



eCOMMONS

Loyola University Chicago  
Loyola eCommons

---

Master's Theses

Theses and Dissertations

---

1953

## The Effect of the Use and Threatened Use of Electric Shock on the Maze Learning of Human Subjects

Richard Joseph Haberle  
*Loyola University Chicago*

Follow this and additional works at: [https://ecommons.luc.edu/luc\\_theses](https://ecommons.luc.edu/luc_theses)

 Part of the [Psychology Commons](#)

---

### Recommended Citation

Haberle, Richard Joseph, "The Effect of the Use and Threatened Use of Electric Shock on the Maze Learning of Human Subjects" (1953). *Master's Theses*. 1037.  
[https://ecommons.luc.edu/luc\\_theses/1037](https://ecommons.luc.edu/luc_theses/1037)

This Thesis is brought to you for free and open access by the Theses and Dissertations at Loyola eCommons. It has been accepted for inclusion in Master's Theses by an authorized administrator of Loyola eCommons. For more information, please contact [ecommons@luc.edu](mailto:ecommons@luc.edu).



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 License](#).  
Copyright © 1953 Richard Joseph Haberle

THE EFFECT OF THE USE AND THREATENED USE OF  
ELECTRIC SHOCK ON THE MAZE LEARNING  
OF HUMAN SUBJECTS

by

Richard Joseph Haberle

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University in Partial Fulfillment of  
the Requirements for the Degree of  
Master of Arts

February

1953

### LIFE

Richard J. Haberle was born in Milwaukee, Wisconsin, April 23, 1928.

He was graduated from Messmer High School in Milwaukee, Wisconsin, in June, 1946. He began his college education in September, 1946, at Marquette University in Milwaukee, Wisconsin. Two years later he transferred to Loyola University, Chicago, Illinois to pursue psychology as his major field of study. He was graduated from Loyola University in February, 1951 with the degree of Bachelor of Science.

He began his graduate studies at Loyola University in June, 1951. His studies have mainly been in preparation for work in clinical psychology. He is a member of Psi Chi, the National Honorary Society in Psychology.

# TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION . . . . .	1
Importance of the problem of anxiety—Major points of agreement among authorities on anxiety—Aims of the present study.	
II. HISTORY OF THE PROBLEM AND CURRENT EXPERIMENTAL FINDINGS . . . . .	4
Early philosophical thought concerning anxiety—contemporary psychological theory on the problem—Difficulties inherent in any experimental approach to anxiety—Experimental studies that have been done on this problem.	
III. THE PROCEDURE . . . . .	20
Description of the experimental group, apparatus, experimental method and procedure.	
IV. THE RESULTS . . . . .	28
Reactions of the subjects to differential treatment—Quantitative differences—Qualitative data.	
V. DISCUSSION OF THE RESULTS . . . . .	34
How the findings relate to current theory and experimental findings on anxiety—Possible explanations of negative results.	
VI. SUMMARY AND CONCLUSIONS . . . . .	42
Summary of related literature, procedure and major conclusions.	
BIBLIOGRAPHY . . . . .	48
APPENDIX I . . . . .	51
The design of the maze used during the first session.	
APPENDIX II . . . . .	52
The design of the maze used during the second session.	
APPENDIX III . . . . .	53
Sample of the rating scale and introspection blank.	

# LIST OF TABLES

Table	Page
I. CORRELATIONS BETWEEN THE MATCHED GROUPS AND THE CRITICAL RATIOS OF THE DIFFERENCES BETWEEN THEIR MEANS AND STANDARD DEVIATIONS.....	24
II. THE MAZE LEARNING SCORES OF THE THREE GROUPS FOR THE FIRST SESSION BEFORE DIFFERENTIAL TREATMENT AND FOR THE SECOND SESSION AFTER DIFFERENTIAL TREATMENT.....	29
III. MEANS AND STANDARD DEVIATIONS OF THE THREE GROUPS FOR THE FIRST SESSION BEFORE DIFFERENTIAL TREATMENT AND FOR THE SECOND SESSION AFTER DIFFERENTIAL TREATMENT.....	29
IV. SELF-RATINGS OF ANXIETY BY SUBJECTS IN THE THREE EXPERIMENTAL GROUPS.....	33

## CHAPTER I

### INTRODUCTION

It requires but cursory observation to substantiate the proposition that there is a large and increasing incidence of anxiety in our civilization. Its effects can be seen in modern poetry and prose, in philosophical and religious literature and in the investigations of sociology, political science and psychology. All these diverse fields in the present decade are in some way concerned with this central problem of anxiety. Many students of human nature believe as does R. R. Willoughby that "anxiety is the most prominent mental characteristic of occidental civilization."<sup>1</sup>

In spite of the fact that anxiety is recognized as the most pervasive psychological phenomenon of our time, and the chief symptom in the neuroses and functional psychoses, there has been little or no agreement on its definition and very little progress in its measurement. The reason for this lack of progress is that the various theories and studies of anxiety have been uncoordinated with the result that investigators in one field are often not aware of the progress made on this problem by investigators in other

---

1 Robert R. Willoughby, "Magic and Cognate Phenomena; a Hypothesis", Handbook of Social Psychology, ed. Carl Murchison, Worcester, Mass., 1935, 498

fields.<sup>2</sup> This lack of coordination appears to be largely a result of confusion in terminology for although most of the prominent theorists wrote about anxiety there is little agreement among them as to what it is or what causes it. While most of the theorists, particularly in the clinical field, make a distinction between fear and anxiety, the experimentalists often treat them as if they were the same thing. Likewise, many of the authors who use terms like dread, fear, apprehension, anxiety and foreboding are really talking about the same thing.

In spite of this confusion in terminology, and different as the theoretical concepts are, there appears to be three basic hypotheses that most authorities either explicitly or implicitly accept. These are:

1. If the organism is confronted by a threatening situation or object, whether this threat be biological or psychological and whether the organism's recognition of it be conscious or unconscious, there will always be an affective reaction.
2. This affective reaction, whether it be called fear, anxiety, dread, alarm or anything else, always varies with the amount of cognitive structure in a situation.
3. The more vague the cognitive structure is, the more intense and diffuse the affect will be and the more incapable it will be of stimulating constructive action.

To illustrate the last two hypotheses one can refer to clinical situations where subjects, during the course of personality testing, can perform quite adequately in well-defined clearly structured situations, but find themselves anxious and completely at a loss when called on to perform in vaguely-defined,

---

2 Paul H. Hoch, "Biosocial Aspects of Anxiety", Anxiety, ed. Paul H. Hoch and Joseph Zubin, New York, 1950, 105

ambiguous situations.<sup>3</sup>

The purpose of this study was to investigate these three hypotheses, particularly the last two. Thus the experiment was designed in an attempt to determine the relative effect of stress, induced by threat of electric shock, on maze learning in a structured and unstructured situation. The term 'stress' is used here to avoid the confusion over the terms anxiety and fear.

The very nature of the experiment presupposes the first of the three hypotheses, namely that when the organism is confronted with a threatening situation it will undergo an affective reaction. If this hypothesis is true, then the object of this study is to determine if there is a difference in maze learning between subjects reacting emotionally to a structured stress situation and those reacting to an unstructured stress situation. In the event that there is a difference, a further objective of the study is to determine which of the stress situations produces the greatest affective reaction and which of the two is more detrimental or advantageous to maze learning.

---

<sup>3</sup> Eugenia Hanfmann, "Psychological Approaches To The Study of Anxiety", Anxiety, ed. Paul H. Hoch and Joseph Zubin, New York, 1950, 65



## CHAPTER II

### HISTORY OF THE PROBLEM AND CURRENT EXPERIMENTAL FINDINGS

While interest in the problem of fear and anxiety has received great impetus in the last fifty years, we find that philosophers have written about it for centuries. In the seventeenth century Spinoza sought to make emotions controllable through mathematical reason and thus contended that fear could be overcome by the correct use of reason. He believed that fear and hope always go together and are characteristic of the person in doubt. He concluded, therefore, that "the more we endeavor to live under the guidance of reason, the less we endeavor to depend on hope and the more to deliver ourselves and make ourselves free from fear and overcome fortune as much as possible."<sup>1</sup> The term "certain" consistently runs throughout Spinoza's writings on fear; the removal of doubt, hope and fear is possible if we direct ourselves by the 'certain' advice of reason.

In opposition to the prevalent confidence in individual reason during the seventeenth century there arose the dissenting voice of Blaise Pascal. He did not believe that human nature, in all its variety, could be

---

<sup>1</sup> Baruch Spinoza, "The Strength of the Emotions", Spinoza's Ethics, Hoch and Zubin, Anxiety, 7

comprehended by mathematical thinking and reasoning. He questioned the prevailing confidence in reason because it failed to take sufficiently into account the power of the emotions.

While Spinoza spoke of fear, Pascal spoke of anxiety and it is in this difference between them that the distinction made between fear and anxiety in modern theory finds its roots. For Spinoza, emotions, like fear, are made amenable to reason. He said one must imagine the common perils of life and then think about the best manner by which they can be avoided and overcome.<sup>2</sup> Thus fear, for Spinoza, was an emotion which could be anticipated by a knowledge of possible causes and dealt with rationally. Pascal, on the other hand, spoke of anxiety as something more intangible and less amenable to rational understanding. His classic sentence, "the heart has reasons which the reason knows not of",<sup>3</sup> was an admirable phrasing of the problem for the stand that was taken by Freud and psychoanalysis two centuries later.

At the turn of the nineteenth century when most of the contemporary schools of psychology began, exponents of these various schools devoted more and more attention to the problem of fear and anxiety. As the theories about it evolved, they differed from each other according to the particular bias of the school which the theorist represented.

Within the psychoanalytic frame of reference Sigmund Freud developed

---

2 Spinoza, "Power of the Intellect", Ethics, 208, cited in Hoch & Zubin, Anxiety, 7

3 Blaise Pascal, Pascal's Thoughts, 110, cited in Hoch & Zubin, Anxiety, 8

two theories about anxiety. In his first theory he believed that when libidinal excitation is aroused but is not satisfied or discharged, the unsatisfied libido is transformed into anxiety. In his second theory he believed that when a repressed impulse presses forward for gratification it arouses an anticipation of external disapproval and punishment and the resulting feeling is that of anxiety.<sup>4</sup> Since the impulses which arouse this anxious feeling are internal and unconscious, it has the peculiar quality of a 'nameless terror' which distinguishes it from ordinary objective fear.

He later devoted an entire book to the problem of anxiety and in it he made a clear distinction between objective anxiety (fear) and neurotic anxiety (anxiety proper).<sup>5</sup> The former he described as being an intelligible reaction to danger in which one anticipates injury from without. It has an object in that the fear is of something definite. Anxiety proper, on the other hand, he described as being altogether perplexing and, as it were, purposeless because it arises in regard to danger which we do not know. It is related to expectation for one feels anxious lest something occur and thus it is endowed with a certain character of indefiniteness and objectlessness.

While Freud conceived of anxiety proper as a neurotic manifestation, McDougall believed there was a purely normal anxiety. For him, anxiety was an emotion standing between hope and despondancy. It arises whenever there is doubt in one's mind as to whether a desired goal will be attained. The result

---

<sup>4</sup> Sigmund Freud, New Introductory Lectures on Psychoanalysis, New York, 1933, 115-130

<sup>5</sup> Sigmund Freud, The Problem of Anxiety, New York, 1936, 112-116

is a strong feeling of insecurity because one does not know what to expect. This conception stresses the vacillation between the positive and negative evaluation of a future situation as the essence of the feeling of anxiety. If it becomes great enough it will make a person give up hope and accept despair in order to destroy the ambiguity of the situation.<sup>6</sup>

MacKinnon, in elaborating and extending this view has pictured the life space of the anxious individual as being distorted simultaneously in two directions: that of exaggerated hopes and that of exaggerated fears. Thus, in the neurotic, his emotional life is torn between his hopes in the future, which are too high, and his unfounded fears of what may actually happen. Since neither emotion has a realistic basis, the neurotic exists in a constant state of fearful expectation for he knows not what to expect from reality. But whether this double distortion between hope and fear takes place in the neurotic or the normal, the result is confused and unstable cognitive structure which serves to disintegrate behavior. Thus, in this conception, the unclear cognitive structure is seen as the central factor in anxiety.<sup>7</sup>

Several behavioristically oriented authors derive the diffuse nature of anxiety from the fact that the visceral sensations constituting it have never been verbalized and shared with others. Cameron believes there are both overt and covert fear reactions. Most older children and adults learn to conceal overt manifestations, but they are usually much less successful in con-

---

6 William McDougall, Outline of Psychology, New York, 1923, 339-340

7 Donald W. MacKinnon, "A Topological Analysis of Anxiety", Character and Personality, XII, March 1, 1944, 173

trolling the predominantly covert skeletal and visceral components which he designates as being anxiety. The very factors which inhibit overt signs of fear are the factors most likely to also inhibit a person from admitting or even recognizing that the covert reactions are present. For this reason they remain un verbalized and are usually harder for the individual, in his own self-reactions, to recognize, identify and formulate in words.<sup>8</sup>

The diffuse nature of this type of fear reaction was found by Liddell even in animals. Although he holds that animals do not have anxiety in the same sense that humans have it, they do have a primitive counterpart, namely vigilance. When an animal is in a situation that involves possible threat (a sheep expecting shock) it exhibits an alertness and a general expectancy of danger. This vigilance is characterized by general suspiciousness, indicating that the animal does not know whence the danger may arise, and tendencies to act without any clear cut direction for acting. Such behavior, Liddell believes, is the parallel on the animal level of the vague and generalized apprehensive behavior of the human being in anxiety.<sup>9</sup>

In the holistic frame of reference many psychologists maintain that anxiety is a more primitive reaction to threat which attacks the very core of the personality. Stern believed that this results in both fear and anxiety because it makes an adequate response difficult, if not impossible. The

---

<sup>8</sup> Norman Cameron, The Psychology of Behavior Disorders, A Biosocial Interpretation, Boston, 1947, 116-117

<sup>9</sup> Howard S. Liddell, "The Role of Vigilance in the Development of Animal Neurosis", Anxiety, ed. Paul H. Hoch and Joseph Zubin, New York, 1950, 184

difference between them is that in anxiety he refers to a general mental condition of diminished self-confidence in ones ability to cope with the environment as a whole. In fear there is a decrease in self-confidence in the ability to cope with a specific situation or occurrence in the environment. This makes a definite object necessary for fear, but not for anxiety.<sup>10</sup>

In Goldstein's view, fear is a higher level of response than anxiety because it involves awareness of the threatening situation or object. There is an appropriate defense reaction, a bodily expression of tension and extreme attention to a certain part of the environment which helps the organism to meet, remove, or flee from the threat. Anxiety, on the other hand, he considers a more primitive response which is not a reaction to a specific stimulus; it represents the subjective experience of disordered functioning when the organism is in contact with an environment which it is incapable of managing. The result is meaningless frenzy, with rigid or distorted expression, useful perception and action are suspended.<sup>11</sup>

May believes, as does Goldstein, that anxiety is primitive, general and undifferentiated. Growing out of this, and an expression of the same capacity, is fear which is a reaction to specific and objectified situations. An individual experiences various fears on the basis of the area of security pattern which is threatened; but in anxiety it is the security pattern itself

498

10 William Stern, Psychology of Early Childhood, New York, 1930,

11 Kurt Goldstein, The Organism: A Holistic Approach to Biology, New York, 1939, 293-294

which is threatened and this results in feelings of uncertainty and helplessness.

May also agrees with Goldstein when he says that normal and neurotic anxiety are basically the same; they differ from each other in quantity not quality. Both types are a reaction to threats to values which the individual holds essential to his existence as a personality. Because they differ only in quantity, neurotic anxiety is more destructive and less correlated with the objective situation than normal anxiety.<sup>12</sup>

Different as these theoretical concepts are, they all seem to stress the cognitive factor as one of the central elements in anxiety. Thus cognitive unclarity is seen as the most important factor in the arousal and perpetuation of anxiety and the factor responsible for the helplessness which is an integral part of it. Conversely, clear cognitive structuring in a stress situation is regarded as having a preventive or ameliorative function.

While the role of cognitive structure in anxiety is stressed by many theorists there have been few studies which have attempted to test this hypothesis experimentally. Indeed, if one excludes the clinical and physiological approaches, as well as experimentation with animals, there is a relative dearth of experimental and psychological studies which have been focused specifically on the investigation of anxiety and fear. This is possibly the logical result of the difficulties involved in identifying and isolating these phenomenon. The very fact that anxiety has pronounced physiological concomitants has probably determined the direction of experimentation away

---

12 Rollo May, *The Meaning of Anxiety*, New York, 1950, 190-193

from the dynamic context.

The studies which have been done on human anxiety usually are concerned with its effects on motor, perceptual, and ideational performances.<sup>13</sup> The subjects chosen for most of these studies were picked from clinical groups which are characterized by intense anxiety states. This has its pitfalls, however, for the diagnostic label is not a sufficient indication of the momentary state of the patient nor does it permit any statement about the relative degrees of overt and covert anxiety present in different patients.

There have been several studies using projective techniques combined with experimental stress situations which appear very promising for mapping out the areas of anxiety and for measuring its intensity. One of these was an investigation by Eichler on the influence of stress-produced anxiety on the occurrence of fifteen Rorschach factors alleged to be signs of anxiety.<sup>14</sup>

In this study sixty college students were matched on certain factors on the Behn-Rorschach test as well as on age, college year and cumulative grade point average. One group of thirty subjects was then assigned to the experimental stress conditions, and the other group to the control (non-stress) condition. "Stress" consisted of the administration of electric shock with the implication that applications of stronger shock were forthcoming. Immediately prior to the administration of the Rorschach test, both

---

<sup>13</sup> Edward Lerner and Laurence B. Murphy, "Methods for the study of personality in young children", Monog. Soc. Res. Child Develop., VI, No. 30, 1941, 4

<sup>14</sup> Robert M. Eichler, "Experimental Stress and Alleged Rorschach Indices of Anxiety", Jour. of Abnormal and Social Psychology, XLVI, July, 1951, 344-355



groups were given a continuous subtraction test. Individuals in the stress condition received shock while performing on the subtraction task but received no shock while taking the Rorschach. At the completion of the test individuals in both groups rated themselves on an anxiety-tension scale.

The results of this study showed that the subjects in the stress condition made significantly more errors on the subtraction test and rated themselves on subjective anxiety much higher than those in the control group. Of the fifteen alleged indices of anxiety investigated on the Rorschach, four were significantly high for members of the stress group, and three more, while not reaching a level of statistical significance, came sufficiently close to warrant considering them as suggestive.

The Rorschach indices of anxiety and the subjective self-ratings clearly indicate that electric shock, together with the threat of stronger shocks in the future, does produce a reaction within the subject which the author calls anxiety. The significant increase in errors on the continuous subtraction test for subjects in the stress situation also indicates that this reaction interferes with and hinders simple arithmetical computation. An objection which can be made to this study, however, is that there is no way of knowing what it was that actually stimulated the reaction. It could have been the shock itself, the ambiguousness of the threat of future shock, or both of them operating together. The actual pain from the shocks gave the subject something by which he could compare them and thus gave the stress situation an element of cognitive structure, but the implication of stronger shocks in the future made the situation cognitively unclear because the subject had no idea of how strong they might become and could not even be certain that shock would

get stronger. Thus it is possible that the results of the study would have been different if this cognitive unclarity had been increased or decreased.

A study which touches on this point was done by Mowrer and Viek on laboratory rats.<sup>15</sup> Twenty rats were randomly paired into two groups of ten. One group was designated as "shock controllable" (S-C) and the other was called the "shock uncontrollable" (S-Un C). Once every day, for fifteen days, each of the twenty rats was placed in a cage having an electric grill for a floor. After a standard interval of twenty minutes food was presented to the animal. If it was accepted it was regarded as a "response" and if the food was rejected it was regarded as an "inhibition." Regardless of whether the food was accepted or rejected, ten seconds later shock was administered through the grill. The only difference in procedure between the two groups was that the rats in the S-C group could terminate the shock by jumping high enough in the air to get all four feet off the grill, while those in the S-Un C group received shock for a predetermined length of time without regard for the response that they made to it.

The results of the study show that the rats in the S-Un C group have a significantly greater number of inhibitions in regard to the food than those in the S-C group. Likewise, the total amount of delay displayed before taking food was found to be significantly greater for those in the S-Un C group. Thus it would seem that by either of these modes of analysis the animals re-

---

<sup>15</sup> Hobart O. Mowrer and Peter Viek, "An Experimental Analogue of Fear From a Sense of Helplessness", Jour. of Abnormal and Social Psychol., XLIII, April, 1948, 193-200

receiving shock for a fixed duration were much more punished by it than the animals who could control the duration.

The authors explain these results by contrasting the helplessness of the S-Un C group with the reassurance which the S-C group had in its ability to cope with the shock. The rats in the latter group came to associate the leaping response with the experience of relief from the shock and fear so that when they became afraid on subsequent occasions, whether before or during the shock, they knew that they could control the situation and this presumably resulted in a reduction of fear. The rats in the S-Un C group did not have this reassuring jump response and thus had no way of knowing how long the shock would last. Once the entrance into the cage and the presentation of the food became a sign that something unpleasant was going to happen, these animals had no choice but to apprehensively wait for the shock and endure it as long as the experimenter saw fit to administer it. This allowed fear to build up and become firmly associated with the experiment as a whole.

This explanation appears to be rather anthropomorphic, but whether it be correct or incorrect, the fact remains that it was the animals in the S-C group who possessed the greatest clarity of cognitive structure and also had the least manifest reaction to shock. The rats in the S-Un C group, on the contrary, had an unclear cognitive structuring and showed the greatest reaction to shock. Clearly, then, the findings of this study seem to substantiate the hypothesis that cognitive structure is the most important factor in the organism's response to stress.

One must be very cautious in applying the findings of any animal experiment to human beings and one must be especially cautious in regard to

the findings in Mowrer's study for there is little corroborative evidence from experiments done on human beings. Tomkins has reported some interesting qualitative observations he has made in an experiment designed to measure the individual's need for "harmavoidance" which seem to substantiate these findings.<sup>16</sup> In this experiment, anxiety was studied in a group of college students by comparing their motor learning under normal conditions and under threat of electric shock for errors.<sup>17</sup> It was shown that threat of shock typically inhibits learning when shock is a simple threat for errors but accelerates learning when there is, in addition, a threat of shock if the subject is too greatly inhibited by the shock for errors. The important thing for this discussion, however, is Tomkin's observation that in any situation involving stress the importance of the cognitive factor is undeniable.

He believes the time perspective is of prime importance here. A shock of constant intensity will have a different effect in a situation in which the subject knows exactly how long it will last than it will when the subject is purposely kept uninformed about the duration. Again, if one is using threat of shock, the individual has no way of knowing how intense it will be. He found it very common for his subjects to ask for a shock so that they would know just what they were up against.

---

<sup>16</sup> Silvan S. Tomkins, "An Analysis of the Use of Shock With Human Subjects", Jour. of Psychol., XV, April, 1943, 285-297

<sup>17</sup> Silvan S. Tomkins, "Experimental Study of Anxiety", Jour. of Psychol., April, 1943, 307-313

Both of these factors were taken into consideration in a very pertinent study done by Haggard.<sup>18</sup> In this study he attempted to determine the extent to which cognitive structure and active participation were influential in modifying certain autonomic, verbal and motor reactions of subjects during a stress situation induced by strong electric shock. Eighteen college males were given a list of forty-two stimulus words. To each word presented, the subject was to respond with as many words as he could associate with the stimulus until he received an electric shock or was told to stop. Each time the subject gave a word he was to simultaneously press down a plunger in the experimental apparatus with his index finger.

Within the stimulus list the word "sharp" followed by the word "sword" recurred five times at irregular intervals. Ten to twelve seconds after the critical word "sword" was presented each time, the subject received a shock of four hundred volts and eighteen microamps. After all the other words in the list the subject was told to stop after the ten to twelve second association period. Nine of the subjects were shocked by the experimenter (E-shock) while the remaining nine were required to voluntarily shock themselves (S-shock) whenever a light flashed on before them. The E-shock subjects were merely told they would occasionally be shocked during the list of words, but they were given no hints as to when the shock would occur. In distinguishing between the S-shock and E-shock groups it should be noted that

---

<sup>18</sup> Ernest A. Haggard, "Some Conditions Determining Adjustment During and Readjustment Following Experimentally Induced Stress", Contemporary Psychopathology, ed. Silvan S. Tomkins, Cambridge, Mass., 1946, 529-544

only the S-shock subjects were provided with a scheme of warnings which would enable them to get set for the shock, and the S-shock subjects took an active role in the administration of the shock rather than remaining passive as did the E-shock subjects.

During the experiment, measures of palmer skin resistance, galvanic skin response (G.S.R.) and motor reactions on the plunger were recorded for each subject. In addition, subjects were asked to give estimates of the number of shocks received, their strength, and the number of stimulus words in the list. All subjects were also asked whether they had been able to predict when the shocks would come.

The results of the study showed that the E-shock subjects had a greater increment in the general level of autonomic activity than the S-shock subjects. The difference in G.S.R. to the critical word "sharp" was significant at the two per cent level and the difference between them in reacting to the stimulus word "sword" was significant at the four per cent level. While both shock groups displayed a marked increase in palmar sweating, the change was much greater for the E-shock subjects and significant at the two per cent level.

When the eighteen subjects had been asked if they were able to predict when the shocks would come, nine were aware that it followed the critical word "sword", but the other nine did not know when it came. This divided the group into the "aware" and "unaware" groups. The unaware group had a G.S.R. to the word "sharp" which was 2.6 times as great as that of the aware group while the latter showed 1.9 times as much adaption to the shock as the experiment progressed. Although the differences between the average scores of the

aware and unaware groups were slightly larger than those between the two shock groups, the excessive variability among the scores of the former subjects precluded the occurrence of differences which were statistically significant.

On the whole the findings of this study clearly indicate that subjects who knew the most about the conditions involved in the experiment and who actively faced this experience showed significantly fewer signs of autonomic, verbal and motor disturbance during the stress situation. This is particularly demonstrated by the differences between the various reactions of the aware and unaware groups since both of these groups received comparable experimental treatment. The subjects in the unaware group showed a significantly larger G.S.R. to all the words in the list, than did the aware subjects, and were characterized by marked tendencies toward disruptive behavior, as evidenced by a distorted evaluation of the length of the stressful session and a general disintegration of the coordinated verbal-motor responses. These differences seem to point to the general inability of the unaware subjects to adequately tolerate the stress imposed during the experiment and clearly demonstrate the importance of differences in cognitive structure.

To summarize the findings of these four experimental studies, it can clearly be seen that when the organism is confronted with a stress situation, involving electric shock and threat of shock, the organism reacts with widespread affective, autonomic, motor and verbal disturbance. This disturbance was found to inhibit human motor learning and simple arithmetical computation as well as to cause marked feeding inhibition in animals.

The most significant finding, for this study, is that the more structured the stress situation was, the less were the adverse effects on the

organism. This generally substantiates the theoretical concepts of earlier philosophers and psychologists concerning the problem of anxiety. Both theory and experimental evidence points to the cognitive factor as one of the central elements in any stress situation. Cognitive clarity is seen as the most important factor in the arousal and perpetuation of anxiety and the factor most responsible for the feeling of helplessness which almost always accompanies it. Clear cognitive structure, on the other hand, is regarded as having an effect which tends to prevent or reduce disturbances within the organism.

The elements which appear to play the biggest part in the structuring of any stress situation are a knowledge of when the unpleasant stimulus will occur, how long it will last and how intense it will be. The more the organism is allowed to control a stress situation the less severe will be the resulting disturbance.



## CHAPTER III

### THE PROCEDURE

The experimental group consisted of thirty white male students ranging in age from twenty-one to thirty-five years. They were all attending graduate or professional schools and enrolled in medicine, law, natural sciences, business and the arts.

The materials used were an electric shock apparatus and two stylus mazes of comparable difficulty. The electric shock apparatus was constructed along the general lines of the one used by Eichler,<sup>1</sup> with several changes and additions being made to conform to the principles of Muenzinger and Walz<sup>2</sup> concerning electrical stabilizing devices.

The electrical apparatus consisted of a variable transformer having a maximum output of 135 volts and 7.5 amperes, two selenium dry rectifiers and two condensers (.50 M.F.D. and 100 V.D.C.). The Primary source current was from a 110 A.C. line which was controlled and reduced by means of the transformer, changed to a pulsating direct current by means of the selenium recti-

---

1 Eichler, "Experimental Stress and Alleged Rorschach Indices of Anxiety", Jour. of Abnor. and Soc. Psych. XLVI, July, 1951, 345

2 K. F. Muenzinger and F. C. Walz, "An Analysis of the Electrical Stimulus Producing Shock", Jour. of Comparative Psychology, XIII, Feb. 1932, 157-171

flers and then to a constant direct current by the condensers.<sup>3</sup>

The shock was administered to the subject through two electrodes made of brass and covered with chrome. Each electrode was two inches long, one and one-half inch wide and two-sixteenths of an inch thick. One electrode was strapped to each of the subjects wrists by means of rubber strips having holes in them for a projection at the top of the electrode to fit through. The wires from the apparatus were connected to these projections. Contact was facilitated by use of an ordinary commercial electrode jelly which was rubbed into the skin and also coated on the undersurface of the electrodes.

The two mazes were constructed from wooden boards which were ten inches square. Each maze had seven cul-de-sacs and the alleys were five sixteenths of an inch wide and equally as deep. They were cut from one board which was then attached to another board which served as a base for the alleys. Both mazes were of the same design and proportions but differed from each other in that the alleys ran in opposite directions. The stylus consisted of a stick six inches long so that it was possible for the subject to rest his elbow on the table and still hold the stylus upright in the alley without brushing his hand over the surface of the maze.

The entire experiment was divided into two sessions. During the first session the subject was seated before the covered maze with none of the electrical apparatus in the room. The instructions given to him were as

---

<sup>3</sup> The writer wishes to express his gratitude to his father, Mr. Joseph E. Haberle, for his aid in designing and constructing the electric shock apparatus.

follows:

This is a maze learning experiment. Your task will be to learn the maze by running this stylus through it while blindfolded. The maze will be considered learned when you are able to complete two successive trials without error.

After you are blindfolded one end of the stylus will be placed in the starting position and you are to push it through the grooves until you reach the end. Each time you reach the end I will signify by saying stop. You are to continue this process of going from beginning to end until you have reached the criterion of learning which is two successive trials without error. A trial is made when you go from beginning to the end and an error is made whenever you go backward or enter a blind alley.

The important thing is the number of trials. I would like you to complete the task in the least number of trials possible. But do not be discouraged if at first your progress is rather slow. Your performance will in no way reflect on your personal ability. I am merely interested in discovering how many trials are required by graduate and professional school students to learn the maze. Anything you do will merely be taken as indicative of the group of students to which you belong. Any questions?

All during the first session an attempt was made to put the subject at ease and avoid giving him the impression that he was being challenged. After each subject was blindfolded and his stylus was placed in the starting position he was once again reminded that there was no need to hurry and that the number of trials was the important thing. A record was then kept of the trials required by each subject to reach the criterion of learning. When each subject had finished, he was told that he had done well and that the second session would also involve maze learning.

The thirty scores obtained were then matched into three groups of ten. In other words, for every subject in group one there was a subject in group two and three who had the same or very nearly the same score on the first session. The groups of scores were then arbitrarily assigned as either

a threat, a shock or a control group. As a result of the matching of scores the means and standard deviations for the groups differed from each other by only a fraction of a point. The threat group had a mean of 19.5 trials and a standard deviation of 8.09, the control group also had a mean of 19.5 with a standard deviation of 8.33, and the shock group had a mean of 19.3 trials and a standard deviation of 8.82.

The critical ratios of the differences between these means and standard deviations were computed and, together with the correlations between the three groups, appear in Table I.<sup>4</sup> The very small critical ratios show that the differences between the groups are clearly not significant and thus it can be assumed that all three groups were of equal maze learning ability prior to their differential treatment during the second session. An interval of two to four weeks was allowed to pass between the first and second sessions for each subject.

When each subject of the shock group entered the room for the second session, he was seated before the covered maze facing the control panel of the electrical apparatus. On the panel was mounted the transformer, the two selenium rectifiers, a volt meter, and two 120 volt lamps. One lamp was green and glowed whenever the apparatus was receiving current. The other lamp was red and increased in brilliance whenever voltage was increased.

---

<sup>4</sup> The critical ratios were computed with the formulas for finding the significance of difference between the means of matched groups and standard deviations which are correlated. Both formulas include a correlation term since they are repeated on the same groups under different conditions. They can be found in, Henry E. Garrett, Statistics In Psychology and Education New York, 1945, 209-216

TABLE I

CORRELATIONS BETWEEN THE MATCHED GROUPS AND  
CRITICAL RATIOS OF THE DIFFERENCES BETWEEN  
THEIR MEANS AND STANDARD DEVIATIONS

COMPARISONS	GROUPS		
	CONTROL AND SHOCK	THREAT AND SHOCK	CONTROL AND THREAT
CORRELATION	.98	.98	.97
C.R. OF DIFFERENCE BETWEEN MEANS	.22	.22	0
C.R. OF DIFFERENCE BETWEEN S.D.	.49	1.23	.35

After each subject was allowed to look at the apparatus a few moments to satisfy his curiosity, he was told the following.

The procedure this time will be exactly as before with the exception that this time you will have a different maze to learn. In addition you will periodically receive an electric shock which will be administered to your wrists. The shock will occur every ten minutes and each time you will get a three second warning by the sound of this bell. In other words you will never be taken by surprise and will always have an opportunity to prepare for the shock. Before we begin you will receive a sample shock so you know exactly how it feels. Do you have any questions?

Now you know that you do not have to go through with this. If you are too frightened you may still "chicken out" if you wish to.

The latter statement was made in order to establish a conflict situation. The subject then had two choices, neither of which were desirable. He

could submit to the experiment and receive a painful stimulus or he could refuse and undergo the humiliation of being considered a coward. The latter alternative evidently proved to be the most undesirable for all of the subjects consented to continue the experiment although they all expressed displeasure at the prospect of receiving shock. Several of them admitted at the end of the session that they would have liked to refuse but they did not want to appear "yellow".

The electrodes were strapped to the subject's wrists and he was told to prepare for the shock. The bell was rung and three seconds later the subject received a shock of twenty D.C. volts and a maximum of eight milliamperes for a duration of one second. The subject was again reminded that each shock would be just like the sample and that it would come every ten minutes, three seconds after the warning bell. The instructions of the first session were repeated, to refresh their memories regarding the task and the criterion of learning, their blindfolds were then put on and their stylus placed in the starting position.

As the subject progressed he received shock every ten minutes as described and a record was kept of the number of trials required to reach the criterion of learning. When the task was completed the subject was asked to rate himself on his subjective feelings of anxiety or fear. The rating was done on a scale containing three categories: little anxiety, moderate anxiety, and severe anxiety. Each category was graded from one to five to allow a more precise subjective rating. In addition each subject was asked to write any introspections concerning his feelings about the shock, the experiment, the examiner, etc. Before the subject left he was asked to tell no one about what had

occurred during the second session.

When the subjects in the threat group entered the room they were also seated before the maze and facing the control panel. After allowing each subject to look at the apparatus a few moments he was told:

The procedure this time will be exactly as before with the exception that this time you will have a different maze to learn. In addition you will receive electric shock during the learning period. I cannot tell you when it will occur, how often, nor how intense the shock will be. You may receive only one shock or you may receive many, and it may come at any time, but this you can be sure of, you will receive shock. I may even wait till the very last second before you complete the task before I administer it. Are there any questions?

The subjects in this group were also given a chance to "chicken out" if they were too much afraid, but all consented to complete the experiment. The voltage was then raised and lowered by means of the transformer so the subject could see the deflection of the volt meter needle and the changes in the brightness of the red bulb. This was done to assure the subject that the apparatus was authentic and capable of delivering shock. The instructions of the first session were repeated to refresh the subject's memory concerning his task and the criteria of learning. The electrodes were then attached and the subject was blindfolded. Although the members of this group had been given every reason to expect shock they received none. At the completion of the task each subject was asked to rate himself on the scale for the amount of anxiety he experienced and to give introspective reports of his feelings about the threat of shock and the experiment in general. These subjects were also asked to tell no one about what had happened during the second session.

The procedure for the control group was identical with that of the first session. Before starting the learning period each subject was told that

the would be working with a different maze. The members of this group were also asked to rate themselves on anxiety and make introspections in order to discover how much, if any, anxiety was created merely by the learning situation.

The scores from each group were correlated with those in each of the other two groups and the means and standard deviations were found as before. The standard error of their differences, as well as the critical ratio, was then computed in the same way as before to determine the significance or non-significance of these differences.



## CHAPTER IV

### THE RESULTS

The thirty scores which had been obtained from the first session were divided, by means of matching, into three groups who were as much alike in maze learning ability as possible. The scores for each of these groups can be seen in Table II along with the scores which each group made on the second session. The means and standard deviations from these groups before and after differential treatment are shown in Table III. As was demonstrated in the previous chapter, the critical ratios of the differences between them on mean and standard deviation after matching are so small that these differences are clearly not significant. Thus we see that the three groups were of equal maze learning ability before differential treatment.

The mean number of trials required by the control group to complete the learning task was reduced from 19.5 for the first session, to 10.9 for the second session. This means that the subjects in this group, on the average, required 8.6 fewer trials on the second session than they did on the first. The critical ratio of this difference was found to be 5.41 which shows the reduction to be significant at the .01 level of confidence.<sup>1</sup> This reduction can

---

1 The critical ratio was obtained from the standard error of the mean gain from session one to session two, as gotten by the single group method. The critical ratio of the difference between standard deviations was gotten in the same way as before. The procedure for the single group method can also be found in Garrett, Statistics in Psychology and Education, 210

TABLE II

THE MAZE LEARNING SCORES OF THE THREE GROUPS FOR  
THE FIRST SESSION BEFORE DIFFERENTIAL TREATMENT  
AND FOR THE SECOND SESSION AFTER DIFFERENTIAL  
TREATMENT

Subject	Control Group		Shock Group		Threat Group	
	One	Two	One	Two	One	Two
A	10	9	9	7	9	11
B	11	5	10	6	10	9
C	12	5	10	9	13	10
D	17	11	16	11	17	14
E	17	5	18	7	18	23
F	18	10	19	7	18	15
G	21	15	19	14	19	20
H	22	7	24	13	27	32
I	28	16	30	18	28	30
J	39	26	38	18	36	30

TABLE III

MEANS AND STANDARD DEVIATIONS OF THE THREE GROUPS  
FOR THE FIRST SESSION BEFORE DIFFERENTIAL TREAT-  
MENT AND FOR THE SECOND SESSION AFTER DIFFERENTIAL  
TREATMENT

Sessions	Control Group		Shock Group		Threat Group	
	M.	S.D.	M.	S.D.	M.	S.D.
First	19.50	8.33	19.30	8.82	19.50	8.90
Second	10.90	6.28	11.00	4.34	19.40	8.44

not be attributed to differences in the difficulty of the two mazes because they were identical in design and proportions; the only difference between them was that the maze used for the second session was turned over so that the alleys ran in the opposite direction from those in the first maze. The control group also showed a reduction in standard deviation from 8.33 on the first session to 6.28 on the second. The critical ratio of this difference was found to be 1.68 which is not significant.

There was a similar reduction in the mean number of trials required by the subjects who received shock during the second session. The mean of the shock group for the first period was 19.3 trials and it was 11.0 trials for session two. This leaves an average reduction of 8.3 trials per subject. The critical ratio of this difference was found to be 4.68 which shows the reduction for the shock group also to be significant at the .01 level. In addition, the difference between the standard deviation of 8.82 on the first session and 4.34 on the second was found to have a critical ratio of 3.42. This shows that the shock group was significantly more homogeneous on the second session than it was on the first at the .01 level of confidence.

The scores of the shock and control groups for the second session, seen in Table II, were found to have a correlation of .82. The difference of .1 between their means has a critical ratio of .07 which is clearly not significant. The difference of 1.94 between their standard deviations had a critical ratio of 1.76 which also is clearly not significant. From this, one can conclude that the control and shock groups, who were of virtually equal maze learning ability before differential treatment, showed practically the same performance on the second session in spite of different experimental learning

conditions.

Although the threat group was of the same maze learning ability as both the control and shock groups, it did not show the same reduction in mean and in standard deviation for the second session. On the first session this group had a mean of 19.5 and a standard deviation of 8.09, while on the second session the mean was reduced to 19.4 and the standard deviation was increased to 8.44. The critical ratio for the difference in mean was .09 and for the difference in standard deviation was .31, both of which, are clearly not significant. Thus, while the control and shock groups exhibited an equally significant reduction in mean number of trials during the second period, the group which was learning under threat of shock showed no improvement. Likewise, while the shock group exhibited a significant reduction in standard deviation, the threat group did not.

The correlation between the scores of the threat and control groups on the second session was .53 and the difference of 8.5 between their mean number of trials was found to have a critical ratio of 2.86 which is significant at the .02 level. The difference of 2.16 between their standard deviations was found to have a critical ratio of 1.02 which is not significant, however.

The scores of the threat and shock groups on the second session had a correlation of .77 and the difference of 8.4 between their mean number of trials was found to have a critical ratio of 4.16 which is significant at the .01 level. This increase in significance can be attributed to the higher correlation between these two groups and the relatively smaller standard deviation of the shock group. The difference of 4.10 between their standard deviations had a critical ratio of 6.11 which also is significant at the .01 level.

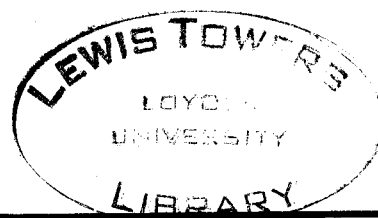
From these findings it is apparent that all three groups went into the second session with the same ability to learn a maze since there were no significant differences between them. When the control group had gone through the second session, under exactly the same conditions as the first time, the scores exhibited a significant reduction in mean number of trials. When the subjects of the shock group had been subjected to electric shock under clear cognitive conditions during the second session, their scores also showed a significant reduction in mean and standard deviation which was almost identical with that of the control group. There still was no significant difference found between them. After the threat group had gone through the second session while under threat of shock in very unclear cognitive conditions, it did not show a reduction in mean and standard deviation. The mean for the threat group was significantly higher than the means of both the control and shock groups and the standard deviation for the threat group was also significantly higher than that of the shock group.

The self-ratings of subjective anxiety can be seen in Table IV. Six of the ten control subjects reported some tension over the learning situation itself. This tension was rated as being very mild, however, and four of the subjects from this group reported no tension at all. Of the ten subjects in the shock group, one rated himself as having little anxiety and nine reported moderate anxiety, but of the latter, two rated themselves as just about reaching severe anxiety. Of the ten subjects in the threat group, four reported little anxiety and six rated themselves as having moderate anxiety, with three of these reporting it as just about severe.

TABLE IV

SELF-RATINGS OF ANXIETY  
BY SUBJECTS IN THE THREE EXPERIMENTAL GROUPS

Groups	No. Reporting	Anxiety		
		Mild	Moderate	Severe
Control	6	6		
Shock	10	1	7	2
Threat	10	4	3	3



## CHAPTER V

### DISCUSSION OF THE RESULTS

The significant reduction in the mean number of trials required by the control group for the second session can be explained in two ways; in terms of differences in the difficulty of the two mazes, or in terms of learning which took place during the first session. Since the two mazes were of the same design and proportions, the only difference being in the directions of their alleys, they can be assumed to be of equal difficulty. The reduction in the number of trials must therefore be explained in terms of learning during the first session. This learning consists essentially of becoming familiar with the maze learning situation so that during the first session the subjects learned how to learn a maze. Thus, after the second session, subject E remarked, "The maze seemed easier this time because I knew how to go about it", and subject D said, "I remembered that the maze doesn't feel as small as it appears so this time I tried to get a visual image of it."

It was found that the three matched groups were of equal ability in learning the maze before differential treatment. Since all subjects had the same opportunity to become familiar with the situation during the first session, it would be expected that the shock and threat groups would show a similar reduction in trials to that of the control group unless the difference in experimental conditions served to alter their performance. This was substantiated for the shock group for it exhibited a reduction in mean number of

trials which was as significant as that of the control group. Although the standard deviation of the shock group showed a greater decrease, it was not found to be significantly lower than that of the control group. Since these two groups performed in such a similar fashion on the second session, it would appear that the administration of shock in a well structured situation does not significantly inhibit maze learning.

The scores of the threat group did not show the expected reduction in mean and standard deviation which had been found for the other two groups. There was very little improvement in the mean number of trials on the second session and the standard deviation was slightly increased. The mean was found to be significantly higher than that of the control group. Since both groups were of equal ability before their differential treatment, this failure to improve clearly indicates that the threat of shock in an unclear cognitive situation does inhibit maze learning.

Both the mean and the standard deviation were significantly higher for the threat group than they were for the shock group. It will be remembered that both groups were exposed to what Miller would call an "avoidance-avoidance" stress situation.<sup>1</sup> Before the second session, subjects in both groups were told that they did not have to go through with the experiment if they were too much afraid and could still "chicken out" if they wanted to. This gave each subject a choice between receiving a painful shock and admitting

---

1 Neal E. Miller, "Experimental Studies of Conflict", Personality and the Behavior Disorders, ed. J. McV. Hunt, New York, Volume I, 143



that he was afraid. Neither of these choices was desirable and several of the subjects admitted that they would have liked to refuse to go on but they feared that they would be considered a coward. Miller found that this type of stress situation creates the greatest amount of vacillation and blocking. The question now arises as to why the shock group did not suffer the same inhibition in learning shown by the threat group when both of them were exposed to the same kind of stress situation. The differences between them can only be attributed to differences in the cognitive structure of the situation.

It will be remembered that the cognitive structure of the situations differed in three basic respects. The subjects in the shock group knew how intense the shock would be, when it would be administered and how often it would occur. The subjects in the threat group were denied all of this knowledge. For them the situation was kept as ambiguous as possible so all that they knew was that sometime during the second session they would receive shock, but it never came.

A shock was administered to the subjects in the shock group at the start of the second session so they would know exactly how the subsequent shocks would feel. Since the subjects in the threat group did not get this sample shock they almost unanimously asked how intense it would be and how long it would last.

The subjects in the shock group also knew when the shock would occur because they were given a three second warning by the sound of a bell which gave them time to get ready for it. Again the subjects in the threat group were denied this knowledge and it is interesting to compare the actions of the two groups in this regard. The subjects in the shock group usually sat leaning

forward in a very attentive position while learning the maze, but when the bell would sound they would stiffen in their chairs, stop moving the stylus through the grooves, wait for the shock, and then return to their former position. The members of the threat group, on the other hand, usually sat in a tense and erect position all through the second session. The disturbance over the lack of knowledge as to when the shock would occur is reflected in subject C's remark that, "I was curious as to when the shock was coming.....then when I made my first successful run it brought more anxiety as to when the shock would come." Subject H said, "I felt a great deal of tension on the last three trials which came from the fact that I expected a shock which never came."

These findings clearly seem to substantiate the hypothesis that the affective reaction resulting from a stress situation always varies with the cognitive structure of that situation. One finding which deserves further consideration, however, is the fact that the shock group did not significantly differ from those in the control group in spite of the difference between their experimental situations. This does not coincide with the findings of Eichler<sup>2</sup>, Tomkins<sup>3</sup>, and Haggard<sup>4</sup> in the studies discussed previously in Chapter Two.

---

2 Eichler, "Experimental Stress and Alleged Rorschach Indices of Anxiety", Jour. of Abnorm. and Soc. Psych. XLVI, 347

3 Tomkins, "Experimental Study of Anxiety", Jour. of Psychology, XV, 313

4 Haggard, "Some Conditions Determining Adjustment During and Re-adjustment After Experimentally Induced Stress", Contemporary Psychopathology, 535

All three investigators found that actual shock caused reactions which were significantly different from their control groups. This discrepancy in results can be accounted for in several ways.

In the study by Eichler, as well as the one by Tomkins, no attempt was made to control the cognitive structure of the stress situation. Thus there is no way of knowing how much of the reaction shown by their subjects was due to the actual shock and how much was due to the thought of impending shock. Another factor to be considered is that both Eichler and Haggard delivered shocks of higher voltage than the one used in this study. Eichler used shocks of twenty-five, thirty and thirty-five volts and Haggard delivered shocks of four hundred volts, which is considerably higher than the twenty volt shocks used in this experiment. Here it should be noted, however, that this large difference is offset by the fact that Haggard's shocks were of a lower amperage. He used eighteen microamps while the shock in this experiment was around eight milliamps. Still another factor which may explain the discrepancy in findings is that all three of these investigators used methods which are more sensitive to affective reaction than is maze learning. Eichler employed mental subtraction problems and the Rorschach test, Tomkins used reaction time and motor control, and Haggard used minute physiological and motor reactions.

The discrepancy between the findings of this study and those of the other investigators can then be accounted for in three ways. These are in terms of: differences of cognitive structure in the various stress situations, the insensitivity of maze learning for revealing minor affective disturbances, and the relatively small voltage used in the shocks of this experiment.

While the shock used in this study is smaller than that used in some

of the other studies, there is little doubt as to whether it was strong enough to evoke an affective reaction in the subjects. The subjective ratings, introspective reports and overt reactions of subjects in the shock group all seem to substantiate this. They rated themselves as high on the anxiety scale as those in the threat group and exhibited the same overt reactions. Examples of these are perspiring hands, deep and rapid breathing, swearing at the experimenter and calling him names.

Goldstein<sup>5</sup> and Cameron<sup>6</sup> both have a theory which probably explains, better than all the others, why shock in this experiment did not inhibit learning. They believe that when fear is not too great it can act constructively by stimulating the organism to action which will either remove it from the stress situation or help to overcome it. This could presumably be what happened in the shock group for it had a decrease in standard deviation which differed from both its own first session and from the standard deviation of the threat group on the second session at a high level of significance. The homogeneity exhibited by this group can be explained in terms of the cognitive structure of the stress situation. The knowledge of impending shock stimulated them to learn the maze as rapidly as possible in order to complete the task with the fewest number of shocks. The clear cognitive structuring of the threat enabled them to know definitely that they could reduce punishment. Thus, subject J remarked, "I was kind of nervous till the first shock, then I tried to calm

---

5 Goldstein, The Organism, 295-296

6 Cameron, The Psychology of Behavior Disorders, 248

down and finish before the next shock." Seven of the ten subjects in this group also stated in one way or another in their introspections that the thought of shock had acted as a strong motive to learn the maze rapidly and get out of the threat situation.

Because of this possibility one cannot say from these findings which situation caused the greatest affective reaction. In a study done by Paintal on the galvanic skin responses of normals and psychotics to shock and threat of shock, he found that the responses of normals to threat of shock was only fifty percent as great as for actual shock.<sup>7</sup> Since the intensity of the electrical stimulus is not reported, however, his study sheds little light on the present problem for one has no way of knowing whether the shock was great enough to elicit much affective reaction. This is particularly true in light of the fact that the shock was given first and then threat of further shock was given. This could easily have served to cognitively structure the stress situation so that threat of future shock no longer held much threat. Thus, one can only be safe in saying that in the present study, the unstructured stress situation was more detrimental to maze learning. The affective reaction to actual shock may have been just as great or perhaps even greater, but the clear cognitive structure in this stress situation may have enabled the subjects to use it constructively. More research will have to be done in this area, using a more sensitive indicator than maze learning, varying the shock

---

7 Autar S. Paintal, "A Comparison Of The Galvanic Skin Responses Of Normals and Psychotics", Jour. of Experimental Psychology, XLI, June, 1951, 425-428

differently, and equating for IQ and neurotic personal components, in order to substantiate this hypothesis.

## CHAPTER VI

### SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the relative effect of stress, induced by electric shock and threat of shock, on maze learning in a cognitively structured and unstructured situation. In other words, an attempt was made to discover if there is a difference in maze learning performance between subjects reacting emotionally to stress situations differing only in cognitive structure. In the event that a difference would occur, a further objective of the experiment was to determine which of the stress situations produces the greatest affect and which of the two is more detrimental or advantageous to maze learning.

A survey of the theoretical literature on fear and anxiety from philosophers, like Spinoza and Pascal, to present day clinicians, like Goldstein, revealed great divergence in theory and terminology regarding this topic. In spite of these differences, it was found that most of the theorists seem to stress the cognitive factor as one of the central elements in any reaction to threat. Cognitive unclarity is seen as essential for the arousal and perpetuation of anxiety and is the factor responsible for the feeling of helplessness which is an integral part of it.

While most of the theorists, especially those in the clinical area, seem to agree on this point, little experimental investigation has been done in order to substantiate or disprove it. Four experimental studies were cited, however, which do shed some light on the problem.

The first of the studies revealed that subjects under threat of electric shock do show signs of anxiety as indicated by Rorschach indices. It also demonstrated that this reaction to threat of shock significantly interfered with the ability of subjects to do simple arithmetical calculation mentally.

The second of these experiments, which was done on laboratory rats, showed that animals who were allowed to terminate electric shock themselves were less punished by it than the animals who could not control it, although the intensity and duration of shock was the same for each group. This difference was interpreted as a result of the greater cognitive structure present for the rats who could control shock.

The third study revealed some interesting purely qualitative observations. A shock of constant intensity was thought to have a different effect if the subject knows exactly how intense it will be and how long it will last than if the subject is kept uninformed regarding this.

The most pertinent experiment, which was discussed, involved subjects who received electric shock a few seconds after the appearance of certain re-current stimulus words in a word association list. Some of the subjects were aware of the connection existing between the shock and a certain word, while to others, the shock came as a complete surprise. Half of the subjects were permitted to administer the shock to themselves while the other half of the group were shocked by the experimenter. All aspects of the autonomic and motor reactions to the shock itself were found to be greater for subjects who were unaware of the connection between the shock and stimulus and were also greater for those who were shocked by the experimenter. These differences seem to point to the general inability of the unaware subjects to adequately tolerate



the stress imposed during the experiment and clearly demonstrate the importance of differences in cognitive structure.

The experimental group in the present study consisted of thirty white male students who were attending graduate and professional schools. The materials used were an electric shock apparatus and two stylus mazes of comparable difficulty. The entire experiment was divided into two sessions.

During the first session each of the thirty subjects was required to learn the stylus maze while blindfolded. The criterion of learning was two successive trials without error. All during the first session an attempt was made to put the subject at ease and avoid giving him the impression that he was being challenged, although he was urged to complete the maze learning in the least number of trials possible.

The thirty scores obtained were then matched into three groups of ten in such a way as to make all three groups as much alike in maze learning ability as possible. The critical ratios of the differences between the means and standard deviations of the three matched groups were found to be clearly insignificant. Thus, the three groups were of virtually equal maze learning ability before differential treatment during the second session. The groups were then arbitrarily assigned as either a threat, a shock or a control group.

When each subject in the shock group came for the second session he was told that he would again be required to learn a stylus maze while blindfolded. The only difference was that it would be a different maze, of comparable difficulty, and that he would receive an electric shock every ten minutes, three seconds after the sound of a bell. Each subject was then given a sample

shock so he would know exactly what it would feel like.

The procedure for the subjects in the threat group, during the second session was exactly the same as for the shock group with the exception that they were not given a sample shock and were not told how long it would last, when it would occur nor how intense it would be. They were merely told that sometime during the learning period they would receive shock and that the experimenter might wait until the very last second before the subject completed the task before administering it. No shock was given to the subjects in this group however.

The procedure for the control group was identical with that of the first session with the exception that they were required to learn the second maze. A record was kept of the number of trials required by each of the subjects in the three groups, to learn the maze, and at the end of the second session each subject was asked to rate himself on a scale for subjective anxiety and make introspective reports.

The results showed that the control group exhibited a significant reduction in mean number of trials on the second session. Since the mazes were of comparable difficulty, this reduction can only be attributed to the familiarity with the maze learning situation which the subjects gained during the first session. The subjects in the shock group showed an equally significant reduction in mean number of trials on the second session and, in addition, had a significantly smaller standard deviation. The subjects in the threat group did not exhibit a reduction in mean number of trials, however. In fact, the mean of the threat group was significantly higher than that of the other two groups, and the standard deviation was significantly greater than that of the

shock group.

On the self-ratings of subjective anxiety the control group reported little or no tension as a result of the learning situation. The reports of the threat and shock groups were approximately equal with estimates ranging from slightly moderate anxiety to just about severe.

Since the groups were of equal maze learning ability before differential treatment, and since all three groups had the same opportunity to become familiar with maze learning during the first session, it would be expected that all three groups would show the same significant reduction in mean number of trials shown by the control group, unless performance was altered by differences in experimental conditions. This was substantiated for the shock group because the performance of these subjects was almost identical with that of subjects in the control group on the second session. From this it can be concluded that administration of shock in situations having clear cognitive structure does not inhibit maze learning.

Contrary to what would be expected from the performance of these two groups on the second session, the threat group did not exhibit any improvement over the first session. Since these subjects were unable to profit from their first experience with maze learning, it can be concluded that threat of shock under unclear cognitive conditions does significantly inhibit maze learning.

In regard to the original objectives of this study, it seems clear that subjects do show a difference in maze learning performance as a result of stress situations differing in cognitive structure. This, in general, substantiates the importance of the cognitive element in any situation involving fear and anxiety. The results of this study also seem to indicate clearly that the

affective reaction to an unstructured stress situation is more detrimental to maze learning than the reaction to a situation having clear cognitive structure. This does not mean that the unclear cognitive structure produces the greatest affective reaction however. The subjects receiving the actual shock reported as much subjective anxiety as those in the threat group. Thus it is entirely possible that the structured nature of the situation for the shock group enabled these subjects to use their affective reaction constructively, to use it as a motivation for learning the maze as rapidly as possible to free them from the stress conditions and reduce the number of shocks. This would seem to be substantiated by the significantly smaller standard deviation of shock subjects during the second session as well as their introspective reports. More research will have to be done, however, in order to test this possibility.

## BIBLIOGRAPHY

### I. PRIMARY SOURCES

#### A. BOOKS

- Freud, Sigmund, New Introductory Lectures on Psychoanalysis, New York, 1933.
- Freud, Sigmund, The Problem Of Anxiety, 2nd ed., New York, 1936
- Hoch, Paul H., and Joseph Zubin, ed., Anxiety, New York, 1950
- May, Rollo, The Meaning Of Anxiety, New York, 1950

#### B. ARTICLES IN BOOKS

- Haggard, Ernest A., "Some Conditions Determining Adjustment During and Readjustment Following Experimentally Induced Stress", Contemporary Psychopathology, edited by Silvan S. Tomkins, Cambridge, Mass., 1946, 529-544.
- Hanfmann, Eugenia, "Psychological Approaches To The Study Of Anxiety", Anxiety, edited by Paul H. Hoch and Joseph Zubin, New York, 1950, 51-69.
- Hoch, Paul H., "Biosocial Aspects of Anxiety", Anxiety, edited by Paul H. Hoch and Joseph Zubin, New York, 1950, 105-118.
- Liddell, Howard S., "The Role Of Vigilance In The Development Of Animal Neurosis", Anxiety, edited by Paul H. Hoch and Joseph Zubin, New York, 1950, 183-196.
- Miller, Neal E., "Experimental Studies of Conflict", Personality and Behavior Disorders, edited by Joseph McVicker Hunt, Vol. I, New York, 1944, 436-459.

#### C. ARTICLES IN PERIODICALS

- Eichler, Robert M., "Experimental Stress and Alleged Rorschach Indices of Anxiety", Journal of Abnormal and Social Psychology, XLVI, July, 1951, 344-355.

- Mac Kinnon, Donald W., "A Topological Analysis of Anxiety", Character and Personality, XII, March, 1944, 163-177.
- Mower, O. Hobart, and Peter Viek, "An Experimental Analogue of Fear From A Sense of Helplessness", Journal of Abnormal and Social Psychology, XLIII, April, 1948, 193-200.
- Muenzinger, Karl F., and Frank C. Walz, "An Examination of Electrical Current Stabilizing Devices For Psychological Experiments", Journal of General Psychology, X, April, 1939, 477-482.
- Paintal, Autar S., "A Comparison of The Galvanic Skin Responses Of Normals And Psychotics", Journal of Experimental Psychology, XLI, June, 1951, 425-428.
- Tomkins, Silvan S., "Experimental Study of Anxiety", The Journal of Psychology, XV, April, 1943, 307-313.
- Tomkins, Silvan S., "An Analysis of The Use Of Electric Shock With Human Subjects", The Journal of Psychology, XV, April, 1943, 285-297.

## II. SECONDARY SOURCES

### A. BOOKS

- Cameron, Norman, The Psychology of Behavior Disorders, A Biosocial Interpretation, 2nd ed., Boston, 1947.
- Garret, Henry E., Statistics In Psychology and Education, 3rd ed., New York, 1948.
- Goldstein, Kurt, The Organism. A Holistic Approach To Biology, New York, 1939.
- Jacobson, Edmund, Progressive Relaxation, 3rd ed., Chicago, 1948.
- Luria, A. R., The Nature of Human Conflict, New York, 1932.
- Mc Dougall, William, Outline of Psychology, New York, 1923.
- Mowrer, O. Hobart, Learning Theory and Personality Dynamics, New York, 1950.
- Stern, William, Psychology of Early Childhood, New York, 1930.
- Willoughby, Robert R., "Magic and Cognate Phenomena: A Hypothesis", Handbook of Social Psychology, edited by Carl Murchison, Worcester, 1935, 453-516.

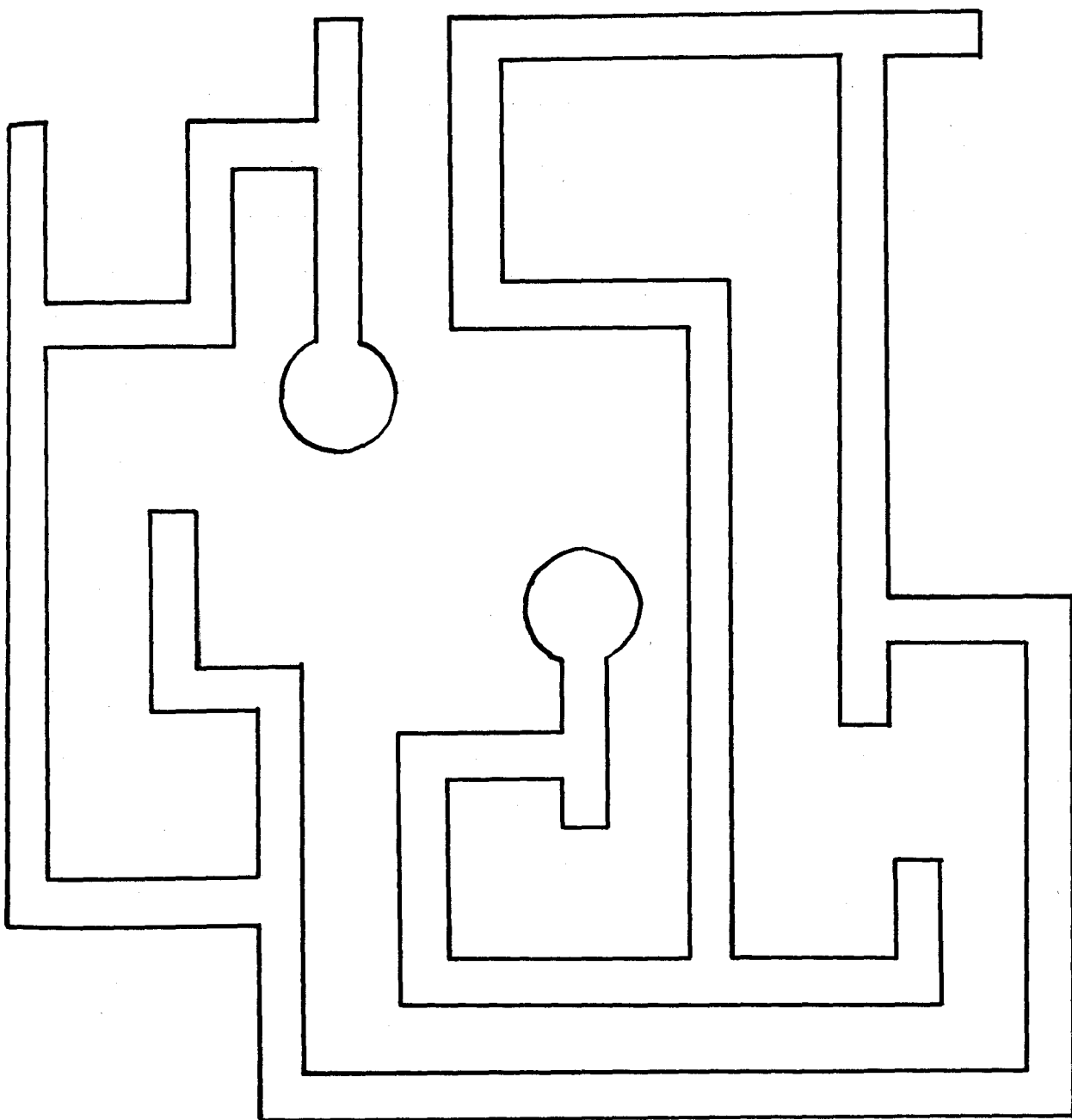
Woodworth, Robert S., Experimental Psychology, New York, 1947.

## B. ARTICLES

- Daniel, Robert S., "The Distribution of Muscle Action Potentials During Maze Learning", Journal of Experimental Psychology, XXIV, June, 1939, 621-629.
- Diethelm, Oskar, and Marshall R. Jones, "Influence of Anxiety On Attention, Learning, Retention and Thinking", Archives of Neurology and Psychiatry, XVIII, July, 1947, 325-336.
- Estes, William K., and Burrhus F. Skinner, "Some Quantitative Properties of Anxiety", Journal of Experimental Psychology, XXIX, October, 1941, 390-400.
- Heron, William T., "Individual Differences In Ability Versus Chance In Learning The Stylus Maze", Comparative Psychology Monographs, April, 1924, Part I.
- Hodgins, Donald R., T.P. Miller, Paul Christie, David D. Cohen, "Symposium On The Anxiety State", Mc Gill Medical Journal, XX, February, 1951, 1-35.
- Lantz, Beatrice, "Some Dynamic Aspects of Success and Failure", Psychology Monographs, VIX, 1945, 1-53.
- Malmo, Robert B., and Charles Shagass, "Physiologic Studies of Reaction To Stress In Anxiety and Early Schizophrenia", Psychosomatic Medicine, XI, January-February, 1949, 9-24.
- Muenzinger, Karl F. and Frank C. Walz, "An Analysis of the Electrical Stimulus Producing a Shock", Journal of Comparative Psychology, XIII, February, 1932, 157-171.
- O'Kelley, Laurence J., "Stimulus Generalization As A Function of Clinical Anxiety", American Psychologist, V, July, 1950, 327-340.
- Scott, Thurman C., "The Retention and Recognition of Patterns In Maze Learning", Journal of Experimental Psychology, XIII, March, 1930, 163-180.
- Wechsler, David, and Renatus Hartogs, "The Clinical Measurement of Anxiety", Psychiatric Quarterly, XX, October, 1945, 618-635.
- Welch, Livingston, and Oskar Diethelm, "Effect Of Pathologic Anxiety On Inductive Reasoning", Journal of Psychology, XXI, February, 1946, 201-226.
- Zander, Alvin F., "A Study of Experimental Frustration", Psychology Monographs, XVI, No. 44, 1942, 1-38.

## APPENDIX I

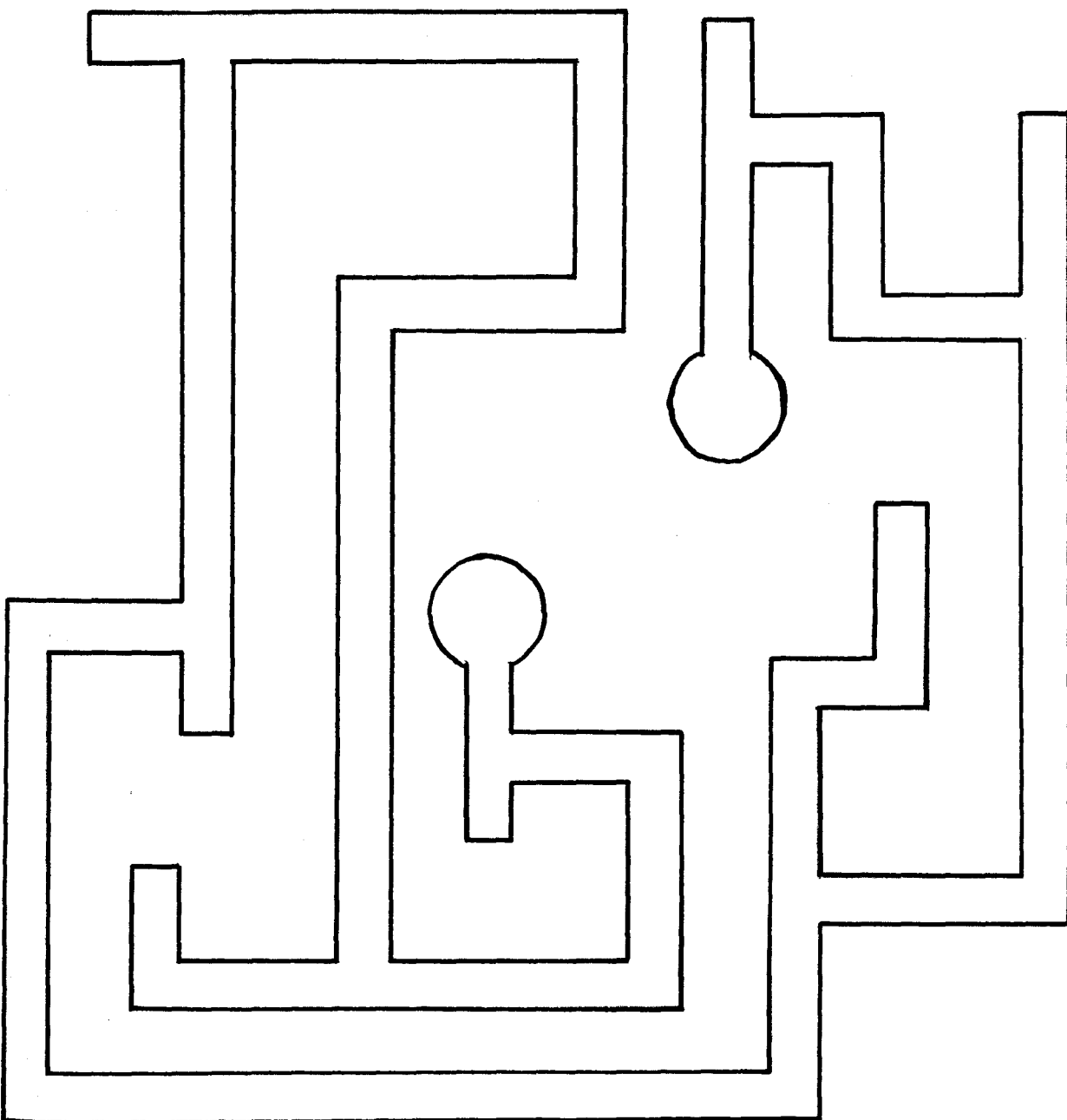
THE DESIGN OF THE MAZE USED DURING  
THE FIRST SESSION





## APPENDIX II

THE DESIGN OF THE MAZE USED DURING  
THE SECOND SESSION



## APPENDIX III

SAMPLE OF THE RATING SCALE AND  
INTROSPECTION BLANK

1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<u>Little Anxiety and</u>					<u>Moderate Anxiety</u>					<u>Severe Anxiety</u>				
<u>Tension.</u>					<u>and Tension</u>					<u>and Tension.</u>				

Further Reactions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

APPROVAL SHEET

The thesis submitted by Richard Joseph Haberle has been read and approved by three members of the Department of Psychology.

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

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

January 30, 1953  
Date

Frank J. Ober  
Signature of Adviser