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The Interaction of Stress and Anxiety

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THE INTERACTION OF STRESS AND ANXIETY

by

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LIFE

Robert G. Riedel was born in Chicago, Illinois, March 7, 1936. He graduated from Wright Junior College in 1960, with an Associate in Arts degree. He received his B.S. in 1962 from Loyola University and his Masters from the same school in 1964. He has been an instructor at Mundelein College and a lecturer at Loyola University. He is presently Assistant Professor of Psychology at Barat College in Lake Forest, Illinois.

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	ii
LIFE	iii
LIST OF TABLES AND FIGURES	v
Chapter	
I. PROBLEM	1
II. REVIEW OF RELATED LITERATURE	7
III. PROCEDURE	37
IV. RESULTS	43
V. DISCUSSION	46
VI. SUMMARY	53
BIBLIOGRAPHY	54
APPENDIX: Raw Data	59

TABLES AND FIGURES

Page

Table

1. Pre-Test Anagrams and Their Solutions. . . . .

2. Experimental Anagrams and Their Solutions. . .

3. Post-Test Anagrams and Their Solutions . . . .

4. Anagrams Without Solutions . . . . . .

5. Assignment of Subjects by Condition. . . . . .

6. Means for both Groups at Each Failure Level for the Post-Task List of Anagrams . . . . . .

7. Analysis of Variance . . . . . .

Figure

1. Means for Both Group as Each Failure Level . .

CHAPTER I

PROBLEM

The present dissertation is concerned with the effects of a prior failure experience on the anagram performance of subjects who are either high or low anxious. The psychological state that accompanies the experience of failure is commonly called stress, although the terms conflict, frustration, anxiety, or even drive are often used to mean the same or similar things. The term stress is used throughout this paper except where the author of a reviewed paper uses one of these other terms; but the essential similarity of these terms in many contexts should be kept in mind.

Stress is used here to specifically indicate a psychological state that accompanies any experience that threatens the individual's well-being or conception of himself. The condition of failure, since it is an environmental variable, will be termed a "stressor" (often called a stress-inducing condition rather than a stressor), while the subjects experience of failure will be referred to as "stress". The present study is designed to ascertain the effects of such stress on performance, and, in addition, to see how individuals, differentiated on the basis of manifest anxiety, are affected by this failure.

Methods of experimentally inducing stress have varied from the use of actual physical stressors to the use of ego-involving instructions on tasks that could or could not be completed successfully by the

subject. Holtzman and Bitterman (1952) classified these methods into seven categories:

1) Disruption of physiological homeostasis
2) Unpleasant or physically painful stimuli
3) Distraction, razzing and time pressures
4) Real, contrived, or anticipated failure
5) Social Conflict and related procedures
6) Conflicting perceptual cues
7) Realistic situations threatening the individual's safety.

Lazarus, Deese and Osler (1952), on the other hand, use only two categories: failure-stress and task-induced stress. The present study fits under the failure-stress dichotomy of Lazarus, Deese and Osler and under category four and perhaps three on the Holtzman and Bitterman classification.

Creation of stress has generally been conceived as a method for arousing an individual's greater effort, so that he is working at a higher level of activation in a stress situation than when not in one. For the last decade or so Spence, Taylor and their colleagues (see Spence, 1958 or Taylor, 1956 for review) have been selecting people who are higher-drive (or higher-anxious) than normal, and testing them in regard to various drive theory hypotheses. Since stress and drive are seen as summative in their view subjects who are high drive will therefore be activated by much less stress than are individuals who are not so high to begin with. Certain ramifications of this idea

have been widely tested and account for a considerable amount of literature.

Taylor (1956, 1963) points out that the manipulation of stress has several effects. The first effect she mentions is "changes in task-attending behavior". Mild stress brings about more persistent effort and closer attention which leads to improvement in performance. As stress is increased a level is reached where performance becomes poorer to the point where extreme levels of stress may even cause a total stoppage of all behavior related to the task at hand. In their discussion of psychological stress, Cofer and Appley (1964) present a similar analysis. At the same time they refer to the similarity between the performance curve obtained in this model and the inverted U-shaped curve typically reported for emotional arousal, which is related to the activity of the autonomic nervous system. (see Malmo, 1957)

Most studies in this area use only the extremes of the stress continuum in their design although an occasional study may be found that uses a middle or neutral group. Since the effects of stress in the model presented by Taylor are differential a design using only extremes will not adequately test it. The present study is designed to present an ordered stress continuum (in the form of increasing failure) to subjects differentiated on the basis of their scores on the Taylor Manifest Anxiety Scale. Failure will be induced on a pre-task to the desired level and the effects will be measured on a post-task of the same nature as the pre-task.

The prediction of differential effects at different points on the stress-arousal continuum has been proposed by several authors (Appley, 1962; Rosenzweig, 1944; Taylor, 1963; and others). Mandler and Sarason (1952), while working in an entirely different framework than Taylor, described the effects of stress in the same manner as she did. They feel that two responses are possible in any given situation. One type of response is task-oriented while the other is self-oriented. If task-oriented behavior occurs it facilitates and thereby improves the level of performance. If self-oriented behavior occurs it has the opposite effect on performance level because it interferes with task-relevant behavior. These ideas are also very similar to those put forth by Appley (1962) and are consistent with the data from Rosenzweig's (1943) study of memory span although his interpretation is within the psychoanalytic framework. In a later study Rosenzweig (1944) presented views that coincide much more closely with the above analysis by Taylor. In this paper he describes a shift from "goal-persistent to ego-defensive behavior" as we go up what he calls the "stress-arousal" scale.

Child (1954) favors another approach which still remains within the drive-theory framework. He feels that when drive level is raised task-irrelevant responses interfere with performance. He derives this idea from the simple drive pardigm of Hull. Hull states that more than one habit may be associated with any given situation and that the habits associated with any given situation are arranged heirarchically by strength of association. Thus, in any given situation, one habit is

most likely to be evoked but there are several that could be if the level of arousal is sufficient. When the level of arousal is high enough more than one response will occur. Whenever two responses occur goal-directed behavior will suffer because of competition and lack of coordination. It should be noted at this point that Child's views favor a quantitative difference in behavior as arousal or stress is increased rather than a qualitative difference such as Taylor points to. It should also be noted that the net effects on performance level are much the same under most of the designs where they have been tested.

Taylor (1963) points out that the subsequent research does not support the position put forth by Child because this would demand a uniform inferiority of high anxiety groups on verbal learning tasks compared to low anxiety groups and this difference has not been shown.

The present dissertation is concerned with a failure continuum, rather than simply with high and low failure levels only. In order to test for any differential or non-linear effects it is necessary to present a continuum rather than two or three extreme points. In the present case induced failure will be used to create failure levels varying from no failure to total failure in twenty per cent steps.

If Taylor's (1963) and Rosenszweig's (1944) ideas are correct an individual will not be sufficiently task oriented at very low levels of stress to perform effectively. As stress is increased, however, this task-orientation should first increase and then shade into an ego-defensive orientation which will interfere with the task at hand. Thus, at low levels of stress the performance should be poor, at intermediate

levels of stress it should be high and at extreme levels of stress performance should show a decrement. This leads to the formulation of two hypotheses to be tested by this dissertation:

1. The groups with low failure experience will be superior to the group with no failure experience on the post-task anagrams.
2. Groups with increasing amounts of failure will show first an improvement and then a decline as failure level is increased.

In addition, if external stress and drive are summative, as assumed in the views presented above, then high anxiety subjects should show a decrement in performance much sooner than low anxiety subjects as we increase the amount of stress present in the situation. The change from task-oriented to ego-defensive behavior should occur much earlier in high anxious subjects. This means that while the performance of high anxious subjects is suffering a decrement the low anxious subjects performance should be showing an improvement. This leads to the formulation of two additional hypotheses:

3. Interaction between anxiety and failure will be significant.
4. There will be an essential similarity between the performance of the high and low anxious subjects but the maximal performance of the high-anxious will occur sooner as will their point of declining performance.

CHAPTER II

RELATED LITERATURE

Reviews of the literature by Taylor (1956), Spence (1958), Sarason (1960) and Farber (1954) attest to the untiring popularity of anxiety research. In addition, several textbooks (see esp. Cofer and Appley, 1964) provide excellent reviews and attempts to integrate the results with the broader body of psychological knowledge.

Much of the work in this area stems from two sources. The primary source, both in the sense of amount and of integration, is Spence and his colleagues working in the drive theory context. The Taylor Manifest Anxiety Scale grew out of this research along with several attempts to develop a theoretical framework. The other source is the work of Sarason. He began working with the TMAS but later developed several different scales to measure specific types of anxiety rather than the global type measured by the TMAS. He does not work within any particular theoretical framework. Many of his studies emphasize the role of stress and anxiety in interaction and it is this group that is especially appropriate to the design of this study. They will be reviewed separately in a later section of this paper.

Three theoretical works by Spence (1956, 1958, and 1960) seem to be the central reference point for the studies of the drive-oriented group. Taylor (1953), working in this context, published the TMAS prior to Spence's theoretical articles mentioned above and it has served as one of the major empirical sources of support and direction

for his theoretical work. Three years after its publication Taylor (1956) attempted to summarize and critically evaluate the numerous studies employing the TMAS. She was especially interested in the relation of the results to the original purposes of the scale and to drive theory. She concluded that the experimental evidence generally supports the notion than an interaction between anxiety and task complexity exists. She further interprets the research as supporting the concept of a direct relationship between anxiety level and the difficulty a subject will have with complex problems with competing responses. She pointed out the necessity of additional research to expand the theory to include more complex situations.

Hill (1957), in a thoughtful reply to this article, denied Taylor's conclusion. He suggested that the failure of high anxiety subjects in many complex situations with competing responses is more logically seen as contradictory to drive theory.

Many of the studies providing the empirical support for drive theory have centered on learning and conditioning. Only two studies were found that employed anagrams in relation to the anxiety level of the subjects. Wiggins (1957) was interested in determining whether a subjects effectiveness in solving multiple solution anagrams might be of possible use as a personality screening device. He administered the TMAS, an anagram solving task and a word association test to a group of psychology students. The words for the word association test were presented in five second intervals in a group testing situation with the subjects being instructed to skip a response rather than get

behind the examiner. He utilized the number of words skipped as a measure of blocking. ACE scores were available on over half the total number of subjects and he found them to be correlated .82 with the number of blockings. When he partialled out the effects of the ACE scores he found that the number of correct solutions was correlated very significantly and negatively with the number of blockings and with the TMAS score. It was further stated that the word association test scored for indices of anxiety, did not correlate with the TMAS significantly.

In another study that utilized anagram solutions in relation to anxiety Tallarico and Reitman (1959) found no relationship between anagram solving ability and the TMAS. It should be noted that while they used a large number of subjects (n equalled 176) they did not partial out the effects of intelligence nor did they put time pressures on their subjects.

Several studies attempting to induce stress have used electric shock or other painful stimuli in an attempt to ascertain the relationship between stress and anxiety. One such study by Lee (1961) used thirty male subjects in the upper twenty per cent and thirty male subjects in the lower twenty per cent of the distribution of TMAS scores. Each subject learned a list of fifteen adjective pairs. After completing the first list each group learned a second list that was mixed such that five of the pairs were changed, five were unchanged and five were neutral. Fifteen subjects from each anxiety group learned the list without shock and fifteen learned the second list

with a shock being administered between trials. She concluded that increases in drive either by shock or high anxiety scores facilitated performance when the dominant habit is correct but that it impeded performance when the dominant habit was incorrect. She concluded on this basis that the TMAS measures chronic anxiety which will be present in experimental situations regardless of whether the subject is shocked or not. Her views and results would seem to coincide with the theoretical interpretation of Child given in the previous section although she does not mention this in her discussion.

When Grant and Patel (1957) analyzed conceptual behavior as the dependent variable they came to a different conclusion than Lee. They concluded on the basis of their study that the TMAS is a measure of the vulnerability of subjects to anxiety provoking stimuli rather than a measure of chronic anxiety. Maltzman, Eisman and Morrisett (1961), on the other hand, found no relationship between performance on a rational learning problem and induced anxiety. They used threat of shock as their anxiety inducing condition and no threat of shock as the control condition. There was no effect noticed from the induced anxiety but different levels of TMAS did exert an effect.

The last three studies give some indication of the confusion that exists in this body of literature. Three different results were reported concerning anxiety of two types with each based on a different dependent variable. As Tayler (1963) indicates the research in this area suffers from a lack of systematic emphasis and a proliferation of conflicting and partially conflicting results.

In another study that utilized electric shock as a stressor Lazarus, Deese and Hamilton (1954) divided their subjects into groups on the basis of their TMAS scores. They found that increasing the task difficulty reverses the usual anxiety-avoidance learning relationship. Spence, Farber and Taylor (1954) performed another study with electric shock as a variable in which they attempted to ascertain the effect of heightened emotional level upon performance in eyelid conditioning. They divided their subjects into three treatment groups of thirty women each and gave each group eighty conditioning trials. The first group was given an occasional electric shock in conjunction with the ready signal preceeding the conditioned stimulus. Another group was told that it might receive such a shock but actually received shocks only during a preliminary tryout. The control group received neither threat of shock nor actual shock on any trials. The results indicated that there was no difference between the groups that were shocked and the groups that received only threat of shock. When these two groups were combined, however, they showed a slightly higher level of performance than the control group during the early stages of conditioning. When the subjects were divided into the upper and lower levels on the basis of their TMAS scores another relationship became apparent. The relatively anxious subjects gave more conditioned responses during the first half of conditioning than did the relatively nonanxious subjects. This difference was only significant for the groups that were shock-involved and not for the control group. On the basis of these results they concluded that level of emotionality, as

defined by the presence or absence of shock, is related to performance in eyelid conditioning. They also concluded that the effect of manifest anxiety upon performance may be a function of the degree of noxiousness or threat present in the experimental situation. Whether this means the subjects were hypersensitive to noxiousness at high levels of anxiety, as Grant and Patel (1957) state, or whether the noxiousness and present chronic anxiety summate (see Lee, 1961 above) is not clear from their article. Caldwell and Cromwell (1959) replicated this study partially while noting that they scored the conditioned response slightly differently and assigned their subjects in a slightly different manner.

Silverman and Blitz (1956) studied the effect of an electric shock and anxiety on rote learning. They found that subjects who obtained high scores on the TMAS were not affected by threat of shock. The low scoring subjects, however, were affected differentially by an avoidance threat and a non-avoidance threat. If the threat was a non-avoidance type the performance of the low anxious was impaired while if it was an avoidance threat their performance was improved. This evidence runs counter to every other study in this section.

In general, the studies utilizing electric shock have yielded results that are inconsistent at best. So many different variables, subjects and conditions are present in the studies however, that it is difficult to ascertain whether enough similarity or common ground exists by which the results can be compared. It seems that what is needed most in this area of research is some direction or centering point. The issue of chronic anxiety versus the vulnerability to stress as the

result of anxiety has not been solved and is not likely to become any clearer within the present trend of disorganized, unconnected studies. The notion of chronic anxiety and stress susceptibility do not seem to be necessarily incompatible concepts. If a person is high in chronic anxiety it would seem likely that he could be pushed into the area where a performance decrement would occur if the model mentioned in the problem section of this paper is correct. The low anxious, of course, would at the same time be showing an improvement in performance due to the increased intensity of task-relevant responses. Therefore, what would appear to be vulnerability to stress would actually be the result of the summation of the anxiety or stress in the situation with the chronic anxiety present in the individual.

Several studies have been performed in which the central concern was the nature of the instructions given to the subjects. Many of these are the product of Sarason (Sarason and Minard, 1962; Sarason and Palola, 1960; Sarason, 1958; Sarason, 1961; Sarason, 1959; to mention a few. These are listed in the order of their appearance in this review). Many of these studies use the Test Anxiety Questionairre (TAQ) rather than the TMAS as their measure of anxiety, although several use the TMAS, or both in combination. While the TAQ and the TMAS are not directly comparable most studies find them to be highly correlated. For example Raphelson (1957) found a correlation between the TMAS and the TAQ of .53. In another study Sinick (1956) found a correlation of .43 between the two scales. Sinick also broke his subjects down into males and females and found that the scores of the males were correlated .45

while those of the females were only correlated .35 when the TMAS is compared to the TAQ.

In order to maintain the emphasis on drive-orientated studies those studies which are specifically in the drive-context will be reviewed first. The conditioned eyeblink response has been a favorite topic of study for this group and two studies are available in which the instructions were manipulated in order to produce different motivational states in the subjects. One of the earliest studies in the area of motivational states induced by differential instructions was performed by Taylor (1951). She divided the subjects into two major groups on the basis of their scores on the TMAS. These groups were divided into subgroups that were either given instructions designed to be anxiety provoking or instructions that were designed to be neutral or non-anxiety producing. She used the conditioning of the eyelid response to a puff of air as her dependent variable. She found that there was no difference between the groups that were given anxiety and non-anxiety provoking instructions as to the amount of eyelid conditioning exhibited. The difference between the high and low TMAS groups was significant at the .0001 level, however. The difference between the number of trials to extinction was not significant but the high anxiety subjects required more trials to extinguish than did the low anxiety subjects as she had hypothesized. Her major hypothesis for this study is the clearest indication of the drive-theorists belief in the additive nature of the internal drive-state and the amount of external affective stimulation to be found in the articles covered in this review. This hypothesis

stated "the amount of conditioning exhibited in a defensive conditioning situation is a direct function of the level of total affective drive". Spence and Goldstein (1961) tested much the same hypothesis without the variable of anxiety in another study of eyelid conditioning. One group was conditioned using the normal procedure with neutral instructions. The second group was warned of a strong puff of air but actually did not receive the puff during any phase of the experiment. The third group was not only warned of the strong puff of air but actually received it. There was a significant difference between the groups conditioned in the normal manner and both instruction groups but the instruction groups did not differ significantly from each other. The authors interpreted this as favoring drive-theory since the set induced by the instructions increased emotionality (an internal anxiety state).

In addition to eyelid conditioning the conditioning of the GSR response has provided an active area for research conducted within this context. Berry and Barclay (1957) obtained GSR conditioning and extinction measures on 120 subjects in college. They divided this group into twelve treatment groups arranged in a factorial design. They had two sex groups, three different instruction groups and two anxiety groups. They gave instructions that were designed to be either apprehension-arousing, neutral or reassuring to their three instruction groups. They found that the male subjects showed less conditioning when given reassuring instructions than under the neutral or the apprehension-arousing conditions. The female subjects, on the other hand, showed the least conditioning with the apprehension-arousing instructions. Females also

showed a greater GSR reactivity than the males in all phases of the experiment. None of the other possible differences or interactions was found to be significant. The fact that the females performed more poorly and were higher in their reactivity on the GSR (higher in internal anxiety?) would be predicted on the basis of the model mentioned in the problem section of this paper. The other prediction, that the low anxious (males) should perform at a higher level with highly motivating (apprehension-arousing instructions) did not appear.

Several studies have attempted to assess the effect of anxiety on tasks of a more abstract and cognitive nature. One of the earlier studies of this type was performed by Cowen (1952). He administered a projective personality test to a large number of subjects and from these he selected fifty at random for further testing. He assigned this fifty alternately to a group that was put under stress and a group that was praised. The stress group was told that their projective test records had certain questionable features in them. The praise group was told that their scores on the projective test were exceptionally good. After the administration of these differential instructions each subject was asked to solve Luchin's water-jar test of problem solving. Cowen found that there were significantly fewer rigid solutions given by the group that was praised than by the group that was threatened. He attributed the reduction of rigid behavior on the part of this group to the reassurance given them concerning their prior test performance. He discussed the implications of these findings for psychotherapy and research but did not discuss drive theory or the TMAS (which was not in general use

at this time).

Romanow (1962) studied concept formation in subjects that differed in level of anxiety as measured by the TMAS. She used a high group, a low group and a group that was in the middle of the distribution of scores. Each group was administered a concept formation task in which the associative strength of the correct response and the strength of competing responses were varied. The high anxiety group did more poorly than the other two groups when the interfering tendencies were strong, providing a verification of a major drive-theory hypothesis. In a second study reported in the same article she administered differential instructions to three different groups attempting to induce three different levels of ego-involvement. The results of this study are not consistent with those of the first study nor with most results found in studies of this general type. She found no parrallelism between ego-involvement and anxiety since the low involvement group was inferior to the other two groups in her study when the interfering tendencies in the material were strong.

Several studies in the realm of cognitive behavior have been performed to assess the relationship between anxiety and scores on one or another of many different types of intelligence tests. For an excellent review of this area of research see Sarason (1960). Two studies are included here because they attempted to assess the interaction between stress (here in the form of instructions designed to induce different motivational states) and anxiety on intelligence test scores. Sarason and Minard (1962) administered three sub-scales of the Wechsler Adult

Intelligence Scale to ninety-six college students. They used a 2X2X2 analysis of variance design with the variables being sex, anxiety and type of instructions. The anxiety level of the subjects was ascertained by using the TAQ. The instructions were designed to be either achievement-orienting or neutral. They found that the low test anxiety subjects were superior to the high test anxiety subjects on the vocabulary, block design and comprehension sub-scales of the WAIS. They indicated that the difference was largely attributable to the effects of the instructions. They found no difference between the high and low anxious subjects on the digit symbol sub-scale. They did find a significant interaction between anxiety and sex by instructions on the digit symbol sub scale but not on the other sub-scales used. They interpreted their results as indicating the relevance of the three variables; sex, anxiety, and motivation (instructions), to performance as well as the importance of the task variable in research on anxiety.

In a study that attempted to assess the relationship between the variables in the Sarason and Minard study Wrightsman (1962) added achievement motivation as an additional, fourth variable. He administered the TMAS, a projective measure of achievement motivation and an intelligence test to 234 subjects. He instructed 112 of the subjects that the test was given only to collect norms while 122 subjects were led to believe that performance on the intelligence was very important. When the test was presented as important to the subjects the high anxious subjects performed significantly lower than the low anxious subjects. In the neutral condition there was no relation between anxiety and intelligence

test scores. Subjects that were high in internalized achievement motivation performed equally well on the intelligence test regardless of its purported importance. Subjects that were low in achievement motivation did less well when they thought the test was important. Wrightsman interprets the last relationship as possibly indicative of an avoidance reaction to stress inherent in the personality makeup of subjects with low achievement motivation. it would seem that this study is another example of the sensitizing properties of anxiety.

In another study relating higher processes to anxiety Sarason and Palola (1960) found that both arithmetic ability and code substitution are more closely related to test anxiety than they were to general anxiety. They also found that the difficulty in the task and high-motivation orientation in the instructions combine to decrease the performance of the high anxious subjects. Their attempts to relate anxiety to either the mode of instructions or the difficulty variables alone was not successful although the three in combination led to the discovery of several relationships that proved to be significant.

Several authors have attempted to study the relationship between anxiety and perceptual phenomena. Most of these studies simply correlate perceptual phenomena with anxiety scores or study the differences between two extreme anxiety groups for a given perceptual phenomena. An example of a study which combines additional variables was run by Moffit and Stagner (1956) in which they introduced a third variable relating to the nature of the instructions given to the subjects. They chose a group of subjects at random from an introductory course in psychology and

administered the Grice revision of the TMAS to this group. They then divided the highest and lowest scores into groups by sex. They gave half of these resultant groups different instructions. One half received threatening instructions while the other half received instructions that were designed to be non-threatening. They then administered a series of perceptual tasks to all groups. The results indicated that threat induced anxiety modified perceptual processes significantly in the case of closure under tachistoscopic presentation of stimuli. They also found the same type of relationship for rigidity and stability of perception regarding tachistoscopically presented stimuli. They discussed the fact that these three functions involve maintenance of a constancy from a previously established percept in the face of incompatible cues from the environment. They found the TMAS scores of their subjects were related only to stability of perception.

In another study assessing perceptual phenomena in conjunction with anxiety and differential instructions, Gavales and Millon (1960) studied the reproductions of subjects differing in anxiety on the Bender-Gestalt. They took the highest forty and the lowest forty TMAS scores from a group of 195 undergraduates and used them for this study. One-half of each group took the Bender-Gestalt under conditions that were designed to be anxiety-producing while the other half took it under normal conditions. The subjects that were working under the anxiety producing situation produced significantly smaller Bender-Gestalt drawings than did the subjects working under the normal conditions. Subjects who were high on the TMAS tended to contribute more to the significant relation between

anxiety and the small size of the Bender-Gestalt reproductions than did those with low scores on the TMAS. This is another example of the summative nature of internal and external drive and may be considered, as such, a confirmation of the general drive theory hypotheses.

A slightly different approach was taken by Winter and Ferreira (1963) in a study which combined three measures of anxiety (although their title says two?) in relation to situations differing in amount and type of anxiety. They used the Affective Adjective Check List (AACL) and the Palmar Sweat Index (PSI) in conjunction with their conditions and administered the TMAS later. They administered all six different conditions on their study to each of nineteen undergraduate subjects. Two of the conditions were of low anxiety, two were of experimentally induced high anxiety and the final two were of examination anxiety. They found that the AACL and the PSI were both validly reflecting the amount of anxiety present in the situation. They also found that they both yielded stable scores that were characteristic of the individual subject. The PSI did not correlate with the AACL, however, since the PSI and AACL responded differently to examination anxiety. The TMAS scores of the subjects correlated with the AACL but not with the PSI. They also found that the PSI indicated that certain fingers seemed to sweat more than others. They discussed the fact that these findings indicated a lack of congruence between these verbal and physiological measures of anxiety.

In another correlational study by Davids (1955) clearer and more positive results were found. He manipulated instructions in the administration of several tests to his subjects. He found that the TMAS

measures essentially the same variable or trait as that measured by several other available instruments. Two instruments that were particularly correlated with the TMAS were the Psychosomatic Inventory and the Anxiety Self-Rating Scale.

In still another study which attempted to asess the role of anxiety and ego-involving instructions Kaye, Kirschner and Mandler (1953) used memory span as their dependent variable. Using thirty-six students from a course in introductory psychology they found that the low anxiety group performed significantly better than the high anxiety group. They found that the differential effect of anxiety levels held whether the testing was done in a group or individual testing situation as long as it was accompanied by ego-involving instructions. This offers another example of anxiety being effective only when used in conjunction with another motivational variable, in this case motivating instructions.

Another variable studied quite often in the context of anxiety and differential instructions is the learning of verbal material. One such study was performed by Rosenstein (1960) using the serial learning of nonsense syllables as his measure of performance. He used fifty undergraduates that had high scores on the TAQ and fifty that had low scores as his subjects. He assigned subjects from each group randomly into five experimental, or treatment, groups. The instructions were given either prior to, or in the course of learning a set of nonsense syllables and were designed to be either ego-involving or non-ego-involving. He took the PSI of each subject twice in the course of the learning period in order to see how well the TAQ predicts the effects of ego-involving

instructions on the PSI. His results indicated that the TAQ failed to predict either changes in the PSI or learning efficiency. In addition, he found that subjects that showed larger-than-average increments on the PSI during the course of learning completed the learning with significantly fewer trials and with significantly fewer errors than did the subjects showing smaller-than-average increments. This latter relationship held for all the various treatment groups.

Conflicting results were found by Kalish, Garmezy, Rodnick and Bleke (1958) in a study using nonsense syllables learned under serial conditions. The major difference between their study and that of Rosenstein above was that they used the TMAS rather than the TAQ to select their high and low anxiety groups. In all, they used four groups divided on the basis of anxiety into high and low; and stress divided into a stress and a non-stress condition. Each group learned a list of twelve nonsense syllables serially. The stress group was told that this type of learning was highly correlated with intelligence and that their performance was well below the college average. The non-stress condition was run without any evaluative statements made by the experimentor. The results indicated no difference between the high and low anxiety groups under the non-stress conditions. Under the stressful conditions the high anxiety group needed fewer trials to criterion, made fewer errors and showed a depressed serial order position curve. The last mentioned serial position effect was attenuated, however, when the groups were matched for trials to criterion. While this study verifies the commonly found fact that anxiety is effective only in combination with some other

motivational variable it is at variance with every other study in terms of the effect they found on performance. It is typically found that performance of high anxious subjects is depressed when stress or extra motivation is added to the situation while they found an improvement both in number of trials to criterion and number of errors.

Similar results on the former point, indicating that anxiety is effective only in interaction with a stressful situation were published by Nicholson (1958) at the same time as the study above. He selected his subjects from the upper and lower deciles on the TMAS. He administered two lists of twelve nonsense syllables of different degrees of difficulty to be learned serially. There was a significant interaction between anxiety and instructions. The out-of-place errors showed a high degree of constancy. He concluded on the basis of the fact that there was no increase of the performance of the high anxiety subjects under ego-orientation on the easy list and no decrease in the performance of the low anxiety subjects under ego-orientation on the hard list that anxiety is more important in its influence as a stimulus rather than a drive-state. Another significant interaction between instructions and anxiety was found by Sarason (1958). He used the TAQ to select subjects high and low in anxiety. He used two forms of instructions which he called, reassuring and standard. He found that the reassuring instructions facilitated the performance of the subjects that were high on the TAQ and proved detrimental for the subjects that were low on the TAQ. This is exactly what would be predicted from the drive model if reassuring instructions can be considered to have an effect opposite to that of

stress instructions, that is of lowering the total amount of drive or emotionality in a situation. He discussed his results in terms of an interfering response interpretation of anxiety that comes fairly close to the task-oriented versus self-oriented dichotomy mentioned in the problem section of this paper.

Another variable that has been used to create stress has been that of failure reports of either induced or actual failure. A study that bridges the previous topic of differential instructions with the present one of failure reports is a rather complex one by Sarason (1956). His basic design was a 2X2X3 analysis of variance with serial learning as his dependent variable. Each sub-group contained fifteen subjects so that his total sample contained 180 subjects. He used three anxiety groups selected on the basis of the TMAS as high, middle and low anxious. One half of his subjects were administered instructions that were designed to be highly motivating and the other half received instructions that were designed to be low motivating. The instructions were administered to the subjects after they had completed fifteen trials on a preliminary list. Immediately after receiving the differentially motivating instructions the subjects went through the first fourteen trials of the test list. Following the fourteenth trial one-half of the subjects were told they had failed while the other half of the subjects was engaged in a "neutral" conversation with the experimentor. Immediately after this one additional trial of the test list was administered to each subject. Following a twenty-four hour period all subjects returned for an additional six trials on the test list. In addition they were tested again

a month later. His results indicated that highly motivating instructions were detrimental for the high anxiety subjects while they facilitated the performance of the low and middle anxious group. This interaction between anxiety and motivation was significant on the test administered a day later as well. In fact, the interaction remained significant when the subjects were retested a month later. The performance of the subjects who were told they had failed was significantly poorer than the performance of subjects who had been engaged in neutral conversation with the experimentor. This relationship held only for the single trial administered immediately following the failure report. The effects of the failure were completely dissapated by the time the test was given on the following day. Anxiety considered as a separate variable was not significant in any phase of the experiment. In his discussion of the results Sarason presented two possible theoretical interpretations of his data. One interpretation considered the motivational aspects of anxiety while the other emphasized the associative factors involved in the learning of certain deleterious responses by the subjects that were high in anxiety. His data again indicate the absence of any effect when anxiety is considered as a variable not in combination with other motivation. His results also report the common relationship between high anxiety, high motivation and a decrease in performance.

This early and rapid dissipation of the effects of failure has been reported elsewhere and in a different context by Walker, Nielsen and Nicolay (1965). They found that the intelligence testing situation is not in itself stressful as Sarason (1960) has stated. This conclusion

was based on the fact that when the object assembly sub-test of the Wechsler Adult Intelligence Scale was administered under a non-stress condition there was no relationship between performance and anxiety scores on the TMAS. A relationship only appeared when the subjects were administered the task under stressful conditions. Stress in this study was an impossible preliminary task consisting of pieces picked at random from the various object assembly sub-tests. The post-task was the object assembly manikin. In addition half the subjects were told the impossible task was difficult and that they should concentrate harder on the next one. The other half were told that "this test isn't really as hard as it seems. The next one will be easier." The control group simply had the object assembly manikin presented in the normal manner without a preliminary task. They confirmed the fact that stress and anxiety are related to intelligence performance when the stress is relevant to the task used as a measure of performance. Another hypothesis that there sould be no relationship between anxiety and performance under conditions of no stress was more clearly demonstrated.

Osler (1954) studied the intellectual performance of her subjects in conjunction with induced failure and induced fear. She found no differential effects in the two anxiety groups selected on the basis of their scores on the TMAS. The general effect of failure was to depress the performance of the subjects while fear did not produce any significant change. She concluded that the difference in effectiveness between failure and fear is probably due to the relation between stress and the experimental task. While failure is directly related to the experimental

task fear has no such relation. This provides another example of the relation found in the previously mentioned study by Walker, Nielsen and Nicolay (1965) with the addition here of a stress condition that was not relevant to the test being administered as the measure of performance.

Verbal learning has been the target of numerous researchers in this general area. Many of the studies test specific hypotheses from drive theory but there are also a great number that simply combine a number of variables without integrating them into any particular framework. One of the former type was run by Taylor (1958) in order to test the hypotheses that under neutral conditions the high anxiety subjects would exhibit a superior performance to that of the low anxious subjects on a paired-associates learning task with minimal intratask interference. In addition they would exhibit poorer performance when they were under conditions of psychological stress due to the greater arousal of interfering extratask responses. Psychological stress in this case was the report of inadequate performance on a task given prior to the experimental task. Her results indicated that while the high anxiety subjects under neutral conditions were significantly superior to the low anxiety subjects under neutral conditions, and the subjects operation under stress was in general inferior to their neutral controls, the predicted interaction between anxiety level and stress was not found. This seems to be another example of the unilateral effects of failure. It seems safe even at this early point in the review to state that the depressing effects of failure is highly replicable but that the effect of anxiety in interaction with failure has yet to be demonstrated convincingly.

One has to say that this interaction has yet to be demonstrated convincingly because it has appeared as significant in several studies but there are still many studies that report no relationship. One study that did report a significant relationship between anxiety and failure-stress was reported by Gotoo and Sugiyama (1960). They utilized a 2X2X2 analysis of variance design in the first of two studies reported in this article. Their first dichotomy was between high and low motivation induced by differential instructions. The second was anxiety determined by their subjects scores on the TMAS. The final dichotomy was psychological stress induced by giving the subject a report of failure during the learning of the task or absence of psychological stress by not giving any report of performance during the task. Before they introduced the stress condition (failure report), the high motivation group learned more rapidly than did the low motivation group but there was no significant difference associated with the anxiety variable. When the report of failure was introduced it depressed the performance of all subjects significantly but it also interacted significantly with motivation and with anxiety. In their second experiment they compared high and low anxious subjects selected on the basis of their TMAS scores with different stress conditions without the variable of differentially motivating instructions. One half of their subjects received failure reports after trials five and ten and success reports following trials fifteen and twenty. The other half of their subjects had no report until trials fifteen and twenty when they were told of failure. Each subject was given twenty-five trials. In each case stress was

significant but anxiety was not significant in any case. It seems on the basis of these findings that before anxiety will interact with failure or any other type of stress there must be some ego-involvement in the task such as that induced by differentially motivating instructions.

Only one study was found in which a failure report was found to improve the performance of subjects. This was in a study of serial learning published by Sarason (1957). He divided his sample initially into two groups on the basis of their anxiety scores. Each of these groups was subsequently divided into two treatment groups and a control group. The first treatment group was failed on a nonsense syllable, serial learning task similar to the one used on the post-test. The second treatment group was failed on a digit cancellation test which was quite dissimilar to the post-failure task. The control groups did not perform any preliminary task. He found that the high anxious groups were adversely affected by failure with the two types of failure being about equally effective. The low anxiety group that was failed on a dissimilar preliminary task was the best group in terms of the post-failure performance. The low anxiety subjects failed on the preliminary list that was similar to the post-failure task did not differ significantly from the low anxiety control group. This mitigates the conclusion offered earlier by Osler (1954) in which she stated that the effectiveness of failure seemed to be related to whether it was task relevant or not. Sarason's results from the present study indicate that it is effective in lowering the performance of high anxiety subjects but not

in lowering the scores of low anxiety subjects. The wide differences in tests, materials used and technique, however, make it difficult to draw a conclusion either way.

An attempt was made to follow up earlier results with a sample of children by Waite, Sarason, Lighthall and Davidson (1958). They administered a general anxiety scale and a test anxiety scale to 747 grade school children. Out of this group they selected matched pairs of high and low anxiety subjects so that they had a total of twenty-four pairs in their final sample. Each subject completed two modified paired-associates learning tasks with some pairs receiving neutral, some receiving failure and some receiving success instructions between the two tasks. The authors found no differences between the subjects as a result of the instructions although the low anxiety subjects performed better than the high anxiety subjects on the second paired-associates task. Several interpretations were given for this rather atypical result but none was presented as conclusive. They ended their discussion by concluding that this study argued for the validity of both of the anxiety scales that were used.

An attempt was made to relate objective failure and subjective estimates of failure in the context of anxiety by Mandler and Sarason (1953). They were especially interested in the effect of degrees of previous experience on the performance of both high and low anxiety groups. They were also interested in the relation performance had to the subjects self-estimation of their performance for both the high and the low anxiety groups. Their first finding indicated that one of the

major effects of experience was to decrease the variability of the two groups performance and to improve the overall performance of the high anxious group. Importantly for the context of this review they found that when a subject gave a low self-estimate of performance (which the authors termed subjective failure) his performance was not affected if he was low anxious but his performance became poorer if he was a high anxious subject. They found that the low anxiety subjects in general reported higher estimates of their performance than did the high anxiety subjects. They concluded on the basis of this study that subjective failure is a significant variable in the performance of high anxious subjects but not such for the low anxious subjects. They also found that a specific success report from the experimenter tended to offset the detrimental effects of subjective failure in the high anxious group. The fact that the low anxiety subjects reported higher estimates of their performance would seem to coincide rather well with the idea put forth by Wrightsman (1962) covered earlier in this review. He concluded that subjects who are low in achievement motivation have an avoidance reaction to stress inherant in their personality makeup. If this also held for the low anxious they would tend to defend themselves against failure in a task such as this by overevaluating their performance among other things.

Several studies used time pressures in order to increase the stress in a situation either alone or in conjunction with several other variables. Sinha and Singh (1959) concluded that anxiety is a significant variable on problem solving tasks of any type but especially on those

that are given as speed tests. The general effect of speed is seen as detrimental to the performance of high anxiety subjects. The same result concerning time was found by Siegman (1956) in a study utilizing a concept formation task. He used psychiatric patients and medical patients who had at least normal intelligence and were without psychosis or suspected cortical damage. Each subject took the TMAS and the Wechsler Adult Intelligence Scale, the Raven's Progressive Matrices, the Bender-Gestalt and the Bender-Gestalt Recall Test. They found that the subjects that scored high on the TMAS scored significantly lower on the timed than on the untimed subscales of the Wechsler Adult Intelligence Scale. They suggested that anxiety has a disruptive effect on abstraction, incidental learning and also on intelligence tests that are timed.

A study which combined time, anxiety and stress was performed by Davidson, Andrews and Ross (1956). They attempted to assess the differential effects of anxiety, failure-stress and task-induced stress on performance on a continuous high speed color-naming task. They used fifty-four male undergraduates who were either high or low on the TMAS. They randomly assigned the subjects within each anxiety group into the various cells of a 3X3X2 factorial design. They used three levels of failure-stress, three levels of task-induced stress and two levels of anxiety. Errors of omission were used as the measure of performance. They studied the performance scores of their subjects for two special portions of the experimental data. The first portion was after a warning of potential failure and the second was after a shock was administered indicating to the subject that he had failed. After each testing session

the subjects were given a stress experience inventory. They found that the errors of omission were a sensitive indicator of the effects of both types of stress. They also found that both the failure-stress and the task-induced stress produced significant decrements in the performance of all their subjects. In addition, the stress also had significant effects on the subjective reports of the stressful experience. They concluded that the TMAS does not produce differential effects on performance, if it is considered as a variable by itself. However, several of the possible interactions between anxiety and the various experimental conditions indicated that anxiety has a priming function which causes the individual high in anxiety to react more strongly to stress than a low anxiety individual. Finally they found that there were highly significant individual differences for high speed color naming found in their subjects. Katchmar, Ross and Andrews (1958) came to much the same conclusion about the sensitizing or priming function of anxiety in a study that utilized a complex verbal-coding task as a measure of performance. They found that both errors and the frequency of blocking are independently and significantly sensitive to both stress and anxiety. The interaction between stress and anxiety was significant which led them to the conclusion that anxiety was a sensitizer in a stress-producing situation.

Rather than using speed as a stressor Reynolds, Burton and Hurlbut (1961) used it as a measure of performance. They found that subjects with high TMAS scores were significantly and consistently better than subjects low on the TMAS in tasks that involved addition problems and

line drawing above or below letters. They interpreted this fact as a confirmation of drive theory since the high anxiety subjects were predicted to perform better in a situation that was not complex and had no competing responses.

In addition to the task and subject variables found in many of the experiments Winkel and Sarason (1964) found that the anxiety level of the experimenter was also an effective variable on the performance of their subjects. They found that female subjects performed better when they were run by an experimenter that scored high on the TAQ. They also found that females were generally superior to males on tests and that subjects that had high TAQ scores performed at lower levels than did the subjects who scored low on the TAQ.

A confirmation of the summative properties of various components of drive was made by Meyer and Noble (1958) in a study that attempted to relate muscular tension, anxiety and task-related stress. They found a significant interaction between muscular tension which was measured by the strength of grip on a dynamometer and the TMAS. Their performance measure was the learning of a verbal maze. They concluded that this indicated that anxiety and motor tension interact as a general drive state.

In general the feeling after reviewing the literature in even this small area of anxiety research is one of confusion and incompleteness. The more one reads the more one is inclined to agree with Sarason (1960) and Taylor (1963) and others that the findings are inconsistent and often contradictory. There are, however, a few relationships that seem

to hold up throughout the majority of the studies and it might be well to delineate a few of them to end this review.

In the first place it seems that anxiety and physical stress almost consistently show a relationship. The relationship between motivational instructions and failure is much less secure. This may be because the subject can escape these latter two situations but not the first. It also seems that failure is relatively ineffective by itself in producing a differential effect in relation to anxiety but that instructions that are designed properly can produce this differential effect between high and low anxiety groups in relation to the failure variable. The general effect of failure is to lower performance but it also seems that if the failure is on an unrelated task the experience may improve the performance of low anxiety subjects.

Again we might say that what is needed is a more systematic approach to the research in this area along with some studies that probe the entire range of anxiety and the entire continuum of stress rather than just a point here or there. The aim of the present dissertation is to take a step in this direction by presenting subjects differentiated on the basis of anxiety to a continuum of stress.

CHAPTER III

PROCEDURE

Subjects: A total of 120 subjects was used in this study. All subjects were college females. One-half of the subjects scored in the upper quarter and one-half in the lower quarter of the distribution of TMAS scores. The subjects came from the following institutions:

1. Loyola University: All subjects were from psychology classes.
2. Barat College: All subjects were either in Introductory psychology classes or had taken it within the two previous semesters.
3. Chicago Teachers College South: All subjects were non-psychology majors taking an elective, undergraduate psychology course.
4. St. Francis School of Nursing: Second year student nurses.

All subjects passed a criterion task of 80% correct on a list of ten anagrams. Subjects were selected from approximately 1700 subjects who were pre-tested.

Testing Materials: The materials consisted of forty anagrams, each four letters in length. Thirty of these anagrams have solutions and ten are unsolvable in the English language. Of the thirty solvable anagrams, each has only two solutions based on a search of Webster's New Collegiate Dictionary (1959) reported by Postillion (1966). In addition, both of the solutions are words judged familiar for college age subjects. None of the anagrams in either the solvable or unsolvable category use any

single letter more than once, and none have more than three vowels or three consonants. The anagrams are divided into three sets, according to their purpose in the design of the study as indicated in Tables I, II, and III below.

Table I: Pre-Test Anagrams and Their Solutions

EMNI	Mine	Mein
OBLW	Blow	Bowl
UROT	Rout	Tour
AENC	Acne	Cane
ANBR	Barn	Bran
TUSL	Lust	Slut
DIAE	Aide	Idea
AGOT	Goat	Toga
TCOL	Clot	Colt
ROTI	Riot	Trio

Table II: Experimental Anagrams and Their Solutions

RMNO	Morn	Norm
ASML	Alms	Slam
GOFL	Flog	Golf
RAEG	Gear	Rage
GUBR	Burg	Grub
OLAF	Foal	Loaf
DWNA	Dawn	Wand
LDCO	Cled	Cold
GPEA	Gape	Page
FERA	Fare	Fear

Table III: Post-Test Anagrams and Their Solutions

EROL	Lore	Role
ABML	Balm	Lamb
ITLF	Flit	Lift
AHTL	Halt	Lath
TLFE	Felt	Left
RGID	Gird	Grid
LKIN	Kiln	Link
CKAS	Cask	Sack
FTAE	Fate	Feat
MAPR	Pram	Ramp

Table IV: Anagrams Without Solutions

BGLA	LEUT
FABI	ARIB
FOBA	EFNO
LKME	SOIM
SNIL	ONSL

Method: Pre-Test: Pre-test anagrams were given in a group form. Each subject received a booklet in which the anagrams were printed. Each page contained one anagram and a space for writing the solution. The odd numbered rows of students in the classroom, numbered from the experimenters left to right, received the anagrams in the same order that they appear in Table I. The even numbered rows received them in the reverse order. This was done to minimize copying. The first three pages of the booklet contained the example anagrams mentioned in the instructions below: AEDM, LKEA, TIKE. All pre-test subjects were run by a male experimenter; all subjects received the following instructions:

> This is an experiment involving the use of anagrams. Anagrams are a series of scrambled letters which need to be rearranged into sensible words. Please open your booklets to the first page. (E writes AEDM on the blackboard). What work is this combination of letters? Yes,_____ is correct (made or dame). So is _____ (other alternative). Now turn to the second page. (E writes LKEA on the balckboard). This can be solved by either Kale or lake. (E writes these on the blackboard. Kale is used to plant the idea that all solutions are not easy.). Now turn to page three. Can anyone tell me a solution to this anagram? Yes, Kite is correct. The rest of the booklet contains ten more anagrams of the same type and length. I want you to spend thirty seconds on each one. When I say "go" I want you to turn to anagram number one and write its solution on the line provided as soon as you can. Write down only one solution even if more than one occurs to you. When I say number two you should turn to anagram number two and solve it as quickly as possible. Do not turn the page until I say the number of the next anagram. If you do not

have the anagram solved when I call out the number of the next anagram you should go on to the next anagram anyway. The entire class will therefore be turning their pages at the same time. Are there any questions about what you are to do? Please be careful to turn only one page at a time. All right when I say go, you may turn to anagram number one and solve it. Please do not ask any questions once we have started. (Pause) Go.

Approximately one-half of the subjects received the TMAS at the same time they took the pre-test anagram test. In about one-quarter of the cases the students had taken it as a regular class excersise. Less than one-quarter had the TMAS administered in volunteer groups outside of the classroom.

Experimental sessions: The subjects were selected on the basis of the pre-test results and divided randomly into groups of ten. In all, twelve groups of subjects were so chosen so that they all scored approximately the same on the pre-test anagram list. Six of these groups were from the upper quarter of scores on the TMAS while the remaining six groups were from the lower quarter of scores. The experimental groups each received lists of anagrams that had different amounts of anagrams that were solvable. This meant that on the experimental set number one (Table II) some subjects had no anagrams that could be solved while others had ten anagrams that could be solved.

Each group went through the first list spending no more than fifteen seconds on each anagram and less if they completed it before the fifteen seconds had elapsed. The failure groups were obtained by counting how many anagrams were failed on list one. After the subject finished list one the experimenter checked them and wrote the number correct on the

answer sheet. As the experimenter handed the answer sheet back he said: "You got_____out of ten correct." Then he administered the second set of anagrams. Each subject was run individually and received the following instructions:

> You remember a short while ago you were asked to solve anagrams in your class. I am going to ask you to do some more now. I will show you an index card like this. (E holds up a 3" X 5" index card with WERA printed on it in heavy ink). As soon as you can, you should write the solution to this anagram in the proper space on your answer sheet. Would you write the solution to this anagram next to the space labeled example anagram. What was your solution? Yes,_____ (Wear or Ware) is correct. _____(other alternative) would also be correct wouldn't it? (E will not proceed until subject solves the example anagram). Please write in the solution as fast as you can. I will give you fifteen seconds for each anagram, but if you finish sooner we will go on to the next anagram. Write only one solution for each anagram even if more than one occurs to you. If you have not solved an anagram and the time runs out please move on to the next one and do not fill in the one just passed. It is not unusual for people of average intelligence to occasionally miss one. After we have finished ten anagrams, we will rest for a minute and then start another set. There are two sets of ten altogether. After we begin please do not ask any questions. Number one.

Since the stress experience here is relatively minor, it will probably tend to dissipate rather quickly, so the answer sheet with the number correct was kept in front of the subject at all times during the experimental session.

The unsolvable anagrams were selected in advance of the subjects appearance by shuffling the deck of index cards containing the unsolvable anagrams and picking the desired number from the deck. The unsolvable anagram or anagrams that were selected in this manner was then placed in the deck of solvable anagrams replacing the solvable anagram that

appears in the same numerical position as the unsolvable anagram in the tables of this paper. For example when FOAB was selected as one of the unsolvable anagrams to be used it was placed in the deck in position three replacing the solvable anagram GOFL. This meant that each anagram was always used in the same position throughout the experiment when it was used although virtually every subject, even those within the same groups received lists that were different in terms of the anagrams contained but were constant in terms of the number of anagrams that could be solved. The exceptions were of course the group that had the ten solvables and the group that had all ten unsolvables since they all received the lists in the same order.

The analysis was made by way of analysis of variance. The double classification with more than one score per cell described in McNemar was followed (see pages 303-307). The partitioning of subjects is presented in Table V.

Table V: Assignment of Subjects by Condition

Number Correct on Pre-Test	Anxiety	
	High	Low
0	10	10
1-2	10	10
3-4	10	10
5-6	10	10
7-8	10	10
9-10	10	10

CHAPTER IV

RESULTS

Table VI shows the means of the high and low anxiety groups on the post task at each failure level. It should be noted that there is a tendency for the higher failure groups to perform more poorly but that this is not a systematic difference. In addition, it should be noted that there is an overall difference in the total means for the high and low anxiety groups but there is no systematic trend when the highs and lows are compared at each failure level. In summary, it might be said that there are differences between high and low anxiety subjects and between the various levels of failure but that there is no systematic trend associated with either of these differences.

Table VI

Means for Both Groups at Each Failure Level for the Post-Task List of Anagrams

Group	Number Correct on Pre-Task Anagrams						
	0	1-2	3-4	5-6	7-8	9-10	Total
High Anxiety	7.2	7.7	7.5	8.2	7.4	8.3	7.72
Low Anxiety	7.6	7.5	7.2	8.7	8.7	9.1	8.13
Total	7.4	7.6	7.4	8.4	8.1	9.7	7.92

Figure One shows the data in table one in a graphical form, providing a clearer picture of the statements made in the foregoing paragraph.

Figure I

Means for Both Groups at Each Failure Level

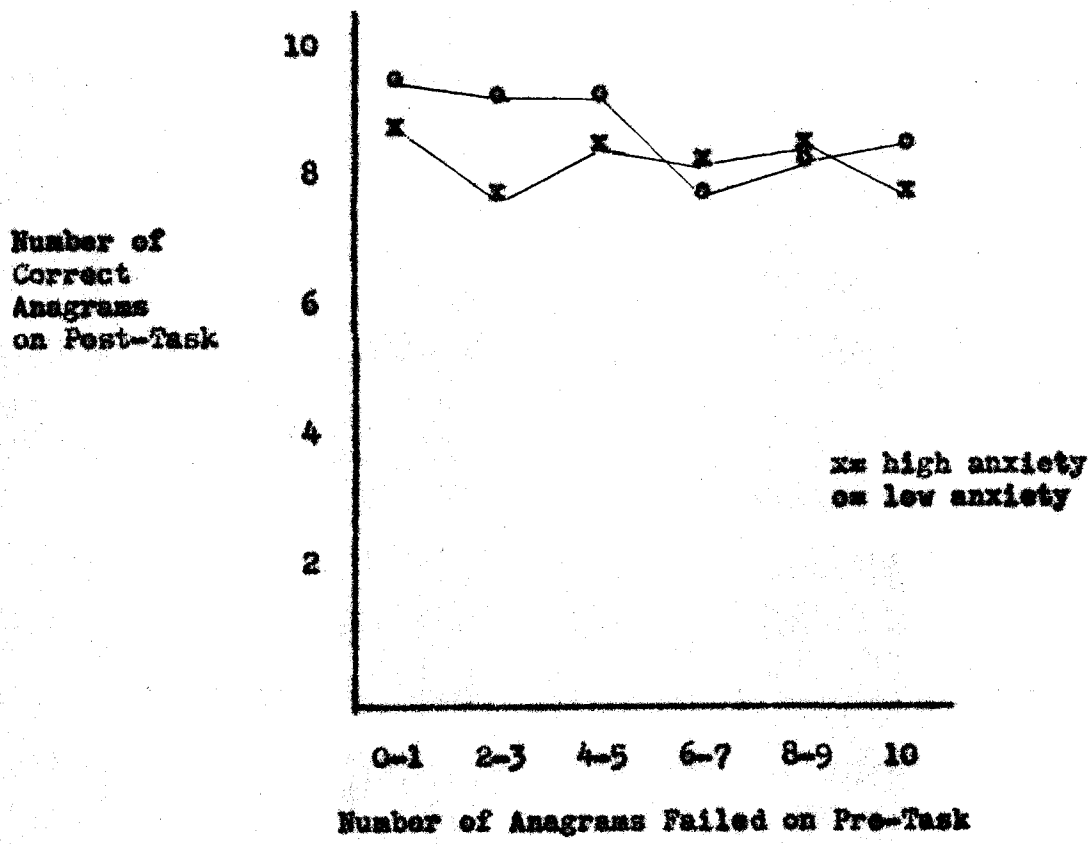

Table VII shows the results of an analysis of variance performed on the data from this experiment. The difference between the failure level is significant at the .05 level while the difference between the high and low anxious groups falls short of the 3.92 F needed for the .05 level. The interaction was also found to be not significant. An additional, more sensitive test, using pooled interaction and within variance estimates as the error term (Hays, 1963) was also performed; it also failed to yield a significant F for the difference between anxiety groups. The latter test is not presented here since the results are in essential agreement with the one presented. The only difference being that the F for the rows (failure) differences is slightly higher, but does not reach the .01 level.

Table VII: Analysis of Variance

Source	Sum of Squares	DF	Var. Est.	F
Rows (Failure)	32.1	5	6.42	2.94*
Columns (Anxiety)	5.2	1	5.2	2.38
Within	235.9	108	2.18	
Rows by Columns (Anxiety by Failure)	9.1	5	1.82	
Total	282.3	119		

*Significant at the .05 level

CHAPTER V

DISCUSSION

The discussion section will be divided into four major areas covering the results, design and design improvements.

A. STATUS OF THE HYPOTHESIS

1. Hypothesis number one: The experimental groups with low failure experience will be superior to the group with no failure experience on the post-task anagrams. This hypothesis was not upheld by the data of this study. There was in fact a general decline in perpormance as failure level increased. This hypothesis was made under the condition that the zero failure level is not stress-inducing and, therefore, as failure occurs the subjects performance will increase at low levels and then decline at the higher levels. Since the failure was not the only possible source of stress in this study, the subjects were possibly never at a zero stress level required for the adequate testing of this hypothesis. This is discussed at greater length in a later section, along with suggestions for the development of a more neutral situation with less stress so that the subject is not working under a high level of stress from the beginning task.

2. Hypothesis number two: Groups with increasing amounts of failure will show first an improvement and then a decline as the failure level is increased. This hypothesis was not upheld by the data of this experi-

ment. Rather than an initial increase there was an immediate and gradual decrement in performance for both groups as a function of the stress. The difference between the various levels of stress (failure) was significant at the .05 level but the lack of systematic difference vitiated this finding. The small number of subjects in each group is probably the most likely source for this lack of systematic trend. In order to see the effect of increasing the number of cases, the means for the adjacent pairs of cells was calculated for each failure group. In this way we end up with a high, low and medium stress group analysis. With this type of analysis the means are more systematically arrayed from high to low stress. The means for the high anxious group from high to low stress were; 7.45, 7.85, and 7.95. The means for the low anxious group from high to low stress were; 7.5, 7.9, and 8.9. The trend for failure to be effective in causing a decrement in performance is even more evident if we combine the scores of the high and low subjects at the three levels of stress. When this is done the means from high to low stress are; 7.5, 7.9, and 8.3.

A second analysis of variance was performed on the data combined in this manner but is not reported here because the results were again very similar to the initial analysis of variance. The only major difference was that the failure was again slightly more significant and the difference between anxiety was actually a little less. Several of the individual means would be significant by themselves but a test of significance could not be performed on them singly since the overall F did not reach significance.

3. Hypothesis number three: Interaction between anxiety and failure will be significant. There was no sign of interaction in the data of this experiment. The data in fact showed identical trends for both the high and low anxious subjects in relation to different levels of failure-stress. The expected interaction was again based on the idea of a zero stress level at the lower levels of failure and this condition did not hold in this study. There was however a slightly differential effect of stress on the two groups, with the low anxiety group being effected less than the high. If we look at the graph in figure one, a consistent decrease is seen with the slope of the low anxious group being greater than the slope of the high anxious group.

4. Hypothesis number four: There will be an essential similarity between the performance of the high and low-anxious subjects, but the maximal performance of the high-anxious subjects will occur sooner as will their point of declining performance. The data did not support this hypothesis since there was a constant decline for both the high and the low anxious groups. The difference between the high and low-anxious groups was greatest when there was no failure in the testing situation, and the difference became less as the failure was increased. The overall difference between the two groups was in favor of the low anxious, over the high anxious, but this difference was not significant, the main reason being that there were reversals at two levels (1-2 correct level and 3-4 correct level).

B. MAINTENANCE OF STRESS

Many of the subjects seemed to feel that list "two" was a different type of list than list number one. Many overtly verbalized this fact by stating "Oh, these are easier". The separateness of the two tasks was enhanced by the fact that the first list was graded before the second list was presented. Once the subject perceives himself to be in a different situation the stress dissipates markedly and does not effect the second task to any great degree. The stress must be maintained in the situation and be made relevant to the total situation if stress is the variable under consideration.

There are two ways to avoid this dissipation of stress, and, at the same time, make the stress relevant to the total situation. The most obvious would be to give all twenty anagrams as one list. The failure level could be manipulated in the same manner in the first ten. The second ten could be used in the same manner as a measure of the effects of the stress. One of the primary difficulties with a design of this type would be that the subject may perceive intrusions as solved anagrams and may not be at the same subjective failure level that his score indicates. To control for this, the anagrams could be administered in the same manner as in this study but the responses would be given verbally. After each response the experimenter could state whether the response was correct or not, and make a tally mark on his record sheet.

A second method of maintaining the stress situation would be to place unsolvable anagrams in the second list, especially at the beginning.

If the subject perceives the second list as difficult in the same manner he did the first list, the situation should appear to be the same rather than a transition from a hard list to an easy list.

C. THE ZERO STRESS LEVEL

In order for the inverted "U" function to appear in a situation of this type the subjects would have to be placed in a situation in which they were under relatively little or no stress. The stress must therefore, be manipulated from a very low to a very high level. If the present experimental situation is analyzed, it can be seen that there may be no stress situation low enough because the subjects are in a problem solving, individual testing setting. For many of the subjects, the experimenter, in addition to being of the opposite sex was either a stranger or in a position of authority (professor) over them. This means that even the low failure levels may have some stress evidenced. It would seem that the impending evaluation of their performance and the immediate evaluation after the first list was at least mildly stressful to all subjects, regardless of the failure level they obtained.

This would seem to indicate that the lower stress should be accomplished in groups where there is no threat of evaluation, and where, the results would be kept totally anonymous. This could easily be accomplished by having a separate group of high and low anxious subjects do this task in groups without asking their names but where they would be included in the group on the basis of their high or low anxiety. It would also be indicated that an experimenter of the same age and

sex would be less threatening in this situation than would an older opposite sexed experimenter.

A higher level of stress could be obtained in the individual testing situations than was possible in this situation if the test were called an intelligence test, and the subjects were informed in advance that very few subjects of average intelligence of their age group ever missed any of the simpler anagrams.

D. TEST-TAKING ATTITUDE

Test-taking attitude was discussed in the review of the literature as one of the factors affecting a subject's anxiety score on the TMAS. No control was utilized in this study for test-taking attitude, other than to give consistent instructions to all subjects of a neutral type. It would seem that subjects whose "K" or "L" scale scores were too high or low should not be used as subjects. While this would not cancel out the effect of test-taking attitudes in a study, it would mitigate them by holding them constant.

In addition, it seems that general anxiety is probably not the best measure for this type of study. Some more specific form of anxiety would seem relevant as opposed to a gross measure such as the TMAS. People can have a high TMAS for a number of different specific reasons and end up with identical scores for completely different reasons. Therefore, it is quite likely that in the high anxiety group there are people who feel very inadequate personally yet not very nervous in the sense of muscular tension. At the same time, there could be people

who were very nervous and yet did not feel personally inadequate.

CHAPTER VI

SUMMARY

One-hundred and twenty female subjects of college age were subjected to an experiment studying anxiety and stress. Anxiety was measured by the Taylor Manifest Anxiety Scale, and stress was manipulated by level of failure on a pre-task. There was a significant difference between the various levels of failure but there was no significant difference between the high and low anxiety subjects, although the difference was in the predicted direction. Several suggestions are made for alternative designs to this study, incorporating controls lacking in the present study.

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APPENDIX I

RAW DATA

Number Correct on Pre-Task

	0		1-2		3-4		5-6		7-8		9-10	
Subject	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1	6	6	7	7	9	3	5	8	9	10	9	9
2	6	9	7	9	10	10	10	9	6	9	8	8
3	9	6	10	5	9	7	7	10	7	8	9	10
4	6	8	6	9	5	5	9	8	8	8	7	10
5	7	10	7	5	8	9	9	8	9	9	8	7
6	8	9	9	9	9	8	9	9	8	7	6	10
7	9	5	6	9	3	8	7	10	6	9	10	10
8	7	5	8	7	7	6	8	9	6	9	8	10
9	6	10	9	9	7	8	9	8	8	9	9	8
10	8	8	8	6	8	8	9	8	7	9	9	9

APPROVAL SHEET

The dissertation submitted by Robert G. Riedel has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the dissertation is now given final approval with reference to content, form, and mechanical accuracy.

The dissertation is therefore accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

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Date Signature of Adviser