THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECTS OF STRESS AND ANXIETY ON

CATEGORIZING BEHAVIOR

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

JOHN CHARLES WOLFE

Norman, Oklahoma

1967

THE EFFECTS OF STRESS AND ANXIETY ON

CATEGORIZING BEHAVIOR

APPROVED BY

DISSERTATION COMMITTEE

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF TABLES

THE EFFECTS OF STRESS AND ANXIETY ON

CATEGORIZING BEHAVIOR

CHAPTER I

INTRODUCTION

This experiment is designed to study the effects of
stress manipulations, as they interact with possible sus-
ceptibilities to stress, upon certain aspects of cognitive
organization.

Although a number of studies have been conducted
which deal with stress and such cognitive functions as
memory (Chansky, 1960; D'Zurilla, 1965; Merrill, 1954),
learning (Sarason, 1961), and rigidity (Pally, 1955), no
studies have been found which have dealt directly with the
effect of stress on the ways in which stimuli are organized.
In his paper, "Cognitive maps in rats and men," Tolman
(1948) has implied that such an effect exists. He posits
two kinds of cognitive maps, strip and comprehensive. Strip
maps, according to Tolman, are intervening brain processes
which respond to only selected, limited aspects of the en-
vironment. Comprehensive maps, on the other hand, are
intervening brain processes which serve more adequately in

1

new situations due to their greater responsiveness to stimuli within the environment.

Although several techniques for measuring aspects of cognitive organization are available, e.g., those measuring cognitive complexity (Bieri, 1955; Bieri & Blacker, 1956; Kelly, 1955), categorizing (sorting) is one technique which deals with the basic function of grouping stimulus events. This technique has come into recent prominence with the work of Gardner (Gardner, 1953; Gardner, Holzman, Klein, Linton, & Spence, 1959; Gardner, Jackson, & Messick, 1960), Sherif (Sherif, Sherif, & Nebergall, 1965), Glixman (1965), and Glixman and Wolfe (in press).

Gardner and his associates (Gardner, 1953; Gardner et al., 1959; Gardner et al., 1960) have examined categorizing behavior as a cognitive control. In general, "cognitive controls refers to the organizing principles that guide this interplay of action and transaction and determine what will be an adequate perceived result" (Klein, 1958, p. 99). The major emphasis in the work of Gardner and his associates was on "equivalence range," which refers to the range of stimuli in a category; i.e., for a given number of stimuli the equivalence range is inversely proportional to the number of categories used. Equivalence range has been shown to be related to a variety of functions such as object-sorting tasks, size and shape constancy judgments, and brightness judgments (Gardner, 1953; Gardner et al.,

1960).

In a study concerning attitude measurement (Sherif et al., 1965), the authors suggested the following rationale for using the categorizing technique: If a person makes a judgment pertaining to the favorableness or unfavorableness of an issue, the number of categories and the width of the categories (the distribution of items within a category) would be one way to assess an individual's attitudes without the person being aware his attitudes were being investigated. It was found that those individuals who are strongly committed (ego-involved) to an issue tend to use fewer categories and to distribute the items within the category differently than those individuals who are less committed to the issue.

Glixman (1965) dealt with the general problem of cognitive organization and with Self as substructure. He found that the number of categories into which an individual divides a meaning domain is a function of the personal relevance (self-relevance) of the domain to the person. His study demonstrated that the more relevant a domain to an individual, the fewer categories the individual uses.

The present study is concerned with the effect of stress on categorizing behavior. There are two aspects of such behavior: The number of categories an individual uses and the distribution of items over categories. Glixman (1965) has used three measures of categorizing behavior: H

(the measure of uncertainty in bits), which reflects both tendencies; the Number of Categories; and H/H_{max} (a measure of the amount of uncertainty in the subject's response repertoire relative to the amount of uncertainty which would exist if he used all of his categories with equal frequency), which reflects the distribution of items. These measures will be used in this dissertation to describe cognitive organization.

In the literature dealing with stress, two different ways of conceptualizing "stress" have been used: Stress has been considered as a set of physiological reactions (Bovard, 1959; Selye, 1956) and stress has been considered as a class of stimuli (Basowitz, Persky, Korchin, & Grinker, 1955; Haward, 1960). In spite of these differences there remains a somewhat basic definition of stress; namely, that stress is a condition that is disturbing to the individual. In this dissertation, stress refers to those physiological reactions which are produced by threatening external events, hereafter called stressors.

The most recent and pertinent research dealing with the effects of stress on cognitive processes has been conducted by Lazarus and his colleagues (Lazarus, 1964; Lazarus & Baker, 1956; Lazarus & Baker, 1957; Lazarus, Baker, Broverman, & Mayer, 1957; Lazarus, Deese, & Osler, 1952; Lazarus & Longo, 1953; Lazarus, Opton, Nomikos, & Rankin, 1965; Lazarus, Speisman, Mordkoff, & Davison, 1962;

Vogel, Baker, & Lazarus, 1958; Vogel, Raymond, & Lazarus, 1959) who have been concerned with defensive reactions to stress. For Lazarus, stress can be understood meaningfully only in terms of the personal threat that the stressor produces for the individual. For example, although both physical assault (e.g., electric shock) and psychological assault (e.g., telling a subject he has performed miserably on an intelligence test) in a laboratory experiment may produce both physiological and psychological reactions, the reactions are neither identical nor are they produced by the same intervening processes (Lazarus et al., 1962). Lazarus also emphasizes that reactions to experimental stressors are also influenced by cognitive controls, as well as by the limitations of the experimental setting itself. Rather than review all of Lazarus' work, selected studies that demonstrate his technique for inducing stress will be reviewed.

Lazarus et al., (1962) used a motion picture film as a stressor. It was believed that a properly selected film would have a great emotional impact upon subjects and consequently would serve as a stressor. The advantages of using the film were:

> First, deception is unnecessary since the impact of the film is natural and appears to take advantage of the human tendency to identify with the characters and their experiences in a dramatic portrayal. . . . Films are also extremely versatile in that all manner of interpersonal situations can be portrayed, and thus the range of such situations which might serve as stressors is enlarged to include any that are conceptualized as potential stressors. Furthermore, since the

experimentally constricting and irritating deception is no longer needed, the subject can be exposed time and time again in repeated measurements designs to a variety of different types of film stressors and nonstressors. . . . Finally, since the subject merely views the film seated comfortably in an easy chair, no physical assault is involved, and no confounding exists between the physical impact of a noxious stimulus and its psychologically mediated properties (Lazarus et al., 1962, p. 3).

The stressor film depicts a series of crude operations performed with a piece of flint on the penis and scrotum of several adolescent boys of an aboriginal Australian tribe, while a nonstressor (or control) film shows a day in the life of a corn farmer and his family. The study sought:

(a) to determine and document the value of the motion picture film technique as a laboratory technique of inducing psychological stress; (b) to identify appropriate response dimensions for evaluating film induced stress; (c) to examine the interrelationships among these response dimensions, and to determine their degree of agreement in pinpointing psychological stress; and (d) to do a limited survey of some of the personality sources of individual difference in reaction (Lazarus et al., 1962, p. 3).

In order to study personality variables the California Psychological Inventory (CPI), the Hysteria (Hy) and Psychasthenic (Pt) scales of the Minnesota Multiphasic Personality Inventory, a group version of the Schlesinger Picture-Sorting Test, and the Stroop Color-Word Test were employed. The above tests were administered during Session I to subjects, at which time they were informed that they would receive $3.00 for finishing the experiment. In Session 2 (control film) and Session 3 (stressor film) the

following dependent measures were made: Two measures of autonomic nervous system activity (skin resistance and heart rate), two measures of affective response (the Nowlis Adjective Check List of Mood and a questionnaire designed explicitly for this study), and a urinalysis. A continuous recording was made of autonomic nervous activity during each film. After the movie was over the subject was taken to another room where he filled out the Adjective Check List of Mood and the standard interview questionnaire.

Results of this study indicated that the Nowlis Adjective Check List of Mood, the interview questionnaire, and both the autonomic measures demonstrated very significant increases in response to the stressor condition (subincision film) as compared to the control condition (corn farming film). The control film seems to have caused the subjects to relax below their usual tension levels, while viewing the stressor film resulted in a significant increase of self-evaluated feelings of tension in the subjects. In other words, the results show that the subincision film is a stressor under these conditions, and that under these conditions experienced stress accompanies physiological measures of stress. Since skin conductance and heart rate measurements showed sensitive differences between the stressor and control film, the authors felt these measures were good indicators of various types of stress. The tests used to study personality variables and their relation to a stressor

condition revealed some interactions which make common sense. For example, "subjects characterized as ambitious, shrewd, confident, impulsive, forceful, and self-centered appear to be less reactive autonomically under the stressor conditions than those identified as moderate, mature, self-controlled and responsive to the plight of others" (Lazarus et al., 1962, p. 28). Although the interview, the Adjective Check List, and autonomic reactivity across subjects correlations were very low, all the indicators revealed significant reactions to the stressor film in the direction that was expected.

In a study that demonstrated the "short-circuiting of threat" (Lazarus et al., 1965), a different stressor film was utilized. The film, which depicts three serious woodshop accidents, one of them ending in fatality, was called "It Didn't Have to Happen." The purposes of the study were to determine if the results of previous experiments (Lazarus & Alfert, 1964; Speisman, Lazarus, Mordkoff, & Davison, 1964) could be replicated and extended to other stressor films and to ascertain whether a denial orientation or an intellectualization orientation would be more effective in reducing the physiological aspects of stress reactions.

Sixty-six subjects, half of them male and half of them female, were distributed randomly over three experimental conditions. In each condition the subject heard a

tape-recorded orientation passage before viewing the stressor film. The first condition contained a denial passage; the second, an intellectualization passage; and the third (a control condition) consisted of a brief descriptive summary of the film. As in the previous studies, heart rate and skin conductance were continually recorded throughout the presentation of the film.

Results indicated a marked reduction of heart rate and skin conductance after the denial and intellectualization orientations. The control group consistently had the highest values for both measures; the denial orientation was in an intermediate position; and the intellectualization orientation group had the least heart rate and skin conductance reaction. The results of this experiment, as well as others (Lazarus & Alfert, 1964; Spiesman et al., 1964) suggest that the introduction of a verbal passage to reduce the stressfulness of a film designed to promote threat is not limited to only one condition of stress or one type of defense-orientating measure. The authors conclude that the subincision film is most advantageous if one wants "the interaction between personality or social variables and a rich complex source of stress. . . . But if one plans normative research . . . then a film such as the shop safety film employed here is desirable, for it produces stable group results with a much smaller number of subjects" (Lazarus et al., 1965, p. 633).

Lazarus has recently completed a cross-cultural study of the reaction patterns to stress in Japan (Lazarus, Tomka, Opton, & Kodama, in press) as well as relating some principles of psychological stress to dentistry (Lazarus, in press). In all of Lazarus' work using stressor films, no sex differences were reported for the physiological and psychological measurements. In summary, Lazarus and his associates' work on the appraisal of threat has pointed toward the fruitfulness of a cognitive concept of psychological stress. They admit that several problems have not yet been dealt with; for example, the problem of individual differences, and the fact that inferences that are derived from either or both self-report and motor measures are often different from those inferences derived from physiological measures.

As stated before, the purpose of this dissertation is to investigate the effect of stress on categorizing behavior. In light of the distinction between "stress" and "stressor," the purpose now is seen as that of investigating reactions to stressors. No strong predictions may be made about the effects of stress upon cognitive organization, but two expectations may be voiced. If stress increases the personal relevance of items to be categorized or if it produces a restriction of cognitive maps, then one expects that there will be a decrease in the amount of uncertainty in the categorial system, i.e., there will be fewer categories used.

or a greater departure from rectangularity of distribution of items over categories or both. To the degree that stressor conditions and general level of anxiety contribute to stress, one would expect that both of these factors would produce both reactions.

For those who deal with stress there is always the question of the subject's susceptibility to the stress stimuli. Generalized anxiety may be a possible determinant of stress. One way of measuring an individual's suscepti- bility to stressor stimuli may then be by means of a gener- alized anxiety indicator, such as the Taylor Manifest Anxiety Scale (Taylor, 1953).

The following review of the literature concerning anxiety points toward the construct and criterion validity of the Taylor Manifest Anxiety Scale (TMAS). In most of the following experiments subjects were selected on the basis of their scores on the TMAS. High anxious scorers and low anxious scorers were then compared with respect to perform- ance on some task. If differences in performance were found, they were presumed to be due to relative differences in degree of manifest anxiety. In several of these studies (Spence & Beecroft, 1954; Spence & Farber, 1953; Taylor & Chapman, 1955) the TMAS has been used to test the Hull- Spence drive theory; the scale has also been used to study the relationship between anxiety and performance (Davidson, Andrews, & Ross, 1956), anxiety and academic achievement

(Spielberger, 1962), anxiety and intelligence (Calvin, Koons, Bingham, & Fink, 1955; Dana, 1957; Matarazzo, Ulett, Guze, & Saslow, 1954), and anxiety and achievement motivation (Wrightsman, 1962). Other studies have used the TMAS in investigating the effects of stress and its relationship to anxiety (Kalish, Garmezy, Rodnick, & Bleke, 1958; Ogawa & Oakes, 1965; Sarason, 1961; Spence, Farber, & Taylor, 1954; Taylor, 1958). As stated before, these studies point toward the construct validity and criterion validity of the TMAS.

In a study designed to investigate the function of rigidity and anxiety in motor responses, Cohen (1961) selected high anxious (HA) and low anxious (LA) subjects on the basis of their TMAS scores. Each anxiety group was then further subdivided into an "Experimental Setting" or a "Clinical Setting" group. For those subjects in the "experimental" condition a key-press task was presented neutrally as a part of a laboratory experiment. For the "clinical" subjects the key-press task was presented as part of a personality investigation and followed the administration of four Similarities items, Digit Span Forward, and one Rorschach card. Results showed HA subjects had a mean rigidity score that was significantly higher than that of the LA subjects. The mean number of trials to first reinforcement was also significantly higher for HA subjects than for LA subjects. And finally, the HA subjects obtained higher acquisition scores than did LA subjects; in other words,

there was significantly less variability of response pattern for HA subjects than did LA subjects.

As stated at the beginning of this chapter, the present study is concerned with the effects of stress upon cognitive organization. In considering this relationship, it seemed advisable to consider the distinction between a stressor and stress as an internal state and to consider the role of general anxiety in producing reactions to stressors. Therefore, the present study is designed to investigate the effects of stress manipulations (stressors), as they interact with possible susceptibilities to stress (Manifest Anxiety Scale), upon the formal properties of cognitive organization (categorizing technique). The results of this study should provide greater understanding of the problems of stress and anxiety and their effect on organizing behavior.

CHAPTER II

PROBLEM

The purpose of this study is to investigate some of
the ways in which stress affects cognitive organization.

Throughout this study, "stress" refers to the at-
tempts to manipulate meanings of the experimental situation
to the subjects, i.e., to the use of an intended stressor.
Instructions in the experimental situation and the introduc-
tion of a presumably stressful film are used to manipulate
these meanings. "Anxiety" refers to a generalized anxiety
score as provided by Bendig's (1956) modified version of the
Taylor Manifest Anxiety Scale. "Cognitive organization" re-
fers to one or more measures of degree of organization pro-
vided by subjects categorizing a set of statements. Since
it has been found (Glixman, 1965) that the meaning domain of
the card-sort affects the categorization process, meaning
domain is retained as a classification variable. Because the
role of sex in studies of categorizing behavior is not clear
(Glixman, 1965), because MAS scores are not related to sex
differences (Bendig, 1954; Taylor, 1953), because no sex x
stress differences have been found (Lazarus et al., 1962;

14

Lazarus et al., 1965), and because the use of the stress film may produce ethical problems if women are used as subjects, all subjects in this study are men.

Consequently, the specific problem under investigation is that of determining the effects of stress manipulations, anxiety level (MAS), meaning domain, and their interactions upon three measures of categorizing behavior.

CHAPTER III

METHOD

The design of this research is a 4 (anxiety) x 2
(Relevant Stress--present or absent) x 2 (Non-relevant
Stress--present or absent) x 2 (meaning domain--Object or
Self) factorial. In essence, each subject was first given
Bendig's (1956) modified version of the Taylor Manifest
Anxiety Scale (hereafter referred to as the MAS). Each sub-
ject then appeared in the experimental situation during
which he categorized a set of cards, representing one of two
meaning domains. The experimental conditions were struc-
tured by a set of instructions and the administration (or
non-administration) of a stressor film.

Subjects

All students enrolled in two second level psychology
courses at The University of Oklahoma took the MAS during
their regular class period at the beginning of the 1966 fall
semester. The scores of all the men were put into a single
distribution and divided into quartiles. From each quartile
24 men were selected randomly; these 96 individuals were the

subjects for the study. The 24 subjects in each anxiety quartile were assigned randomly to a stress x meaning domain condition, with the restriction that there be three subjects in each cell (stress condition x anxiety quartile x meaning domain) and these three subjects in a cell be run as a group, with the running order of the groups randomized. Five subjects did not come to the experiment at their appointed times. Since the subject pool was exhausted, these five subjects were replaced randomly by five subjects from a pilot study run during the 1966 summer school session at The University of Oklahoma. The five replacements had been in conditions identical to those of the five missing subjects.

Anxiety

The MAS was utilized in order to obtain a measure of anxiety that was independent of the stressor conditions. This measure of anxiety was considered to be independent of the experimental manipulations since presumably it measures a general level of anxiety and since each subject took the MAS before being exposed to the specified experimental conditions. For the sake of convenience, Bendig's (1956) modified version (20 items as compared to Taylor's 50 items) of the Taylor Manifest Anxiety Scale was used. The median internal consistency reliability of the 20-item scale is .76 as compared to .82 for the 50-item scale.

The MAS was administered during the regular psychology class session by a confederate examiner (a

graduate student in psychology), who introduced himself and his purpose in the following way:

> I am a graduate student in psychology. We are in the process of collecting data for a general subject pool and would like to ask you to volunteer for the subject pool. I am sure you will find this an interesting task and I encourage you to take part. Those of you who wish to participate are asked to stay for 10 or 15 minutes; the rest may be excused. Please fill in the necessary information at the top of your sheets, and then answer the questions either "True" or "False" depending on how you feel about the questions.

All men and women were given the MAS, but only the protocols of the men were used. Protocols were scored by counting the total number of anxious responses (Taylor, 1953) of each subject. All men then were grouped into quartiles based on their anxiety scores.

Stress Conditions

Subjects were contacted in their regular classes approximately two weeks after having taken the MAS. The instructor introduced the examiner as "Mr. Wolfe, who wishes to say some things to you about participation in a research project." After some introductory remarks, the examiner asked the males of the class to fill out a schedule sheet indicating their preferred days and times for participation in the research study. All subjects were scheduled and each was contacted prior to his participation in the research project (except for the five subjects drawn randomly from the pilot study). The schedule was arranged so that three subjects appeared for the experimental session at the

same time. After the three subjects, who were to be run as a group, entered the room and sat down, they were asked to supply their names and ID numbers. Then the appropriate stress (or no-stress) condition for their particular group was administered.

There were two types of stress manipulations, task relevant and task non-relevant. Task relevant stress involved telling subjects that the categorizing task was a personality test, in this way making the stress relevant to the task. Task non-relevant stress involved showing subjects a stressful film, which, in itself, had no direct relevance to or connection with the categorizing task. A stressor film dealing with three serious woodshop accidents, titled "It Didn't Have to Happen" (Lazarus et al., 1965), was used as a source of task non-relevant stress.

Each stress dimension (kind of stress) had two values, Stress Absent and Stress Present. The interaction of the two stress dimensions resulted in four conditions: Relevant Stress Absent, Non-relevant Stress Absent (OO); Relevant Stress Absent, Non-relevant Stress Present (ON); Relevant Stress Present, Non-relevant Stress Present (RN); and Relevant Stress Present, Non-relevant Stress Absent (RO). These conditions are presented in Table 1.

In the OO condition, after the examiner attempted to establish a warm and friendly atmosphere and to reduce any fear of time pressure, subjects were given the categorizing

task with the instructions as they appear on p. 22. In this condition neither the film nor the personality interpretation of the sorting task was introduced.

Table 1

Non-relevant Stress x Relevant Stress Conditions

Non-relevant Stressor (Film)	Relevant Stressor (Personality test)	
	Absent	Present
Present	ON	RN
Absent	OO	RO

The ON condition included the same introductory remarks as the OO condition, after which the film was introduced by the following statement:

The film you are about to see is an industrial film on safety. Please observe the film carefully. I will ask for any questions after we are finished.

Then the categorizing instructions were given as in the OO condition. In the ON condition only the non-relevant stressor was present.

The RO condition did not entail presenting the stressful film but did include telling the subjects the task was a "personality test." In this condition only the relevant stressor appeared. Introductory remarks were the same as in the previous two conditions, but the categorizing instructions were preceded by the following instructions:

The task you are about to perform is a personality test designed to measure different aspects of

personality. You may be called back for further
testing later. Please listen carefully.

Then the categorizing instructions were given (see p. 22).
In this condition, only the stressor relevant to the task
was present.

The RN condition consisted of the same introductory
remarks as the other three conditions, followed by the in-
troduction of the stressful film as in the ON condition.
Following the film subjects were given the same instructions
as in the RO condition, as well as the categorizing instruc-
tions as given in the previous three conditions. In this
condition (RN) both the relevant stressor and non-relevant
stressor were present.

Categorizing

The task for each subject was to categorize a set of
50 statements, each typed on a 4" x 6" card. For each sub-
ject the set of statements represented one of two meaning
domains, referred to as "Object" or "Self."

Object statements consisted of a set of 50 descrip-
tions of dime store objects drawn randomly from Gardner's
(1953) original set of 73 items. Self statements consisted
of a set of 50 self-referring statements drawn randomly from
Butler and Haigh's (Roger & Dymond, 1954, pp. 79, 275-277,
388, 389) original set of 92 items.

The task for each subject was to take his set of 50
cards (Object or Self) and place the cards into piles. The

subject was to place cards into piles which he felt belonged together. There were no restrictions on the number of piles he could use nor on the number of cards in a pile. For each subject, three scores were determined from the categorization procedure: $\underline{H}$ (the measure of uncertainty in bits; $\underline{H} = -\Sigma P_i \log_2 P_i$ where P_i is the probability of being in the i category), the Number of Categories, and $\underline{H}/\underline{H}_{max}$ (a measure of the amount of uncertainty in the subject's response repertoire relative to the amount of uncertainty which would exist if he used all of his categories with equal frequency; $\underline{H}_{max} = \log_2$ for the number of categories). These measures indicate the degree of organization in the categorization response. Where the values are low, the degree of organization is high; where the scores are high the degree of organization is low.

A modified version of Gardner's (1953) instructions was given orally to all subjects for the categorization task. These instructions were as follows:

> First of all, I want you to know that there is no answer to this task. Everyone does it in his own way. I want you to do it in the way that seems most natural, most logical, and most comfortable to you. The instructions are simply to put together into groups the statements which seem to you to belong together. You may have as many or as few statements in a group as you like, so long as the statements in each group belong together for one particular reason. If after you have thought about all the statements, a few do not seem to belong with any of the others, you may put these statements into groups by themselves. Please sort all the statements.

All subjects were told they had participated in a study of reactions to stress. Subjects in the ON, the RN, and the RO conditions had the nature of the manipulations explained to them. Subjects in the OO condition were told they had served in a control condition. All subjects were asked not to discuss the study with anyone until the study was completed. The examiner promised to reserve a time, after the completion of the experiment, to explain the dissertation to all who had taken part.

CHAPTER IV

RESULTS

In order to evaluate the effects of Relevant Stress and Non-relevant Stress on categorizing behavior, three measures of the categorizing procedure were analyzed ($\underline{H}$, Number of Categories, and $\underline{H}/\underline{H}_{max}$). For each measure the statistical design was a 4 x 2 x 2 x 2 factorial: Anxiety (Quartile 1 indicating Low Anxiety; Quartile 4 indicating High Anxiety), Domain (Object or Self), Relevant Stress (personality test, absent or present), and Non-relevant Stress (film, absent or present). An analysis of variance was conducted for each of the scores.

Where significant interactions were found, individual $\underline{t}$-tests were performed between the means of the appropriate cells. For all $\underline{t}$-tests the error terms are based on the appropriate error term taken from the overall analysis of variance; hence, for all such tests, $\underline{df}$ = 64. A significance level of .05 is used to evaluate all statistical tests.

The data relevant to $\underline{H}$ may be found in Table 2. The following effects were significant: Domain, Non-relevant Stress, Domain x Non-relevant Stress, Relevant Stress x

24

Non-relevant Stress, and Anxiety Quartiles x Relevant Stress x Non-relevant Stress. In order to evaluate the second-order interaction, a separate analysis of variance was conducted for each Anxiety Quartile. Only for Q2 was there a significant R x N interaction.

Table 2

$\underline{H}$: Summary of Analysis of Variance

Source of Variance	df	Mean Squares	$\underline{F}$
Total	95		
Between groups	31		
(A) Anxiety Quartiles	3	.44	
(D) Domain	1	37.92	89.22**
(R) Relevant Stress	1	.02	
(N) Non-relevant Stress	1	3.07	7.23**
A x D	3	.35	
A x R	3	.36	
A x N	3	.87	
D x R	1	.00	
D x N	1	3.31	7.80**
R x N	1	2.63	6.18*
A x D x R	3	.34	
A x D x N	3	.23	
A x R x N	3	1.18	2.78*
D x R x N	1	.39	
A x D x R x N	3	.41	
Error (Within)	64	.43	

*$\underline{p}$ < .05

**$\underline{p}$ < .01

An idea of the magnitude of the atypicality of Q2 is presented in Table 3.

Table 3

Difference between Differences Distributed
over Anxiety Quartiles
$[(R-O)_N \text{ minus } (R-O)_O]$

Q1	Q2	Q3	Q4
-1.82	11.20	3.94	3.27

The distribution of means over A, R, and N conditions
appears in Table 4. Relevant Stress Present in Q2 was the
only condition that reversed the effects between Non-relevant
Stress Absent and Non-relevant Stress Present; i.e., in all
other conditions there was no difference or H was smaller in
the Non-relevant Stress Present condition. (Table 4 and
Table 5).

Table 4

Distribution of Means for $\underline{H}$ over Anxiety Quartile,
Relevant Stress, and Non-relevant Stress

Non-relevant Stress	Q1		Q2		Q3		Q4	
	Relevant Stress							
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Present	2.65	2.27	2.59	3.40	2.11	2.72	2.63	3.02
Absent	3.02	2.95	3.33	2.29	3.08	3.14	3.29	3.13

Table 5

Distribution of Means for $\underline{H}$, Number of Categories,
and $\underline{H}/\underline{H}_{max}$ over Non-relevant Stress

	Non-relevant Stress	
	Absent	Present
$\underline{H}$	3.03	2.67
Number of Categories	12.38	9.46
$\underline{H}/\underline{H}_{max}$	.91	.89

The data for the R x N interaction appears in
Table 6. The presence or absence of Non-relevant Stress (N)
made a significant difference ($\underline{t}$ = 3.67) only when Relevant
Stress (R) was absent.

Table 6

Distribution of Means for $\underline{H}$ over Relevant
Stress and Non-relevant Stress

Non-relevant Stress	Relevant Stress	
	Absent	Present
Present	2.49	2.85
Absent	3.18	2.88

The distribution of means over D and N conditions
appears in Table 7. Individual $\underline{t}$-tests indicate that the
mean for Object, Non-relevant Stress Present is less than
the mean for Object, Non-relevant Stress Absent ($\underline{t}$ = 3.83);
Self, Non-relevant Stress Present is not significantly

different from Self, Non-relevant Stress Absent; for Non-
relevant Stress Absent, the mean for Self is less than the
mean for Object (t = 8.61); and for Non-relevant Stress Pres-
ent, the mean for Self is less than that for Object (t =
4.73).

Table 7

Distribution of Means for H over Domain
and Non-relevant Stress

Non-relevant Stress	Domain	
	Object	Self
Present	3.12	2.23
Absent	3.84	2.22

The main effects now may be understood in light of
the interaction effects: For N, H was smaller when the
stress was present than when it was absent (Table 5); this
effect was not uniform over Anxiety Quartiles (Table 4), R
conditions (Table 6), or Domains (Table 7). For D, H was
smaller for Self than for Object over all conditions, but
the difference was greater when Non-relevant Stress was
absent than when it was present.

With the exception of the A x R x N interaction, the
results for Number of Categories are very similar to those
for H. The data relevant to Number of Categories may be
found in Table 8. The following effects were significant:
Domain, Non-relevant Stress, Domain x Non-relevant Stress,

and Relevant Stress x Non-relevant Stress.

Table 8

Number of Categories: Summary of
Analysis of Variance

Source of Variance	df	Mean Squares	F
Total	95		
Between groups	31		
(A) Anxiety Quartiles	3	34.31	
(D) Domain	1	1962.04	83.34**
(R) Relevant Stress	1	8.17	
(N) Non-relevant Stress	1	204.17	8.67**
A x D	3	27.24	
A x R	3	9.53	
A x N	3	27.86	
D x R	1	2.04	
D x N	1	273.38	11.61**
R x N	1	121.50	5.16*
A x D x R	3	29.74	
A x D x N	3	5.62	
A x R x N	3	52.69	
D x R x N	1	35.04	
A x D x R x N	3	9.12	
Error (Within)	64	23.54	

*$p < .05$

**$p < .01$

The distribution of means over R and N conditions
appears in Table 9. Again, the presence or absence of N
made a significant difference ($t = 3.69$) only when R was
absent.

Table 9

Distribution of Means for Number of Categories over
Relevant Stress and Non-relevant Stress

| Non-relevant | Relevant Stress | |
Stress	Absent	Present
Present	8.04	10.88
Absent	13.21	11.54

The distribution of means over D and N conditions appears in Table 10. Again, individual t-tests indicate that the mean for Object, Non-relevant Stress Present is less than the mean for Object, Non-relevant Stress Absent (t = 4.49); for Self, the mean for Non-relevant Stress Present is not significantly different from that for Non-relevant Stress Absent; for Non-relevant Stress Absent, the mean for Self is less than that for Object (t = 8.87); and for Non-relevant Stress Present, the mean for Self is less than that for Object (t = 4.05).

Table 10

Distribution of Means for Number of Categories over
Domain and Non-relevant Stress

| Non-relevant | Domain | |
Stress	Object	Self
Present	12.29	6.62
Absent	18.58	6.17

The main effects may be understood in view of the interaction effects: For N, the Number of Categories was smaller when the stress was present than when it was absent (Table 5); this effect was not consistent over R conditions (Table 9) or Domains (Table 10). For D, the Number of Categories was smaller for Self than for Object over all conditions, but the difference again was greater when Non-relevant Stress was absent than when it was present.

Except for the N main effect and the A x R x N interaction, the results for H/H_{max} are similar to those for H and Number of Categories. The data relevant to H/H_{max} may be found in Table 11. The following effects were significant: Domain, Domain x Non-relevant Stress, and Relevant Stress x Non-relevant Stress.

The distribution of means over R x N conditions appears in Table 12. The presence or absence of N once again made a significant difference (t = 2.22) only when R was absent.

The distribution of means over D and N conditions appears in Table 13. Again, individual t-tests indicate that the mean for Object, Non-relevant Stress Present is less than for Object, Non-relevant Stress Absent (t = 2.77); for Self, the mean for Non-relevant Stress Present is not significantly different from that for Non-relevant Stress Absent; for Non-relevant Stress Absent, the mean for Self is less than that for Object (t = 3.33); but for Non-relevant

Stress Present, the mean for Self is not significantly dif-
ferent from that for Object ($\underline{t}$ = .55).

Table 11

$\underline{H}/\underline{H}_{max}$: (Mean Squares x 1000) Summary
of Analysis of Variance

Source of Variance	df	Mean Squares	F
Total	95		
Between groups	31		
(A) Anxiety Quartiles	3	1.39	
(D) Domain	1	18.29	4.68*
(R) Relevant Stress	1	.01	
(N) Non-relevant Stress	1	3.90	
A x D	3	.97	
A x R	3	9.31	
A x N	3	8.53	
D x R	1	.53	
D x N	1	21.19	5.42*
R x N	1	19.00	4.86*
A x D x R	3	.89	
A x D x N	3	8.94	
A x R x N	3	3.32	
D x R x N	1	.36	
A x D x R x N	3	7.06	
Error (Within)	64	3.91	

*$\underline{p}$ < .05

Table 12

Distribution of Means for $\underline{H}/\underline{H}_{max}$ over Relevant
Stress and Non-relevant Stress

Non-relevant Stress	Relevant Stress	
	Absent	Present
Present	.88	.91
Absent	.92	.89

Table 13

Distribution of Means for $\underline{H}/\underline{H}_{max}$ over Domain
and Non-relevant Stress

Non-relevant Stress	Domain	
	Object	Self
Present	.89	.90
Absent	.94	.88

The overall Domain effect may now be understood as being carried by the Non-relevant Stress Absent condition; $\underline{H}/\underline{H}_{max}$ for Self ($\overline{X}$ = .89) was smaller than for Object ($\overline{X}$ = .91; $\underline{t}$ = 2.16).

In summary the following conclusions seem warranted, even though discrepancies exist for Q2, Relevant Stress Present for $\underline{H}$: By and large, values for Self were less than for Object, and Non-relevant Stress Present produced lower scores (a greater degree of organization) than did Non-relevant Stress Absent for Object but not for Self. All three measures indicated that the presence or absence of Non-relevant Stress made a significant difference only when Relevant Stress was absent.

CHAPTER V

DISCUSSION

The degree of Anxiety as measured by the MAS did not
result in differential responses to the stress manipulations.
Since this was an exploratory study the effect of the pro-
cedures on subjects is not known and the discriminating
ability of the MAS is not certain. Two proposals could be
offered: The test may not measure what it purports to meas-
ure, or it may make little difference how anxious a subject
is prior to a stressful situation for all subjects may react
in a like manner to the stressor.

For $\underline{H}$ there was an A x R x N effect. This was re-
ported as being a function of the atypicality of Q2, Relevant
Stress Present group; in this condition R and N were con-
founded with A. It is not known why this group was so dif-
ferent from the other groups, but there was one subject in
the Q2, Relevant Stress Present, Non-relevant Stress Absent
condition who categorized Self statements that "pegged" the
experiment in the sense that he believed the administration
of the MAS by the confederate examiner was part of the en-
tire experiment. Whether or not this resulted in an

atypical response is not known.

It was consistently found in all three measures that the degree of organization for the Self Domain was higher than for the Object Domain. This served, in part, as a replication of previous research (Glixman, 1965; Glixman & Wolfe, in press). In the present study this effect was due to the fact that the Object minus Self difference was greater when the Non-relevant Stress was absent. This was because the values for Object decreased when the Non-relevant Stress was present but the values for Self did not. In other words, the information in the Object Domain was reduced by the stressor film as the subject placed greater organization on the task. This was an expected finding; the stressor film evidently increased the personal relevance of items to be categorized and perhaps produced a restriction of cognitive maps (Tolman, 1948) resulting in a decrease in the amount of information in the categorial system. For Self there was no significant difference between the Non-relevant Stress Absent and Non-relevant Stress Present conditions. This may be accounted for by the fact that the subject was already minimizing his uncertainty by using approximately 2.6 bits of information in the Non-relevant Stress Absent condition; therefore there was little latitude to constrict the number of categories for the Self Domain in the Non-relevant Stress Present condition. For the Self Domain the organization was already relatively high in the

Non-relevant Stress Absent condition, no doubt due to the
Self Domain being personally relevant to the subject.

The degree of organization was found to be greater
for those subjects who saw the film than for those who did
not see the film. As mentioned before, this effect was
stronger for the Object Domain than for the Self Domain, due
to the fact that the Self Domain was already strongly organ-
ized in the Non-relevant Stress Absent condition. The effect
is also stronger for Relevant Stress Absent than for Relevant
Stress Present; i.e., there was greater organization when the
Relevant Stress was absent than when it was present. This
was an unexpected finding and is explained in the next two
paragraphs.

The fact that there was the least degree of organi-
zation when both Non-relevant Stress and Relevant Stress were
absent is in accordance with the expectations of the study;
i.e., a stressor condition should reduce the uncertainty and
increase the relative degree of structure placed on a task.
In other words, the subject limits his usage of the informa-
tion available. But it now becomes necessary to explain why
the greatest degree of organization (low score values) did
not occur when Non-relevant Stress and Relevant Stress were
both present. It is suggested that after seeing the stressor
film (Non-relevant Stress Present) and then being told that
the task they were about to perform was a personality test
and that they "may be called back for further testing"

(Relevant Stress Present), subjects became cognitively more highly differentiated; i.e., the subjects looked for more ways to discriminate among items. Subjects in this condition may feel they "have to perform correctly" in order to reduce the possibility of being given a negative psychological diagnostic label; under these conditions structure breaks down and uncertainty increases. This view is supported, in part, by the remarks of one subject who, after the experiment said, "I thought you were going to find out something about my mental health and as a consequence I was very careful in selecting which cards went into a pile." The above interpretation is also supported, in part, by the fact that there was greater organization in the ON condition than in the RO condition (see above). In other words, the Non-relevant Stress Present condition resulted in a constriction of subjects' cognitive organization, but the Non-relative Stress in conjunction with the Relevant Stress produced an opposite effect.

It now becomes essential to explain why there was an N effect (stressor film) but not an R effect (personality test instructions). It seems, both from the data and from observations during the experiment, that the film had a great deal more impact upon subjects than did the personality test instructions. Nearly all subjects gave an involuntary startle reaction upon seeing the first accident in the stressor film. Several closed their eyes as they

anticipated the second and third accidents. The fact that the film does produce stress is well attested to by the work of Lazarus and his associates (1965). Just the personality test instruction, by itself, seems to have little, if any, effect upon subjects.

It can now be said that a stressor situation does indeed affect organizing behavior. There is also evidence to suggest that organization involves a two-stage process (Glixman, 1965). In the first stage subjects regulate the magnitude of information with which they have to deal by determining the number of categories to be used. Then in the second stage they make another kind of adjustment by using some of the categories more often than others. When subjects use a small number of categories there is a high degree of organization, but there is a greater risk of having misplaced the items. Subjects are able to compensate for being overinclusive by placing few items in a category they evaluate as important and a relatively greater number of items in a category that is judged less relevant. This interpretation seems supported by the fact that subjects in the N conditions would categorize and re-categorize, appearing very intent on fixing the number of categories and then being very selective of which cards went into a category.

When $\underline{H}$ is broken into components, Number of Categories and $\underline{H}/\underline{H}_{max}$, the results are not always the same. This was evident by the fact that there was a significant

Non-relevant Stress effect for Number of Categories but not for $\underline{H}/\underline{H}_{max}$. This may be due to the fact that after the first stage in the N condition (determining a smaller number of categories), subjects did not need to adjust the distribution of items over categories in a different manner. Or put another way, the N conditions did not seem to affect the optimal level of organization for subjects in terms of a departure from the degree of rectangularity of the distribution of items over categories, even though less information was being used in the categorial system.

This study has demonstrated that stress manipulations do affect aspects of cognitive organization, particularly the Object Domain. Another study that eliminates the anxiety measurement and personality test instructions might provide a more clear-cut picture of the effects of stress on categorizing behavior. The stressor film effectively produced lower scores (greater degree of organization) for the Object Domain but not for the Self Domain. It should be emphasized that understanding the function of the meaning domain is crucial to understanding the behavioral concomitants in everyday life. The present study has helped to provide information on the effects of stress on categorizing behavior.

CHAPTER VI

SUMMARY

Although the area of stress and anxiety has received
much attention in psychological research in the past three
decades, there have been no investigations that have dealt
with the effects of stress on cognitive organization. This
study investigated the effects of stress manipulations, as
they interact on possible susceptibilities to stress, upon
certain aspects of cognitive organization.

The specific problem under investigation concerns the
effects of stress manipulations (Non-relevant Stress, absent
or present; Relevant Stress, absent or present), Anxiety
scores (Bendig's short form of the Taylor Manifest Anxiety
Scale), meaning domain (Object items or Self statements),
and their interactions upon three measures of categorizing
behavior ($\underline{H}$, Number of Categories, and $\underline{H}/\underline{H}_{max}$). It was ex-
pected that stress would either or both increase the per-
sonal relevance of items to be categorized or produce a
restriction of cognitive maps, resulting in a decrease in
the amount of information in the categorial system; that is,
there would be fewer categories used or a greater departure

from rectangularity of distribution of items over categories
or both.

The anxiety measurement did not give evidence for
differential responses among quartiles as a result of stress
manipulations. It was suggested that this could have been a
function of the test or perhaps a function of subjects re-
acting to stress in very similar ways regardless of the
amount of anxiety they brought into the stressful situation.

The results of this study provided strong support
for the expectation that there would be fewer categories used
in the stressor situation, but not for the expectation that
there would be a greater departure from rectangularity of
distribution of items over categories. For the Object Do-
main there was a greater degree of organization under the
Non-relevant Stress Present condition (in all three analyses)
than in the Non-relevant Stress Absent condition, indicating
an increased personal relevance of items to be categorized
and a decreased amount of information in the categorial
system. For Self there was no significant difference be-
tween conditions in which Non-relevant Stress was present
and those in which it was absent. This may be explained by
the fact that subjects were only using 2.6 bits of informa-
tion when Non-relevant Stress was absent and there was
little latitude to constrict further when Non-relevant
Stress was present. Expectations for the study were also
supported by the findings that the lowest organization

occurred when both Non-relevant Stress and Relevant Stress
were absent. The highest degree of organization did not
occur when both Non-relevant Stress and Relevant Stress were
present, as expected, but rather when Non-relevant Stress was
present and Relevant Stress was absent. This was interpreted
as meaning that the subjects became more discriminating when
they thought they might receive a diagnostic label (Relevant
Stress Present condition), resulting in an effect opposite
to that expected.

Apparently the Relevant Stress, by itself, had lit-
tle, if any, effect on subjects; on the other hand, the Non-
relevant Stress was very effective in producing greater
organization and structure on the Object Domain. The film
(Non-relevant Stress) evidently carries a great deal more
impact than does the personality test instructions (Relevant
Stress).

The fact that H/H_{max} was affected differently by the
stressor film than was Number of Categories suggests a two-
stage process in organizing behavior (Glixman, 1965). There
was a significant Non-relevant Stress effect for Number of
Categories but not for H/H_{max}.

It has been demonstrated that cognitive organization
is significantly affected by a stressor situation, particu-
larly in the Object Domain. Eliminating the anxiety measure-
ment and personality test instructions may prove helpful in

better ascertaining the effects of stress on organizing

behavior.

REFERENCES

Basowitz, H., Persky, H., Korchin, S.J., & Grinker, R.R. Anxiety and stress. New York: McGraw-Hill, 1955.

Bendig, A.W. Age, sex and the Manifest Anxiety Test. J. consult. Psychol., 1954, 18, 16.

Bendig, A.W. The development of a short form of the Manifest Anxiety Scale. J. consult. Psychol., 1956, 20, 384.

Bieri, J. Cognitive complexity-simplicity and predictive behavior. J. abnorm. soc. Psychol., 1955, 51, 263-

Bieri, J., & Blacker, E. The generality of cognitive complexity in the perception of people and inkblots. J. abnorm. soc. Psychol., 1956, 53, 112-117.

Bovard, E.W. The effects of social stimuli on the response to stress. Psychol. Rev., 1959, 66, 267-277.

Calvin, A.D., Koons, P.B., Jr., Bingham, J.L., & Fink, H.H. A further investigation of the relationship between manifest anxiety and intelligence. J. consult. Psychol., 1955, 19, 280-282.

Chansky, N.M. Preexamination stress, information schedules, and learning. J. gen. Psychol., 1960, 63, 219-228.

Cohen, I.S. Rigidity and anxiety in a motor response. Percept. mot. Skills, 1961, 12, 127-130.

Dana, R.H. Manifest anxiety, intelligence, and psychopathology. J. consult. Psychol. 1957, 21, 38-40.

Davidson, W.Z., Andrews, T.G., & Ross, S. Effects of stress and anxiety on continuous high-speed color naming. J. exp. Psychol., 1956, 52, 13-17.

D'Zurilla, T.J. Recall efficiency and mediating cognitive events in "experimental repression." J. person. soc. Psychol., 1965, 1, 253-257.

Gardner, R.W. Cognitive styles in categorizing behavior. J. Pers., 1953, 22, 214-233.

Gardner, R.W., Holzman, P.S., Klein, G.S., Linton, Harriet P., & Spence, D.P. Cognitive control: A study of individual consistencies in cognitive behavior. Psychological Issues, 1959, 1(4, Monogr. No. 4).

Gardner, R.W., Jackson, D.N., & Messick, S.J. Personality organization in cognitive controls and intellectual abilities. Psychological Issues, 1960, 2(4, Monogr. No. 8).

Glixman, A.F. Categorizing behavior as a function of meaning domain. J. pers. soc. Psychol., 1965, 2, 370-377.

Glixman, A.F., & Wolfe, J.C. Category membership and inter-item semantic-space distances. J. Pers., in press.

Haward, L.R.C. The subjective meaning of stress. Brit. J. Med. Psychol., 1960, 33, 185-194.

Kalish, H.I., Garmezy, N., Rodnick, E.H., & Bleke, R.C. The effects of anxiety and experimentally induced stress on verbal learning. J. gen. Psychol., 1958, 59, 87-95.

Kelly, G.A. The psychology of personal constructs. Vol. 1. New York: W.W. Norton & Company, 1955.

Klein, G.S. Cognitive control and motivation. In G. Lindzey (Ed.), Assessment of human motives. New York: Rinehart, 1958, Pp. 87-118.

Lazarus, R.S. A laboratory approach to the dynamics of psychological stress. American Psychologist, 1964, 19, 400-411.

Lazarus, R.S. Some principles of psychological stress and their relation to dentistry. J. dent. Sci., in press.

Lazarus, R.S., & Alfert, Elizabeth. Short-circuiting of threat by experimentally altering cognitive appraisal. J. abnorm. soc. Psychol., 1964, 69, 195-205.

Lazarus, R.S., & Baker, R.W. Personality and psychological stress--a theoretical and methodological framework. Psychol. Newsltr., 1956, 8, 21-32.

Lazarus, R.S., & Baker, R.W. Motivation and personality in psychological stress. Psychol. Newsltr., 1957, 8, 159-193.

Lazarus, R.S., Baker, R.W., Broverman, D.M., & Mayer, J. Personality and psychological stress. J. Pers., 1957, 25, 559-577.

Lazarus, R.S., Deese, J., & Osler, Sonia F. The effects of psychological stress upon performance. Psychol. Bull., 1952, 49, 293-317.

Lazarus, R.S., & Longo, N. The consistency of psychological defenses against threat. J. abnorm. soc. Psychol., 1953, 48, 495-499.

Lazarus, R.S., Opton, E.M., Jr., Nomikos, M.S., & Rankin, N.O. The principle of short-circuiting of threat: Further evidence. J. Pers., 1965, 33, 622-635.

Lazarus, R.S., Speisman, J.C., Mordkoff, A.M., & Davison, L.A. A laboratory study of psychological stress produced by a motion picture film. Psychol. Monogr., 1962, 76(34, Whole No. 553).

Lazarus, R.S., Tomka, M., Opton, E., Jr., & Kodama, M. A cross-cultural study of stress reaction patterns in Japan. J. pers. soc. Psychol., in press.

Matarazzo, J.D., Ulett, G.A., Guze, S.B., & Saslow, G. The relationship between anxiety level and several measures of intelligence. J. consult. Psychol. 1954, 18, 201-205.

Merrill, R.M. The effect of pre-experimental and experimental anxiety on recall efficiency. J. exp. Psychol., 1954, 48, 167-172.

Ogawa, J., & Oakes, W.F. Sex of experimenter and manifest anxiety as related to verbal conditioning. J. Pers., 1965, 33, 553-569.

Pally, S. Cognitive rigidity as a function of threat. J. Pers., 1955, 23, 346-355.

Rogers, C.R., & Dymond, Rosalind F. (Eds.). Psychotherapy and personality change. Chicago: University Chicago Press, 1954.

Sarason, I.G. The effects of anxiety and threat on the solution of a difficult task. J. abnorm. soc. Psychol., 1961, 62, 165-168.

Selye, H. _The stress of life_. New York: McGraw-Hill, 1956.

Sherif, Carolyn W., Sherif, M., & Nebergall, R.E. _Attitude and attitude change_. Philadelphia: W.B. Saunders Company, 1965.

Speisman, J.C., Lazarus, R.S., Mordkoff, A.M., & Davison, L.A. Experimental reduction of stress based on ego-defense theory. _J. abnorm. soc. Psychol._, 1964, 68, 367-380.

Spence, K.W., & Beecroft, R.S. Differential conditioning and level of anxiety. _J. exp. Psychol._, 1954, 48, 399-403.

Spence, K.W., & Farber, I.E. Conditioning and extinction as a function of anxiety. _J. exp. Psychol._, 1953, 45, 116-119.

Spence, K.W., Farber, I.E., & Taylor, E. The relation of electric shock and anxiety to level of performance in eyelid conditioning. _J. exp. Psychol._, 1954, 48, 404-408.

Spielberger, C.D. The effects of manifest anxiety on the academic achievement of college students. _Ment. Hyg._, 1962, 46, 420-426.

Taylor, Janet A. A personality scale of Manifest Anxiety. _J. abnorm. soc. Psychol._, 1953, 48, 285-292.

Taylor, Janet A. The effects of anxiety level and psychological stress on verbal learning. _J. abnorm. soc. Psychol._, 1958, 57, 55-60.

Taylor, Janet A., & Chapman, Jean P. Anxiety and the learning of paired associates. _Amer. J. Psychol._, 1955, 68, 671.

Tolman, E.C. Cognitive maps in rats and men. _Psychol. Rev._, 1948, 55, 189-208.

Vogel, W., Baker, R.W., & Lazarus, R.S. The role of motivation in psychological stress. _J. abnorm. soc. Psychol._, 1958, 56, 105-112.

Vogel, W., Raymond, Susan, & Lazarus, R.S. Intrinsic motivation and psychological stress. _J. abnorm. soc. Psychol._, 1959, 58, 225-233.

Wrightsman, L.S., Jr. The effects of anxiety, achievement
    motivation, and task importance upon performance on an
    intelligence test. J. educ. Psychol., 1962, 53, 150-
    156.

APPENDIX A. BENDIG'S MODIFIED VERSION OF THE TAYLOR

MANIFEST ANXIETY SCALE

MANIFEST ANXIETY SCALE (short form) and Anxious Responses

Anxious Responses	MAS
_T_ 1.	I work under a great deal of tension.
_T_ 2.	I find it hard to keep my mind on a task or job.
_T_ 3.	I am certainly lacking in self-confidence.
_F_ 4.	I am happy most of the time.
_T_ 5.	I certainly feel useless at times.
_T_ 6.	I frequently find myself worrying about something.
_T_ 7.	I have periods of such great restlessness that I cannot sit long in a chair.
_F_ 8.	I believe I am no more nervous than most others.
_T_ 9.	Life is a strain for me much of the time.
_T_ 10.	I am more sensitive than most other people.
_T_ 11.	I cannot keep my mind on one thing.
_T_ 12.	I feel anxiety about something or someone almost all the time.
_T_ 13.	I am inclined to take things hard.
_T_ 14.	I am not unusually self-conscious.
_T_ 15.	I have sometimes felt that difficulties were piling up so high that I could not overcome them.
_F_ 16.	I am usually calm and not easily upset.
_T_ 17.	At times I think I am no good at all.
_T_ 18.	I am a high-strung person.
_T_ 19.	I shrink from facing a crisis or difficulty.
_T_ 20.	I sometimes feel that I am about to go to pieces.

APPENDIX B. OBJECT STATEMENTS

Object Statements

Item number	Statements
2	Red and white oilcloth
3	Half bar of soap
4	Yellow pencil
5	Small glass jar
7	Flashlight bulb
8	Small light bulb
9	Small blue candle
11	Blue plastic candle holder
13	Dime
14	Penny
17	Metal spoon
18	Small red plastic spoon
19	Small blue plastic spoon
20	Small red plastic knife
21	White plastic button
22	Cigarette
23	Cigar wrapped in cellophane
27	Padlock and key--green design
28	Block of wood with nail
29	Block of wood painted yellow
30	Block of plywood with red paper pasted on one side
32	Small printed picture--colored Western scene
33	Ping pong ball
34	Piece of white chalk
35	Black and yellow fishing fly
37	Hairpin
38	Pipe bowl
39	Pipe stem, fits pipe bowl
40	Bottle of mercurochrome
41	Nail
43	Picture postcard--black and white--wood scene
44	Piece of large white candle
45	Small cork
47	Orange sucker with paper handle wrapped in cellophane
48	Orange vitamin pill
49	Metal staple with paper on head
51	Olive drab whistle with star design
52	Small pebble
53	Mothball
58	White rectangular card
59	Two German stamps, attached--1 red, 1 green
60	Whiskbroom
65	Rubber nipple
66	Green plastic earring with metal clip

Item number	Statements
68	Suede brush--metal and wood with paper price tag
69	Piece of fine sandpaper
70	Plastic dark glasses with metal clip
71	Red lipstick container
72	Screwdriver
73	Piece of red crayon

APPENDIX C.   SELF STATEMENTS

Self Statements

Item number	Statements
1	I feel uncomfortable while talking with someone.
5	I often kick myself for the things I do.
6	I often feel humiliated.
7	I doubt my sexual powers.
9	I have a warm emotional relationship with others.
11	I am responsible for my troubles.
15	I can accept most social values and standards.
17	I have a hard time controlling my sexual desires.
18	It is difficult to control my aggression.
20	I am often down in the dumps.
21	I am really self-centered.
26	I can usually live comfortably with the people around me.
27	My hardest battles are with myself.
28	I tend to be on my guard with people who are somewhat more friendly than I had expected.
29	I am optimistic.
30	I am just sort of stubborn.
36	I feel helpless.
37	I can usually make up my mind and stick to it.
38	My decisions are not my own.
39	I often feel guilty.
40	I am a hostile person.
41	I am contented.
42	I am disorganized.
44	I am poised.
47	I am impulsive.
52	I have the feeling that I am just not facing things.
53	I am tolerant.
58	I feel inferior.
59	I am no one. Nothing seems to really be me.
60	I am afraid of what other people think of me.
61	I am ambitious.
62	I despise myself.
65	I just don't respect myself.
66	I am a dominant person.
68	I am assertive.
71	I am confused.
72	I am satisfied with myself.
73	I am a failure.
74	I am likable.

Item number	Statements
78	I am relaxed, and nothing really bothers me.
79	I am a hard worker.
80	I feel emotionally mature.
83	I really am disturbed.
85	I feel insecure within myself.
88	I am intelligent.
90	I feel hopeless.
93	I am inhibited.
95	I am unreliable.
98	I feel adequate.
99	I am worthless.

APPENDIX D. INDIVIDUAL SCORES (RAW DATA)

Relevant Stress Absent, Non-Relevant Stress
Absent: Raw Scores For All Subjects
over Quartiles and Domains

Quartile and Domain	Subjects	Number of Categories	$\underline{H}$	$\underline{H}/\underline{H}_{max}$
1Q, Object	1.	16	3.88322	.9708
	2.	21	4.25632	.9691
	3.	14	3.70129	.9722
1Q, Self	4.	5	1.89535	.8162
	5.	8	2.95755	.9858
	6.	3	1.42787	.9009
2Q, Object	7.	19	3.91671	.9220
	8.	21	4.20651	.9578
	9.	26	4.37632	.9311
2Q, Self	10.	11	3.23448	.9351
	11.	6	2.35659	.9116
	12.	4	1.91589	.9579
3Q, Object	13.	12	3.48174	.9712
	14.	23	4.40851	.9745
	15.	25	4.43142	.9542
3Q, Self	16.	6	2.30142	.8903
	17.	5	1.76842	.7616
	18.	6	2.12066	.8204
4Q, Object	19.	17	3.82329	.9355
	20.	17	3.62775	.8876
	21.	31	4.68851	.9464
4Q, Self	22.	8	2.82305	.9410
	23.	7	2.45897	.8760
	24.	6	2.32324	.8987

Relevant Stress Absent, Non-relevant Stress
Present: Raw Scores For All Subjects
over Quartiles and Domains

Quartile and Domain	Subjects	Number of Categories	$\underline{H}$	$\underline{H}/\underline{H}_{max}$
1Q, Object	1.	4	1.96821	.9841
	2.	10	2.80770	.8452
	3.	14	3.63922	.9559
1Q, Self	4.	4	1.94283	.9714
	5.	8	2.78878	.9296
	6.	8	2.72899	.9097
2Q, Object	7.	14	3.30543	.8682
	8.	6	2.11436	.8179
	9.	12	3.42464	.9553
2Q, Self	10.	4	1.68530	.8426
	11.	6	2.47624	.9579
	12.	8	2.54027	.8468
3Q, Object	13.	8	2.58227	.8608
	14.	7	2.35185	.8378
	15.	7	2.30134	.8198
3Q, Self	16.	6	2.42623	.9386
	17.	3	1.47308	.9294
	18.	4	1.52417	.7621
4Q, Object	19.	12	3.38051	.9430
	20.	19	3.59615	.8466
	21.	12	3.07448	.8576
4Q, Self	22.	3	1.11421	.7030
	23.	10	2.92225	.8797
	24.	4	1.68747	.8437

Relevant Stress Present, Non-relevant Stress
Present: Raw Scores For All Subjects
over Quartiles and Domains

Quartile and Domain	Subjects	Number of Categories	H	H/H_{max}
1Q, Object	1.	20	3.88544	.8990
	2.	8	2.40573	.8019
	3.	6	2.40504	.9304
1Q, Self	4.	2	.95819	.9582
	5.	6	2.45475	.9496
	6.	3	1.53104	.9660
2Q, Object	7.	11	3.27477	.9467
	8.	13	3.40735	.9209
	9.	16	3.88322	.9708
2Q, Self	10.	11	3.07226	.8882
	11.	8	2.86748	.9558
	12.	20	3.87193	.8959
3Q, Object	13.	15	3.55691	.9104
	14.	9	2.70065	.8519
	15.	18	3.90077	.9354
3Q, Self	16.	3	1.53994	.9716
	17.	10	2.90915	.8757
	18.	4	1.69255	.8463
4Q, Object	19.	25	4.39341	.9460
	20.	22	4.22529	.9476
	21.	7	2.17548	.7750
4Q, Self	22.	3	1.42787	.9009
	23.	8	2.66701	.8890
	24.	13	3.20807	.8670

Relevant Stress Present, Non-relevant Stress
Absent: Raw Scores For All Subjects
over Quartiles and Domains

Quartile and Domain	Subjects	Number of Categories	H	H/H_{max}
1Q, Object	1.	24	4.30858	.9397
	2.	18	3.75792	.9012
	3.	21	4.00568	.9120
1Q, Self	4.	6	2.27749	.8810
	5.	6	1.82199	.7048
	6.	4	1.52417	.7621
2Q, Object	7.	5	2.07002	.8915
	8.	16	3.78812	.9470
	9.	11	2.69013	.7777
2Q, Self	10.	4	1.48620	.7431
	11.	4	1.98504	.9925
	12.	4	1.72754	.8638
3Q, Object	13.	24	4.16038	.9074
	14.	6	2.43922	.9436
	15.	19	4.12903	.9720
3Q, Self	16.	5	2.30756	.9938
	17.	15	3.64744	.9336
	18.	6	2.12858	.8234
4Q, Object	19.	19	4.09102	.9630
	20.	29	4.62161	.9513
	21.	12	3.40090	.9486
4Q, Self	22.	4	1.56313	.7816
	23.	11	3.15561	.9123
	24.	4	1.96841	.9842