 coping tactics. After a summary of the tactics was then given to them; they were then able to recall a mean of 3.61 coping tactics, at the end of the study.

To summarize, the anxiety data from the administrations of the modified A-State questionnaire revealed no main effects of the model. The Model x Time interaction for the statement "I am relaxed" was the only indication that the model influenced anxiety. On the other hand, Stress x Time effects were salient. Time significantly influenced

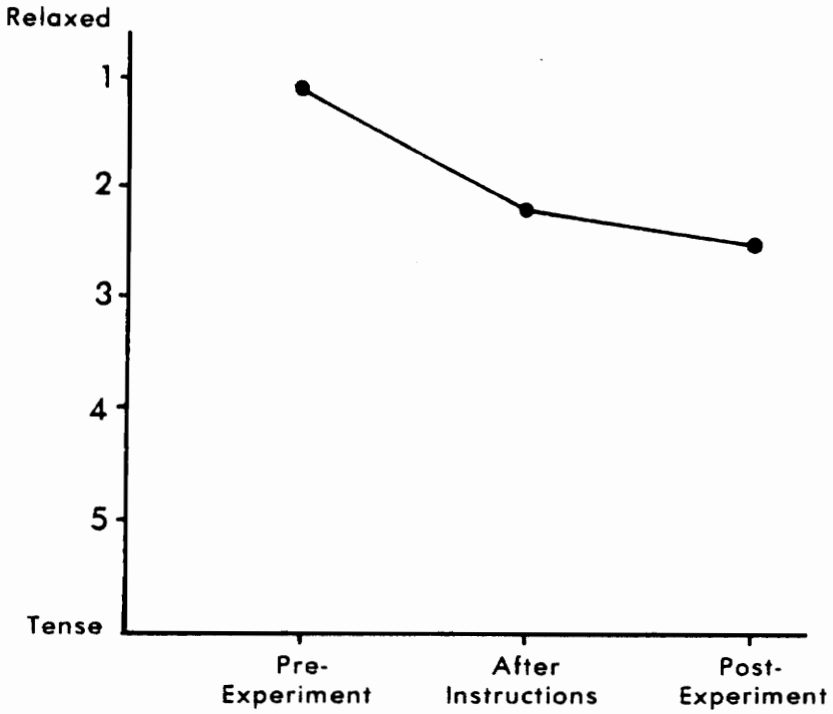

Figure 7 Continuum of "Relaxed" to "Tense" (All Treatments) Main Effect for Time

responses to all questions except "I am secure". Stress was influential when anxiety scores were analyzed in total and for the statements, "I am secure" and "I am relaxed". A Stress x Time interaction occurred when the total anxiety scores were analyzed.

Discussion

It was hypothesized that High Stress subjects who viewed a model before the onset of stress (HSMI) would perform in a superior manner on the serial learning task and indicate less anxiety than those subjects who observed the model after being stressed (HSIM group) and those subjects who were stressed but viewed no model (HSNM group). Further, it was predicted that Low Stress subjects would not be differentially affected by the model observation-instructions order (LSMI and LSIM groups) of presentation but would be superior in performance on the learning task and would remain less anxious than their High Stress counterparts. Low Stress subjects who viewed no model (LSNM group) were also predicted to perform better on the learning task and remain less anxious than all High Stress subjects, but not perform significantly different from the Low Stress subjects who had observed the model, regardless of order (LSMI and LSIM groups).

Results only partially supported hypothesized relationships. While there was no consistent reliable main effect for stress, the stress x time interactions for both the learning performance data and anxiety data indicate the effectiveness of the stress manipulation. Thus, subjects receiving the High Stress manipulation, regardless of whether the model was presented before or after the stressful instructions were given, or whether the model was even present at all, performed more poorly on the learning task (during the latter half of the study) and reported higher levels of anxiety at the end

of the experiment compared to Low Stress subjects. That is, High Stress subjects (groups HSMI, HSIM, and HSNM) performed more poorly than did Low Stress subjects (groups LSMI, LSIM, and LSNM) on the learning task, and they (High Stress subjects) became more anxious. That the High Stress subjects became more anxious by the end of the experiment supports the results of the present writer's pilot study (1976).

That High Stress subjects differed from Low Stress subjects in learning performance only after the eighth trial intervention by the experimenter in the High Stress condition deserves comment. Initial stressful instructions were similar to those usually cited as threatening and debilitative to high test anxious students. However, in the present study there was no stress main effect. This was noted also by Sarason (1975). The inferiority of the learning performance of the High Stress subjects toward the end of the study must be attributed to the eighth trial negative feedback given them about their performance or to the interactive effect of this feedback with the initial stressful instructions. One area of future research could be the attempt to examine what component of the High Stress condition of this study influences learning performance of high test anxious subjects.

No widespread support was found for I. Sarason's (1975) conclusion that a model whose self-description dealt with the experience of test anxiety and adaptive ways to cope with it has a facilitative effect on high test anxious subjects given the opportunity to view the model. Indeed, the analysis of the total number of correct

responses in 16 list presentations, nor the number of trials to remain a criterion of two successive trials. Both Sarason's dependent variables demonstrated significant differences within each stress level among groups who received instructions first, or after viewing the model, or viewed no model at all. There may be several cogent explanations for this failure to replicate Sarason's results.

First, in the present study, the learning task was stopped after trial 16, if the subject did not come to criterion. The percentage of subjects who did not reach criterion of two successive correct trials in 16 list presentations varied; 80% did not reach criterion in the NSIM group while only 33% did not in the NSNM group. Overall, 70% of the High Stress subjects and 56% of the Low Stress subjects did not reach criterion. It is evident then that some variability of the data was lost by the arbitrary cut off at 16 trials (Sarason did not indicate in his procedure what his cut off was). Had the subject procedure been extended until each subject reached criterion, perhaps the results would have been in consonance with Sarasons. However, in doing so, other factors may have become inherent, e.g., subject fatigue.

Further, a videotaped interview was used in this study. This was done for several reasons. It was thought that better standardization of the transmission of coping tactics information would be achieved by the videotape presentation. Sarason used a live model/experimenter who performed for 200 subjects individually. While this may have a personal unique effect, one doubts if the presentation could have been uniform for all 200 subjects. Practice effects would

have to enter in. Further, live performances tend to go "flat" upon repeated presentation. Hence, a videotape was used in this study which outlined Sarason's coping-anxious model condition. The videotape was an interview, however, with the subjects looking on to the interviewer-model interaction as a third party. Perhaps something was lost in this transition. That the coping tactics were noted by subjects is evident from the recall data. Further, recall that both Wine (1970) and Jaffe and Carlson (1972) both used videotape presentations as part of a treatment package. Wine had her subjects do considerable rehearsing of cognitive tactics between modeling sessions and her performance measures were cognitive intellectual (e.g., WAIS subtests) tasks. While, Jaffe and Carlson used no rehearsal in their study, they also used a cognitive-intellectual task as a performance measure. Mallee, Park, and Watkins (1976) also used a videomodel but they, too, had subjects rehearse desired test taking behavior in an interim week between first and second observations of a model. The discrepancy between the results of this study and those of Sarason (1975) may therefore be due to the combination of the use of a video tape instead of a live presentation of the model, the use of a serial list learning task versus a more cognitive task, the opportunity to rehearse coping tactics, or a combination of any of these factors. Bjorksten (1976) has indicated that some effectiveness in the transmission of information is lost when one goes from 35 mm film to videotape. Conceivably, then, something is also lost in the transition from a live model to a videotape model. That loss may be compounded when the task is

also altered, e.g., from paired associates to a serial list learning task.

During debriefing, some subjects mentioned that they felt the coping tactics outlined by the model did not apply to a serial list task but rather to a classroom examination situation. In that the list in this study and that used by Sarason (1975) were constructed from the same source (Archer, 1960) this apparent mismatch perceived by some subjects cannot be used to explain differential results. It should be added here that the writer was following Sarason's precedent of using a serial list task in order to replicate, in part, Sarason's results. A more cognitive-intellectual task, such as the WAIS subtests would have been preferable.

In summary, Sarason's query about examining the effects of modeling as a treatment for test anxiety as a function of the degree of stress present at the time the model is observed must remain unanswered. No conclusions can be drawn as to whether stress hinders or aids an individual's ability to attend to and apply information transmitted through modeling. Further, results of this study do not support Sarason's conclusion as to the efficacy of a self-disclosing test-anxious model as a means of reducing test anxiety. It is admitted that there are some potential artifacts in this study which could have contributed to this lack of support.

The role of a videotape model versus a live model presenting a self-disclosure is also a basis for future research. How both of these treatments interact with the opportunity to rehearse, and with the type of performance task used, is also a viable area of research.

Finally, it would be interesting in future research to examine exactly at what point in the progression of the study subject begins to become stressed. This study suggests that, although stress is a factor in performance at serial learning, the time at which the stress becomes critical is uncertain. Are high test anxious subjects naturally stressed upon knowledge or participation in an experiment or do they reflect this as a function of feedback about their performance. Perhaps a study examining this temporal relationship is in order.

References

Aborn, M. The influence of experimentally induced failure on the retention of material acquired through set and incidental learning. Journal of Experimental Psychology, 1953, 45, 225-231.

Agnew, N. & Agnew, Mary. Drive level effects on tasks of narrow and broad attention. Quarterly Journal of Experimental Psychology, 1963, 15, 58-62.

Allen, G.J. Effectiveness of study counseling and desensitization in alleviating test anxiety in college students. Journal of Abnormal Psychology, 1971, 77, 282-289.

Allen, G.J. The behavioral treatment of test anxiety: recent research and future trends. Behavior Therapy, 1972, 3, 253-262.

Alpert, R. & Haber, R.N. Anxiety in academic achievement situations. Journal of Abnormal and Social Psychology, 1960, 61, 207-215.

Anton, W.D. An evaluation of process of outcome variables in the systematic desensitization of test anxiety. Unpublished Doctoral Dissertation, University of South Florida, 1975.

Aponte, J.F. & Aponte, C.E. Group programmed systematic desensitization without simultaneous presentation of adversive scenes with relaxation training. Behavior, Research, and Therapy, 1971, 9, 337-346.

Archer, E.J. A re-evaluation of the meaningfulness of all possible CVC trigrams. Psychological Monograms, 1960, 74 (10, Whole No. 497).

Atkinson, J.W. & Reitman, W.R. Performance as a function of motive strength and expectancy of goal attainment. Journal of Abnormal and Social Psychology, 1956, 3, 361-366.

Bahrick, H.P., Fitts, P.M., & Rankin, R.E. Effect of incentives upon reactions to peripheral stimuli. Journal of Experimental Psychology, 1952, 44, 400-406.

Bahrick, H.P. Incidental learning under two incentive conditions. Journal of Experimental Psychology, 1954, 47, 170-172.

Bandura, A. Psychotherapy based on modeling principles in Bergen, A.E. & Garfield, S.L. Handbook of Psychotherapy and Behavior Change, New York: John Wiley & Sons, 1971.

Bandura, A., Ross D., & Ross, S. A comparative test of the status envy, social power, and secondary reinforcement theories of identification learning. Journal of Abnormal and Social Psychology, 1963, 67, 527-534.

Bandura, A. & Walters, R.H. Social learning and personality development. New York: Holt, Rinehart & Winston, 1963.

Bedell, J. The role of suggestion in the desensitization and relaxation treatments of test anxiety. Unpublished Doctoral Dissertation. University of South Florida, 1975.

Bergler, E. Psychoanalysis of a case of examination anxiety. Zentbl fur Psychotherapy, 1933, 6, 65-83, in Spielberger, C. D., Gonzales, N. D., Taylor, C. J., Algaze, B., & Anton, W. D. Examination Stress and Test Anxiety. In Spielberger, C. D. & Sarason, I. G. (eds.). Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Bjorksten, O. Sexually graphic material in the treatment of sexual disorders. In Meyer, J. K. (ed.) Clinical Management of sexual disorders. Baltimore: Williams & Williams, 1976.

Bloomfield, D. R. Unpublished pilot study, Virginia Polytechnic Institute and State University, Winter, 1976.

Boor, M. Relationship of test anxiety and academic performance when controlled for intellignece. Journal of Clinical Psychology, 1972, 28(2), 171-172.

Boor, M. & Schill, T. Digit symbol performance of subjects varying in anxiety and defensiveness. Journal of Consulting Psychology, 1967, 31, 600-603.

Broadbent, D. E. Perception and communication. New York: Pergamon Press, 1958.

Brown, C. H. Emotion reactions before examinations: I. Physiological changes. The Journal of Psychology, 1938, 5, 1-9.

Brown, C. H. Emotional reactions before examinations: II. Results of a questionnaire. The Journal of Psychology, 1938, 5, 11-26 (a).

Brown, C. N. & Gelder, D. V. Emotional reactions before examinations I. physiological changes. The Journal of Psychology, 1938, 5, 1-9 in Spielberger, Gonzales. . . .

Bruner, J. S., Matter, J., & Papanek, M. L. Breadth of learning as a function of drive level and mechanization. Psychological Review, 1955, 62, 1-10.

Bruning, J. L., Capage, J. E., Kozuh, G. F., Young, P. F., & Young, W. E. Socially induced drive and range of cue utilization. Journal of Personality and Social Psychology, 1968, 9, 242-244.

Bursill, A. E. The restriction of peripheral vision during exposure to hot and humid conditions. Quarterly Journal of Experimental Psychology, 1958, 10, 113-129.

Buss, A. Psychopathology. New York: John Wiley & Sons, 1966.

Caffrey, B. & Brainerd, E. Emotionality and worry as components of test anxiety. Paper presented at the South Carolina Psychological Association, Charleston, South Carolina, April 14, 1978.

Cohen, R. The effects of group interaction and progressive hierarchy presentation on the desensitization of test anxiety. Behavior Research and Therapy, 1969, 7, 15-26.

Cohen, R. Effects of feedback on test anxiety and performance as a function of certain personal characteristics. New York University, 1971.

Cornish, R. D. & Dilley, J. S. Comparison of three methods of reducing test anxiety: Systematic desensitization, implosive therapy and study counseling. Journal of Consulting Psychology, 1973, 20, 499-503.

Cox, F. N. Some effects of test anxiety and presence or absence of other persons on boys' performance on a repetitive motor task. Journal of Experimental Child Psychology, 1966, 3, 100-112.

Cox, F. N. Some relationships between test anxiety, presence or absence of male persons, and boys' performance on a repetitive motor task. Journal of Experimental Child Psychology, 1968, 6, 1-12.

Cozby, P. L. Self disclosure: A literature review. Psychological Bulletin, 1973, 79, 73-91.

Crighton, J. & Jehu, D. Treatment of examination anxiety by systematic desensitization or psychotherapy in groups. Behavior, Research and Therapy, 1969, 7, 245-248.

Crowne, D. P. & Marlowe, D. A new scale of social desirability independent of psychopathology. Journal of Consulting Psychology, 1960, 24, 349-354.

Davis, D. R. Pilot error. Air publication 3139A. London: HM Stationery Office, 1948.

Davison, G. C. Systematic desensitization as a counterconditioning process. Journal of Abnormal Psychology, 1968, 73, 91-93.

Debus, R. Effects of brief observation of model behavior on impulsive children. Developmental Psychology, 1970, 2, 202-214.

Deffenbacher, J. Relationship of worry and emotionality to performance on the Miller Analogies Test. Journal of Educational Psychology, 1977, 69(2), 191-195.

Denny, P. J. Effects of anxiety and intelligence on concept formation. Journal of Experimental Psychology, 1966, 72(4), 596-602.

Desiderato, O. & Kosilihen, P. Anxiety, study habits and academic achievement. Journal of Consulting Psychology, 1969, 16, 162-165.

Deutsch, J. A. & Deutsch, D. Attention: Some theoretical considerations. Psychological Review, 1963, 70, 80-90.

Doctor, R. M. & Altman, F. Worry and emotionality as components of test anxiety: Replication and further data. Psychological Reports, 1969, 24, 563-568.

Doctor, R. M., Aponte, J., Burry, A. & Welch, R. Group counseling versus behavior therapy in the treatment of college underachievement. Behavior, Research and Therapy, 1970, 8, 87-89.

Donner, L. & Guerney, B. G., Jr. Automated group desensitization for test anxiety. Behavior, Research and Therapy, 1969, 7, 1-13.

Doris, J. & Sarason, S. B. Test anxiety and blame assignment in a failure situation. Journal of Abnormal and Social Psychology, 1955, 50, 335-338.

Easterbrook, J. A. The effect of emotion on cue utilization and the organization of behavior. Psychological Review, 1959, 83-201.

Egeth, H. Selective attention. Psychological Bulletin, 1967, 1, 41-57.

Ellis, A. Reason and emotion in psychotherapy. New York: Lyle-Stuart Press, 1963.

Emery, J. R. & Krumboltz, J. D. Standard versus individualized hierarchies in desensitization to reduce test anxiety. Journal of Counseling Psychology, 1967, 14, 204-209.

Fiedler, F. E. An experimental approach to preventive psychotherapy. Journal of Abnormal and Social Psychology, 1949, 44, 386-393.

Finger, R. & Galassi, J. Effects of modifying cognitive versus emotionality responses in the treatment of test anxiety. Journal of Consulting and Clinical Psychology, 45(2), 280-287.

Ganzer, V. J. Effects of audience presence and test anxiety on learning and retention in a serial learning situation. Journal of Personality and Social Psychology, 1968, 8, 194-199.

Garlington, W. K. & Cotler, S. B. Systematic desensitization of test anxiety. Behavior, Research and Therapy, 1968, 6, 247-256.

Goldberg, C. Some effects of fear of failure in the academic setting. The Journal of Psychology, 1973, 84, 323-331.

Goldfried, M. R. & Davison, G. C. Clinical Behavior Therapy. New York: Holt, Rinehart & Winston, 1976.

Goldfried, M., Linehan, M. & Smith, L. Reduction of test anxiety through cognitive restructuring. Journal of Consulting and Clinical Psychology, 1978, 46(1), 32-39.

Hahnloser, R. M. A comparison of cognitive restructuring and progressive relaxation in test anxiety reduction. Unpublished Doctorial Dissertation, University of Oregon, 1974.

Harleston, B. W. Test anxiety and performance in problem-solving situations. Journal of Personality, 1962, 30, 557-573.

Hastings, J. T. Tensions and school achievements examinations. Journal of Experimental Education, 1944, 12, 143-164.

Holroyd, K. Cognition and desensitization in the group treatment of test anxiety. Journal of Consulting and Clinical Psychology, 1976, 44(6), 991-1001.

Human Behavior. April, 1978, 7(4), 24-25.

Iaxer, R. M., Quarter, J., Kooman, A. & Walker, K. Systematic desensitization and relaxation of high-test-anxious secondary school students. Journal of Consulting Psychology, 1969, 5, 446-451.

Ihli, K. L. & Garlington, W. K. A comparison of group versus individual desensitization of test anxiety. Behavior, Research and Therapy, 1969, 7, 207-209.

Jaffe, P. G. & Carlson, P. M. Modeling therapy for test anxiety: The role of model affect and consequences. Behavior, Research and Therapy, 1972, 10, 329-339.

Janis, I. L. Anxiety indices related to susceptibility to persuasion. Journal of Abnormal and Social Psychology, 1955, 51, 663-667.

Johnson, E. E. The role of motivational strength in latent learning. Journal of Comparative and Physiological Psychology, 1952, 45, 526-530.

Johnson, S. M. & Sechrest, L. Comparison of desensitization and progressive relaxation in treating test anxiety. Journal of Consulting and Clinical Psychology, 1968, 32, 280-286.

Jonisch, G. Imitation as a function of anxiety and self esteem. Unpublished Doctorial Dissertation, City University of New York, 1975.

Katahn, M., Strenger, S., & Cherry, N. Group counseling and behavior therapy with test-anxious college students. Journal of Consulting Psychology, 1966, 30, 544-549.

Kazkih, A. The effects of model identity and fear related similarity on covert modeling. Behavior Therapy, 1974, 5, 624-636.

Kogan, E. & Wallach, N. Risk-taking. New York: Holt, Rinehart, and Winston, 1964.

Kohn, H. Effects of variations of intensity of experimentally induced stress situations upon certain aspects of perception and performance. Journal of Genetic Psychology, 1954, 85, 289-304.

Kondas, O. Reduction of examination anxiety and 'stage-fright' by group desensitization and relaxation. Behavior, Research and Therapy, 1967, 5, 275-281.

Liebert, R. M. & Morris, L. W. Cognitive and emotional components of test anxiety: A distinction and some initial data. Psychological Reports, 1967, 20, 975-978.

Little, S. & Jackson, B. The treatment of test anxiety through attentional and relaxation training. Psychotherapy: Theory Research and Practice, 1974, 11, 175-178.

Lombardi, V. The effect of test anxiety on the relationship of intelligence in a group of seventh grade suburban children. Unpublished Doctorial Dissertation, Temple University, 1974.

Mallee, J., Park, T., & Watkins, J. T. Model with roleplaying as a treatment for test anxiety. Journal of Consulting and Clinical Psychology, 1976, 44(4), 679.

Mandler, G. & Sarason, S. A study of anxiety and learning. Journal of Abnormal and Social Psychology, 1952, 47, 166-173.

Mandler, G. & Watson, D. Anxiety and the interruption of behavior. In C. D. Spielberger (ed.) Anxiety and Behavior. New York: Academic Press, 1966.

Many, M. A. & Many, W. A. The relationship between self-esteem and anxiety in grades four through eight. Educational and Psychological Measurement, 1975, 35, 1017-1021.

Martlett, Nancy J. & Watson, D. Test anxiety and immediate or delayed feedback in a test-like avoidance task. Journal of Personality and Social Psychology, 1968, 8, 200-203.

McManus, M. Group desensitization of test anxiety. Behavior, Research and Therapy, 1971, 9, 51-56.

McMillan, J. The effects of desensitization treatment, rational emotive therapy, and a combination treatment program for test anxious students with high and moderate levels of generalized anxiety. Unpublished Doctoral Dissertation, University of Maryland, 1973.

Meichenbaum, D. H. The effects of instructions and reinforcement on thinking and language behavior of schizophrenics. Behavior, Research and Therapy, 1969, 20, 101-114.

Meichenbaum, D. H. An examination of model characteristics in reducing avoidance behavior. Journal of Personality and Social Psychology, 1971, 17, 298-307.

Meichenbaum, D. H. Cognitive modification of test anxious college students. Journal of Consulting and Clinical Psychology, 1972, 39(3), 370-380.

Meichenbaum, D. H. Cognitive behavior modification. New York: Plenum Press, 1977.

Meichenbaum, D. H. & Goodman, J. Reflection-impulsivity and verbal control of motor behavior. Child Development, 1969a, 40, 785-797.

Meichenbaum, D. H. & Goodman, J. The developmental control of operant motor responding by verbal operants. Journal of Experimental Child Psychology, 1969b, 7, 553-565.

Meichenbaum, D. H. & Goodman, J. Training impulsive children to talk to themselves. Journal of Abnormal Psychology, 1971, 77(2), 115-126.

Meunier, C. & Rule, B. G. Anxiety, confidence and conformity. Journal of Personality, 1967, 35, 498-504.

Miller, N. E. & Dollard, J. Social learning and imitation. New Haven: Yale University Press, 1941.

Mitchell, K. R. & Ng, K. T. Effects of group counseling and behavior therapy in the academic achievement of test anxious students. Journal of Counseling Psychology, 1972, 19, 491-497.

Montague, E. The role of anxiety in serial rote learning. Journal of Experimental Psychology, 1953, 45, 91-95.

Morris, L. W. & Liebert, R. M. Effects of anxiety on timed and untimed intelligence tests. Journal of Consulting and Clinical Psychology, 1969, 53, 240-244.

Morris, L. W. & Liebert, R. M. The relationship of cognitive and emotional components of test anxiety to physiological arousal and academic performance. Journal of Consulting and Clinical Psychology, 1970, 19, 35, 332-337.

Morris, L. W. & Perez, T. L. Effects of test-interruption on emotional arousal and performance. Psychological Reports, 1972, 31, 559-564.

Neumann, J. Anxiety and illness before an examination. Guterson: Bertels, 1933 in Spielberger, C. D., Gonzalez, N. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination Stress and Test Anxiety. In Spielberger, C. D. and Sarason, I. G. (eds.) Stress and Anxiety, New York: Hemisphere/Wiley, 1978.

Nicholls, J. When a scale measures more than its name denotes: The case of the test anxiety scale for children. Journal of Consulting and Clinical Psychology, 1976, 44(6), 976-985.

Nottelman, E. D. & Hill, K. T. Test anxiety and off-task behavior in evaluative situations. Child Development, 1977, 48, 225-231.

Oliver, R. Overcoming test anxiety. Rational Living, Spring, 1975, 10(1).

O'Neil, H. F., Spielberger, C. D., & Hansen, D. N. The effects of state-anxiety and task difficulty on computer-assisted learning. Journal of Educational Psychology, 1969, 60, 31-50.

Osterhouse, R. A. A comparison of desensitization and study-skills training of two kinds of test-anxious students. Unpublished Doctoral Dissertation, Ohio State University, 1969. In Speilberger, C. D., Gonzalez, H. P., Taylor, C. J., Algaze, B., & Anton, W. O. Examination stress and anxiety. In Spielberger, C. D. and Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Paul, G.L. Insight and desensitization in psychotherapy. Stanford, California: Stanford University Press, 1966.

Paul, G.L. Behavior modification research: Design and tactics. In C.M. Franks (ed.), Behavior Therapy: Appraisal and Status. New York: McGraw-Hill, 1969, 29-62.

Paul, G.L. & Eriksen, C.W. Effects of test anxiety on "real-life" examinations. Journal of Personality, 1964, 32, 480-494.

Rachman, S. Studies in desensitization-I: The separate effects of relaxation and desensitization. Behavior Research and Therapy, 1965, 3, 245-252.

Redl, F. We teachers and the fear of examinations. Z.Psychoanal Padag, 1933, 7, 478-400. In Spielberger, C.D., Gonzalez, H.P., Taylor, C.J., Algaze, B. & Anton, W.D. Examination stress and test anxiety.In Spielberger, C.D. & Sarason, I.G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Richardson, F.C., O'Neil, H.F. Jr., Whitmore, S. & Judd, W. Factor analysis of the test anxiety scale and evidence concerning the components of test anxiety. Journal of Consulting and Clinical Psychology, 1977, 45(4), 704-705.

Rosenthal, R. Experimenter effects in behavioural research. New York: Appleton, 1966.

Russell, D.G. & Sarason, I.G. Test anxiety, sex and experimental conditions in relation to anagram solution. Journal of Personality and Social Psychology, 1965, 1, 493-496.

Sarason, I.G. Interrelationships among individual difference variables, behavior in psychotherapy and verbal conditioning. Journal of Abnormal and Social Psychology, 1958a, 56, 339-344.

Sarason, I.G. The effects of anxiety, reassurance, and meaningfulness of material to be learned in verbal learning. Journal of Experimental Psychology, 1958b, 56, 472-477.

Sarason, I.G. Relationships of measures of anxiety and experimental instructions to word association test performance. Journal of Abnormal and Social Psychology, 1959, 59, 37-42.

Sarason, I.G. Empirical findings and theoretical problems in the use of anxiety scales. Psychological Bulletin, 1960, 57, 403-415.

Sarason, I.G. The effects of anxiety and threat on solution of a difficult task. Journal of Abnormal and Social Psychology, 1961, 62, 165-168.

Sarason, I.G. Verbal learning, modeling, and juvenile delinquency. American Psychologist, 1968, 4, 254-266.

Sarason, I.G. Experimental approaches to test anxiety: Attention and the uses of information. In Spielberger, C.D. (ed.) Anxiety: Current Trends in Theory and Research (Vol. 2), New York: Academic Press, 1972(a).

Sarason, I.G. Test anxiety and the model who fails. Journal of Personality and Social Psychology, 1972, 22(3), 410-413(b).

Sarason, I.G. Test anxiety and cognitive modeling. Journal of Personality and Social Psychology, 1973, 28(1), 58-61.

Sarason, I.G. Test anxiety and the self-disclosing coping model. Journal of Consulting and Clinical Psychology, 1975, 43(2), 184-153.

Sarason, I.G. & Ganzer, V.J. Anxiety, reinforcement, and experimental instructions in a free verbalization situation. Journal of Abnormal and Social Psychology, 1962, 65, 300-307.

Sarason, I.G. & Koenig, K.P. The relationship of test anxiety and hostility to description of self and parents. Journal of Personality and Social Psychology, 1965, 2, 617-621.

Sarason, I.G. & Marmatz, M.G. Sex differences and experimental conditions in serial learning. Journal of Personality and Social Psychology, 1965, 1, 521-524.

Sarason, I.G. & Minard, J. Test anxiety, experimental instructions and the Wechsler Adult Intelligence Scale. Journal of Educational Psychology, 1962.

Sarason, I.G. & Palola, E.G. The relationship of test and general anxiety, difficulty of task, and experimental instructions to performance. Journal of Experimental Psychology, 1960, 59, 185-191.

Sarason, I.G., Pederson, A.M. & Nyman, B. Test anxiety and the observation of models. Journal of Personality, 1968, 36, 493-511.

Sarason, I.G. and Stoops, R. Test anxiety and the passage of time. Journal of Consulting and Clinical Psychology, 1978, 46(1), 102-109.

Sarason, I.G. Test anxiety, attention, and the general problem of anxiety. In Spielberger, C.D. & Sarason, I.G. (eds.) Stress and Anxiety (vol. 1). New York: Hemisphere Publishing Co., 1975.

Sarason, S.B. What research says about test anxiety in school children. NEA Journal, 1959, 48, 26-27.

Sarason, S.B., Davidson, K.S., Lighthall, F.F., Waite, R.R. & Ruebush, B.K. Anxiety in elementary school children. New York: Wiley, 1960.

Sarason, S.B. & Mandler, G. Some correlates of test anxiety. The Journal of Abnormal and Social Psychology, 1952, 47a, 810-817.

Sarason, S.B., Mandler, G., & Criaghill, P.G. The effect of differential instructions on anxiety and learning. Journal of Abnormal and Social Psychology, 1952, 47, 561-565.

Shafiabady, A. The relationship between self-esteem and anxiety among high school students in grades nine through twelve. Unpublished Doctoral Dissertation, Northern Illinois University, 1974.

Silverman, R.E. Anxiety and the mode of response. Journal of Abnormal and Social Psychology, 1954, 49, 538-542.

Silverman, R.E. & Blitz, B. Learning and two kinds of anxiety. Journal of Abnormal and Social Psychology, 1956, 52, 301-303.

Snider, J. G. & Oetting, E. R. Autogenic training and the treatment of examination anxiety in students. Journal of Clinical Psychology, 1966, 22, 111-114.

Spiegler, M. D., Morris, L. W. & Liebert, R. M. Cognitive and emotional components of test anxiety: Temporal factors. Psychological Reports, 1968, 22, 451-456.

Spielberger, C. D. Anxiety as an emotional state. In Spielberger, C. D. (ed.) Anxiety: Current trends in theory and research. Vol. 1. New York: Academic Press, 1972.

Spielberger, C. D., Anton, W. D., & Bedell, J. The nature and treatment of test anxiety. In Zuckerman, M. & Spielberger, C. D. (eds.) Emotions and Anxiety: New Concepts, Methods, and Applications. New York: John Wiley, 1976.

Spielberger, C. D., Gonzalez, N. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination stress and test anxiety. In Spielberger, C. D. & Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. The State-Trait Anxiety Inventory, Test Manual for Form X, 1968.

Stanford, D., Dember, W., & Stanford, F. A children's form of the Alpert-Haber achievement scale. Child Development, 1963, 34, 1027-1032.

Steffy, R. A., Meichenbaum, D. H., & Best, J. A. Aversive and cognitive factors in the modification of smoking behavior. Behavior, Research and Therapy, 1970, 8, 115-125.

Stengel, E. Examination fear and examination neurosis. Z. Psychoanal. Pedag., 1936, 10, 300-320. In Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination stress and test anxiety in Spielberger, C. D. & Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Suinn, R. M. The desensitization of test-anxiety by group and individual treatment. Behavior, Research and Therapy, 1968, 6, 385-387.

Suinn, R. M. The STABS, a measure of test anxiety for behavior therapy: Normative data. Behavior, Research and Therapy, 1969, 7, 335-339.

Taylor, C. J. The nature and measurement of test anxiety. Unpublished Master's Thesis. University of South Florida, 1977. In Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination stress and test anxiety in Speilberger, C. D. & Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Taylor, J. A. A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology, 1953, 48, 285-290.

Tecce, J. J. & Happ, S. Effects of shock-arousal on a card-sorting test of color-word interference. Perceptual and Motor Skills, 1964, 19, 905-906.

Thompson, J. A comparison of four behavior therapies in the treatment of test anxiety. Unpublished Doctoral Dissertation, University of Arkansas, 1976.

Time. High schools under fire, 1979, 110(20), 62-75.

Trapp, E. P., & Kausler, P. H. Test anxiety level and goal-setting behavior. Journal of Consulting Psychology, 1958, 22, 31-34.

Treisman, Anne M. Selective attention in man. British Medical Bulletin, 1964, 20, 12-16.

Wachtel, P. L. Anxiety, attention, and coping with threat. Journal of Abnormal Psychology, 1968, 73, 137-143.

Wachtel, P. L. Anxiety, cue utilization, and patterns of ego defense. Unpublished Doctoral Dissertation, Yale University, 1969.

Waite, W. N. The relationship between performance and examinations and emotional responses. The Journal of Experimental Education, 1942, 11, 88-96. In Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination stress and test anxiety in Spielberger, C. D. & Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Weber, C. Examination anxiety in taking intellignece tests. Indus Psychotechn, 1934, 11, 53-55. In Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Algaze, B., & Anton, W. D. Examination stress and test anxiety in Spielberger, C. D. & Sarason, I. G. (eds.) Stress and Anxiety. New York: Hemisphere/Wiley, 1978.

Weiner, B. Effects of unsatisfied achievement-related motivation on persistence and subsequent performance. Unpublished Doctoral Dissertation, University of Michigan, 1963.

Wendt, H. W. Motivation, effort and performance. In McClelland, D. C. (ed.) Studies in Motivation. New York: Appleton, 1955.

West, C. K., Lee, J. F., & Anderson, T. H. The influence of test anxiety on the selection of relevant from irrelevant information. The Journal of Educational Research, 1969, 63, 51-52.

William, J. T. A comparison of four behavior therapies in the treatment of test anxiety in college students. Unpublished Doctoral Dissertation, University of Arkansas, 1976.

Wine, J. Investigations of an attentional interpretation of test anxiety. Unpublished Doctoral Dissertation, University of Waterloo, 1970.

Wine, J. D. Test anxiety and direction of attention. Psychological Bulletin, 1971, 76(2), 92-104.

Wine, J. Cognitive-attentional approaches to test anxiety modification. Paper presented at symposium on Anxiety and Instructions, Annual Conference of American Psychological Association, Montreal, August, 1973.

Wine, J. Counselors manual for attentional strategies in evaluation anxiety management. Address to Atlantic Regional Conference of Canadian University Counseling Association, Halifax, April, 1974.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1962.

Wittmaker, B. Test anxiety mood and performance. Journal of Personality and Social Psychology, 1974, 29(5), 664-669.

Wolpe, J. Psychotherapy by reciprocal inhibition. Stanford: Stanford University Press, 1958.

Young, F. & Brown, M. Effects of test anxiety and testing conditions on intelligence test scores of elementary school boys and girls. Psychological Reports, 1973, 32, 643-649.

Zaffy, D. & Bruning, J. L. Drive and the range of cue utilization. Journal of Experimental Psychology, 1966, 71, 382-384.

Appendix A

Videotape Interview Transcript

E. Good morning. Your name is Wendy?

M. Wendy Settle

E. What year are you here?

M. I'm a senior at Tech.

E. I see that you participated as a research assistant here for several quarters here at Tech. Can you tell me what some of the things are that you've done

M. Yah. Well I'm a psychology major and I've been doing research in personality and Child Development. Right now I'm working at the infant behavior lab and I enjoy that very much.

E. Ah, your from Virginia Beach. Right?

M. Mm -

E. What are some of the other things you like to do here at Tech? What are some of your interests and hobbies and things that you have here besides being a psychology major?

M. I enjoy horseback riding and swimming, and right now - since its summer, I enjoy laying out in the sun, and partying, of course (laughs).

E. (laughs). Of course. Wendy I'm interested in two aspects of your record. And one of those indicates that you have a lot of problem taking tests and yet the other one is that you have a very high grade point average. And the two seem to be opposed to each other. Can you tell me what some of these problems are? Taking tests?

M. Yah. I've got a, well it used to be really bad, but even now I've got a really bad problem taking tests. Just thinking about taking tests will make me nervous and get me upset. And I worry about flunking it and start thinking about how other people are doing compared to myself and they must be doing better than I am because I'm missing all these questions. And, you know, if I come to a question that I don't know the answer I get really upset and flustered and, you know, it just debilitates my performance on the whole test and I don't work on the whole thing. I just worry about those questions that I don't know. And I have alot of trouble concentrating and I start thinking about myself and the butterflies in my stomach. And I'm sweating and thinking about I'm doing awful instead of taking the test which is what I'm supposed to be doing.

E. And yet, at the same time, your grades indicate that you've done something to overcome this group of problems that you've just mentioned. Can you tell me something about those?

M. What? How I've coped with test anxiety?

E. Yah, how you've coped with test anxiety.

M. Yah. Well, I have to force myself to concentrate on the test instead of on myself and I try not to think of how other people are doing.

E. Right.

M. And compare myself with them. uhm. Sometimes I look at the test and the question and find things that are interesting that concern me of an interesting lecture or something that I've read - just anything to get my mind off myself.

E. m-m

M. I try not to get too upset when I ruin a question. I can't expect to get all of them right, you know?

E. mm

M. So I just try to work at a steady pace.

E. m-m

M. Without concentrating on one question - the ones that I don't know.

E. m-m

M. And, you know, just like that I just have to force myself to do these things and force myself to concentrate.

E. m-m

M. In order to take a test or it'll just completely...blow me out.

E. m-m.. So, ah, if I were to summarize them the things which you have found helpful in taking tests and which might be helpful to other people would be, first of all, that you really have to force yourself to concentrate on the test.

M. m-m

E. The test itself, and the second thing that I think I heard you say that you try to interest your self in the questions or see what questions might be interesting because they relate back to something that you read or had in lecture. Right?

M. Uh-m

E. And the third point that you brought out is that you try to work at a steady pace and not get to flustered, or upset if you miss a difficult question and certainly don't go and spend all of your time trying to do one question.

M. Yeah.

E. Right? And finally the last one, er, that I think I heard you say is that you don't worry about how other p·ople are doing on the test.

M. uh-m

E. Whether they're doing better, or are more prepared and certainly don't compare yourself to other people taking the same test. Is that right?

M. Yah. I just try to prepare for the test as best I can and just try to better than last time. I don't try to better than everybody else.

E. Right. So I imagine that these four things were difficult for you to learn as a Freshman, but they're much easier for you now?

M. Yah. And during my Freshman year I was so anxious when I took a test that I would flunk them outright and I'd get really upset.

E. Uh-m

M. One test I remember even crying in the middle of it because I just couldn't do the questions. And, since then, well since I learned how to do these things, uh, its gotten a whole lot better.

E. Yeah. And you don't worry about how other people are doing.

M. Uh-m

E. And just keep yourself going at a steady pace.

M. Uh-m

E. Yeah. OK. Well. Thank you very much. I hope we can use some of your pointers.

M. Yeah. I hope I've helped.

E. OK. Thank you.

Appendix B

Modified A-State Questionnaire and Anxiety Scale

1. Please answer the following questions on how you feel right at this moment. Place a check mark in the appropriate column.

	Not at all	Somewhat	Moderately so	Very much so
I feel secure	1_____	2_____	3_____	4_____
I feel upset	1_____	2_____	3_____	4_____
I am relaxed	1_____	2_____	3_____	4_____
I feel pleasant	1_____	2_____	3_____	4_____

2. Circle the number on the scale below which indicates how you feel right now at this moment.

I am:

Rattled and Jittery	1 2 3 4 5 6 7 8	Cool and Collected
Calm	1 2 3 4 5 6 7 8	Worried
Tense	1 2 3 4 5 6 7 8	Relaxed

Appendix B

Nonstressful Instructions

You are going to participate in an experiment which involves learning a list of syllables. When you see an asterisk, you will know that the first syllable is going to appear for two seconds. The syllable will be followed by a blank slide for two seconds and then another slide with a different syllable, which will also appear for two seconds. There are 16 syllables on the list, all presented in the same manner, i.e., a two second syllable slide followed by a two second blank slide. A second asterisk indicates the end of this list and the beginning of a six second interval which will end with another asterisk.

Your task is to anticipate what syllable will appear next (after the syllable being shown) before it actually appears. You may do this by calling out the next syllable, which you think will be shown next while the preceding syllable is being shown or in the two second interval when no syllable is being shown or in the two second interval when no syllable is being shown. You will know after the two second interval if your answer was correct when you see the syllable appear. We will continue until you are able to call out the syllables of the entire list two times correctly twice in succession.

Now before we begin, do you have any questions? Once we begin, I cannot answer any questions.

Appendix C

Stressful Instructions

You are going to participate in an experiment which involves learning a list of syllables. When you see an asterisk, you will know that the first syllable is going to appear for two seconds. The syllable will be followed by a blank slide for two seconds and then another slide with a different syllable, which will also appear for two seconds. There are 16 syllables on the list, all presented in the same manner, i.e., a two second syllable slide followed by a two second blank slide. A second asterisk indicates the end of this list and the beginning of a six second interval which will end with another asterisk.

Your task is to anticipate what syllable will appear next (after the syllable being shown) before it actually appears. You may do this by calling out the next syllable, which you think will be shown next while the preceding syllable is being shown or in the two second interval when no syllable is being shown. You will know after the two second interval if your answer was correct when you see the syllable appear. We will continue until you are able to call out the syllables of the entire list two times correctly twice in succession.

This kind of learning is difficult for some people. Our research here at Virginia Tech indicates that there is a number of significant relationships between learning this type of list and your verbal I.Q., your academic grade point average, and

your reaction to pressure situations.

Also, we have found that a person's performance here is related to other factors such as blood pressure, pulse rate, respiration, etc.

In light of these relationships, we are going to observe and record some of your bodily processes as you learn this task. These wires lead to a polygraph, which you may know is also called a lie detector. The curved metal plates measure very small changes in the perspiration at your finger tips. Technically, they are recording your basal skin response. The device on your small finger is a photocel which measures your pulse rate. Because the machine is very sensitive, be sure to keep your hand still. The chair in which you are sitting is also connected to the polygraph to measure body and muscle movement.

After you have learned the list successfully so that you can anticipate the syllable correctly two times in succession through the list, I am going to ask you to sign a release so I may ask the registrar for your grades in order that we may correlate your grades with your performance.

Now, before we begin, do you have any questions? Once we begin, I cannot answer any questions.

APPENDIX D

Subject Procedure

High Stress, model - instructions.

1. Subject fill out abbreviated A-state form (Appendix B).
2. Subject ushered into experimental room and connected to polygraph.
3. Subject views videotape model.
4. Subject asked to list anxiety coping tactics outlined by model.
5. Tactics outlined by model summarized for the subject by the experimenter.
6. Subject receives stressful instructions (Appendix C).
7. Second A-State form administered to subject (Appendix B).
8. Subject begins learning task.
9. At the beginning of the eighth trial, the slide projector is stopped, and the experimenter informs the subject that her performance is inferior compared to other subjects'.
10. Subject completes the learning task.
11. Third A-State form administered to subject (Appendix B).
12. Subject lists tactics outlined by model.
13. Subject is debriefed.

High Stress, instruction - model.

1. Subject fills out abbreviated A-State form outside of experimental room. (Appendix B)
2. Subject ushered into experimental room and connected to the polygraph.

3. Subject receives stressful instructions. (Appendix C)
4. Second abbreviated A-State form administered to the subject. (Appendix B)
5. Subject views videotape model.
6. Subject asked to list anxiety coping tactics outlined by model.
7. Tactics outlined by the model summarized by the experimenter for the subject.
8. Subject begins the learning task.
9. At the beginning of the eighth trial the slide projector is stopped, and the experimenter informs the subject that her performance is inferior compared to other subjects' performances.
10. Subject completes the learning task.
11. Third A-State form administered to the subject (Appendix B).
12. Subject lists tactics outlined by the model.
13. Subject is debriefed.

High Stress, control.

1. Subject fills out A-State form outside experimental room (Appendix B).
2. Subject ushered into experimental room and connected to the polygraph.
3. Subject receives stressful instructions (Appendix C).
4. Second A-State form administered to subject (Appendix B).
5. Subject begins learning task.
6. At the beginning of the eighth trial, projector is stopped, and subject is informed that her performance is inferior compared to other subjects' performances.

7. Subject completes learning task.
8. Third A-State form administered to subject (Appendix B).
9. Subject is debriefed.

Low Stress, model - instructions.

1. Subject fills out abbreviated A-State form outside of experimental room (Appendix B).
2. Subject ushered into experimental room and connected to the polygraph.
3. Subject observes videotape model.
4. Subject asked to list anxiety coping tactics outlined by model.
5. Tactics outlined by model are summarized by the experimenter for the subject.
6. Subject is given nonstressful instructions (Appendix C).
7. Second A-State form administered to subject (Appendix B).
8. Subject performs learning task.
9. Third abbreviated A-State form administered to the subject (Appendix A).
10. Subject lists tactics outlined by the model.
11. Subject is debriefed.

Low Stress, instructions - model.

1. Subject fills out A-State form outside experimental room (Appendix B).
2. Subject ushered into experimental room and connected to the polygraph.
3. Subject receives nonstressful instructions.

4. Second A-State form administered to subject (Appendix B).
5. Subject observes videotape model.
6. Subject asked to list anxiety coping tactics outlined by model.
7. Tactics outlined by model are summarized by the experimenter for the subject.
8. Subject performs the learning task.
9. Third A-State form administered to subject (Appendix B).
10. Subject lists tactics outlined by videotape model.
11. Subject is debriefed.

Low Stress, control.

1. Subject fills out A-State form outside of experimental room (Appendix B).
2. Subject ushered into experimental room and connected to the polygraph.
3. Subject receives nonstressful instructions (Appendix B).
4. Second A-State form administered to subject (Appendix C).
5. Subject performs learning task.
6. Third A-State form administered to subject (Appendix B).
7. Subject is debriefed.

VITA

Douglass R. Bloomfield was born on December 10, 1942 and attended public schools in the Upstate New York community of Glens Falls. He graduated from Cornell University in June 1964, where he lettered in varsity football and qualified for a Regular Army Commission in the Intelligence Corps.

Prior to attending Virginia Polytechnic Institute and State University, he was employed as a commodity trader with the Continental Grain Company, New York, New York. In addition, he taught history and physical science and coached football at Norfolk, Virginia Academy and Crestwood High School. Chesapeake, Virginia. He was awarded a Master's Degree in Experimental Psychology from the University of Richmond (Virginia) in 1973. In the interim year between his Master's and Doctoral studies he was on the staff of the Mount Rogers Mental Health Clinic, Galax, Virginia, as a Clinical Psychologist.

He completed his clinical internship at the Medical University of South Carolina, Charleston, South Carolina, and is presently on the staff of the Department of Psychiatry and Behavioral Sciences of the Medical University.

EFFECTS OF MODELING AND ONGOING PSYCHOLOGICAL STRESS ON LEARNING PERFORMANCE AND STATE ANXIETY OF HIGH TEST ANXIOUS SUBJECTS

by

Douglass R. Bloomfield

(ABSTRACT)

Sarason has demonstrated that a model who discloses anxiety about performing on tests and at the same time outlines successful tactics for coping with this anxiety has a facilitative effect on the learning performance of high test anxious subjects. The effectiveness of the above model was determined with high test anxious female subjects who were psychologically stressed at the time that they observed the model.

Using the number of correct responses per trial and the number of trials to criterion in a serial list learning task as a dependent measure. A 2 (stress - high and low) x 3 (model instruction order) x 16 (trials) analysis of variance failed to demonstrate the effectiveness of the videotape model on the learning performance regardless of whether the model was observed under conditions of stress, or prior to the stress manipulation. Assessment of the stress manipulation using groups who performed without the opportunity to observe a model indicated that the combination of ego-involving instructions plus later negative feedback to the subject about her performance midway through the task was effective, in that performance of high stress subjects later in the study was inferior to

low stress subjects. Partial support was seen for earlier studies which indicated that evaluative instructions negatively affected high test anxious subjects.

Some methodological differences between Sarason's 1975 study and the present study were discussed as possible sources of explanations of the differential results between the two studies. Future affects of research regarding the examination of the components of the stress manipulation, the use of live versus videotaped models, etc. were outlined.