

1979

The induction and attenuation of state anxiety in helping profession trainees during the initial counseling interview

Michael A. Crabbs
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The induction and attenuation of state anxiety
in helping profession trainees during
the initial counseling interview

by

Michael A. Crabbs

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
Anxiety: Operationally Defined	3
The Measurement of Anxiety	4
Anxiety in Helping Professionals in Training	7
Statement of the Problem	13
Research Questions	13
Hypotheses	14
Definitions	16
Delimitation	18
Overview	18
REVIEW OF LITERATURE	20
The Dimensions of Anxiety	20
The Measurement of Anxiety	49
The Impact of Anxiety on Helping Professionals	86
Anxiety Reduction Techniques	91
METHODOLOGY	104
Purpose of Study	104
Experimental Design	104
Subjects	107
Instrumentation	108
Stratification Procedures and Preliminary Data Analysis	111
Data Collection	120

	Page
Treatment of the Sample	126
Organization of Data	134
Analysis of Data	135
FINDINGS	143
Introduction	143
Results of the Statistical Analysis	144
Summary	174
SUMMARY, DISCUSSION, AND RECOMMENDATIONS	176
Summary	178
Discussion	181
Recommendations	189
REFERENCES	191
APPENDIX A: THE STATE-TRAIT ANXIETY INVENTORY	203
APPENDIX B: INFORMATION ON PHYSIOLOGICAL INSTRUMENTS	206
APPENDIX C: ACTOR TRAINING PROCEDURES	210
APPENDIX D: CLIENT DISPOSITION FORM	217
APPENDIX E: DEMOGRAPHIC DATA	219

LIST OF TABLES

	Page
Table 1. Test-retest reliability for college undergraduates on the State-Trait Anxiety Inventory	75
Table 2. Oneway analysis of variance for age between groups in the Solomon Four Group Design	114
Table 3. Separate variance estimates of the t value between male and female performance on the A-Trait scale	115
Table 4. Separate variance estimates of the t value between graduate or undergraduate performance on the A-Trait scale	116
Table 5. Oneway analysis of variance for A-Trait scores between groups in the Solomon Four Group Design	117
Table 6. Summary information of sample composition and performance on the A-Trait scale	118
Table 7. Summary information for age across treatment groups	119
Table 8. Summary of dependent measures taken on each group of subjects within the Solomon Four Group Design	136
Table 9. Differences between pre-treatment baseline and induction phases on three measures of state anxiety	147
Table 10. Differences between pre-treatment baseline and interview phases on three measures of state anxiety	148
Table 11. Differences between pre-treatment induction and interview phases on three measures of state anxiety	149
Table 12. Pre-treatment baseline to induction change score differences between experimental and control groups on three measures of state anxiety	152

	Page
Table 13. Pre-treatment induction to interview change score differences between experimental and control groups on three measures of state anxiety	154
Table 14. Post-treatment baseline, induction, and interview phase means and standard deviations for each group in the Solomon Four Group Design	156
Table 15. Post-treatment induction phase analysis of variance for electromyography	157
Table 16. Post-treatment induction phase analysis of variance for finger temperature	159
Table 17. Post-treatment induction phase analysis of variance for A-State scale performance	160
Table 18. Post-treatment interview phase analysis of variance for electromyography	162
Table 19. Post-treatment interview phase analysis of variance for finger temperature	163
Table 20. Post-treatment interview phase analysis of variance for A-State scale performance	164
Table 21. Pearson Product-moment Correlation Coefficients for three dependent variables within each pre-treatment phase	166
Table 22. Pearson Product-moment Correlation Coefficients for three dependent variables within each post-treatment phase	171

INTRODUCTION

It is difficult to dispute the contention that anxiety is a "pervasive psychological phenomenon" of modern society (Levitt, 1967, p. 1). In general, it is recognized as one of the most important concepts in theoretical attempts to explain and predict human behavior. As such, it plays an important role in the development of personality as well as in the dynamics of personality functioning. In recent years, with the growth and sophistication of the mental health professions and behavioral sciences, as well as the considerable attention from the print and nonprint media, the enormous impact of anxiety as a determinant of human behavior is being realized.

Within psychological literature, there is common agreement that anxiety is an unpleasant feeling state which serves as an important motivational determinant in the development and maintenance of maladaptive behavior (Bandura, 1956). Thus anxiety and the defense developed against it, may bring the individual up short immediately before a major achievement. It may take the joy out of life and replace it with apathy. It can choke off feeling what is experienced, and knowing what is felt. It can retard development, obscure memories, and lead to the development of elaborate protection systems (Mueller, 1973). Without restraint, anxiety may prevent self-understanding as well as create a sense of discomfort that will extend itself

through all aspects of the individual's existence.

To be useful scientifically through the examination of research problems, anxiety must initially be viewed as a "broad abstraction, a hypothetical entity which has no actual physical existence, but which has proven useful in explaining observable phenomena" (Levitt, 1967, p. 5). In this manner, anxiety is a hypothetical construct used to explain behavior. It is not inferred from experience but is a scheme which fosters additional investigation while providing a framework for predicting behavior and its consequences (English and English, 1958; Runes, 1960). Hence, anxiety is hypothetical because it lacks definite physical properties of a book or stone or observable fact that might be described by such a statement as "The flower pot lay broken on the patio." Viewed in a hypothetical and abstract manner it is no wonder that investigators of the human condition have been unable to agree upon a single precise definition.

Because of the nature of the construct, the range of possible definitions continues to grow even though researchers 20 years ago located more than 300 proposed definitions of this term (Cattell and Scheier, 1958). Each of these encompass the hypothetical nature of anxiety as well as the prediction of behavior. It is the prediction of behavior that today appears to be most important (Levitt, 1967). With this belief in mind, psychological researchers select a definition that operationally defines the anxiety paradigm. Following this approach,

this investigation will explore anxiety from a single operational definition while measuring its impact on helping professionals in training.

Anxiety: Operationally Defined

The words stress (Brown, 1977; Selye, 1974), fear (Fischer, 1970; Levitt, 1967; Martin, 1961), and phobia (Brown, 1974; Levitt, 1967; Martin, 1971) have been used constantly in conjunction with emotional states. Each of these appear almost as often in discussions of anxiety as does the word anxiety itself. These expressions seem to be employed in a number of different ways, usually without a specific explanation by the user of the intent. Such indiscriminate usage has resulted in confusion, and suggests that there is no consensus on the use of the words to describe this hypothetical construct. The theoretical concepts upon which this research is undertaken assumes that each of these words are synonymous with the term anxiety. Following from this, the operational definition of anxiety includes two aspects: 1) the multiple experiential dimension; as well as 2) the mode specific manifestation of anxiety.

In the first case, an anxious person may connote more than one meaning. It may mean that the individual is anxious at the moment, or contrastingly, the individual may be an anxious person. The two meanings are quite different and address

themselves to the multiple experiential dimension of anxiety. The former refers to an immediate and probably ephemeral state and is characterized as situational anxiety or state anxiety. The latter refers to a constant condition without a time limitation and is usually described as anxiety proneness or trait anxiety (Levitt, 1967). This multiple experiential dimension of the operational definition of anxiety has been explored by a number of researchers (Cattell and Scheier, 1958; Cattell and Scheier, 1961; Davidson and Schwartz, 1976; Jackson and Bloomberg, 1958; Johnson, 1968; Johnson and Spielberger, 1968).

Considering the second aspect, anxiety is operationally defined as a feeling or emotional state as well as a physiological-behavioral response to a certain set of conditions. In general a person's predisposition toward anxiety is largely responsible for determining the behavioral and emotional reactions. These reactions are manifested by the individual in two mode specific ways: 1) somatic or bodily tension and discomfort, and 2) cognitive or mental turmoil (Bowman, Roberts, and Giesen, 1978; Corah, 1964; Davidson and Schwartz, 1976; Eysenck, 1961).

The Measurement of Anxiety

Anxiety is viewed and interpreted as being a hypothetical construct, one which is useful in explaining observable behavior. The recognition of the complexities of this

construct, while advancing our understanding of the process, simultaneously poses an important methodological problem: how shall anxiety be quantified and measured?

Given the present multi-experiential view of anxiety, it is clear that all attempts at quantification must initially accept the psycho-physiological principle (Green, Green, and Walters, 1970) as an operational base. The principle specifies that "every change in the physiological state is accompanied by an appropriate change in the mental-emotional state . . . and conversely, every change in the mental-emotional state is accompanied by an appropriate change in the physiological state" (Green, et al., p. 3). As a result, to evaluate anxiety completely it is necessary to measure one's physiological (somatic) state and to assess one's mental-emotional (cognitive) state.

One important source in the assessment of anxiety is the experimenter's observations of physiological changes in the subjects. This is accomplished through the use of a vast and ingenious array of instruments and procedures that are designed to measure such phenomena as heart rate, respiration rate, muscle tension, skin conductance, finger temperature and brain states (Fischer, 1970; Martin, 1961). These techniques permit today's researchers to tap the completely internal, life-governing functions of the body, transforming these internal signals into externalized information-bearing signals. The

consequence of this rather extraordinary process of sampling a subject's physiological state is realized as the experimenter is now able to perceive, recognize, quantify, and statistically manipulate an individual's anxiety response (Brown, 1974).

Of those techniques and instruments described above, high levels of muscle tension and low finger temperature recordings are a common denominator for many individuals suffering from anxiety (Brown, 1974; Thompson, 1976). Muscle tension is measured by the electrical activity of skeletal muscular responses (i.e. electromyography--EMG) and is a widely employed somatic measure with an extraordinary range of applications (Davidson and Schwartz, 1976). Finger temperature measurement is accomplished by attaching a thermister to the finger which feeds the biological readings to the measuring instrument. This information on peripheral vascular function (Brown, 1977) as well as the electrical activity of skeletal muscles gathered from electromyography, are two somatic responses that are easily measured in anxiety research.

The attempt to assess the inner thoughts and feelings of individuals experiencing anxiety is a task of considerable difficulty (Anastasi, 1968; Davidson and Schwartz, 1976). The effort to see what the individual says about himself/herself has in most instances been accomplished through the administration of self-report inventories. In general these instruments consist of a series of items--statements or words--that are

descriptive of the manner in which anxiety is experienced. The subject responds by assigning a degree of truth or falseness, or agreement or disagreement, to the items. Each item contributes to the total score which is considered to be a direct, quantitative account of the respondent's anxiety level (Levitt, 1967).

Of the dozen or more self-report instruments which establish a subject's anxiety level, the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, and Lushene, 1970) is most appropriate for this investigation. This instrument extends the multiple experiential dimension of behavior to anxiety research. The State-Trait Anxiety Inventory includes more items which assess an individual's cognitive expression of anxiety than other available instruments (Davidson and Schwartz, 1976).

Anxiety in Helping Professionals in Training

Defined in terms of its cognitive and somatic influences, anxiety is frequently interpreted behaviorally in a manner that permits friends, associates, and loved ones to form opinions of the individual's well-being. In addition to the typical physiological reactions of rapid heart rate, rapid or irregular breathing, intense perspiration, and dizziness; an individual experiencing anxiety may report apprehension, restlessness, nightmares, fatigue, or forgetfulness (Martin, 1971;

Spielberger, 1972). At low levels, there is general agreement (Basowitz, Persky, Korchin, and Grinker, 1955) that anxiety stimulates an individual's sensitization to outside events while enhancing one's ability to cope with ambiguous, abstract, or even dangerous situations. This results in the integration of behavior and an increase in the ability for productive performance. However, as anxiety mounts, the individual's behavior loses its spontaneity, flexibility, and efficiency. At this stage, responses are rigid and mechanistic in manner with reduced ability to improvise and a tendency to be inhibited (Hanfmann, 1950).

Anxiety also plays an important part in the learning experiences of helping professionals in training. Bandura (1956) reports that while anxiety serves as an important motivational determinant in the development and maintenance of maladaptive behavior, the effectiveness of counseling is dependent upon the modification or elimination of the client's underlying anxiety. Hence, the trainee's "permissive and nonanxious response to the patient's conflictful expressions provides one of the important conditions that leads to the alleviation of the patient's anxiety" (Bandura, 1956, p. 333).

The work of Bandura has been incorporated into the principle of reciprocal affect postulated by Truax and Carkhuff (1967). This principle states that in any interpersonal situation, the affect elicited in one person is in kind and propor-

tion to the affect being transmitted by the other. As a result, the helping professional who is aware of the cues to his/her anxiety will be better able to consciously control and adapt his/her reactions for therapeutic ends and thereby function at a more effective level than the professional who lacks such insight.

The danger inherent for students in helping professional programs is that their training experiences will overemphasize the importance of theory (Bergantino, 1978) or techniques (Harman, 1977) in establishing and maintaining a counseling relationship. If this is the case, trainees become technique or theory bound, a simple carbon copy of an approach they subscribe to, while failing to become aware of themselves and their own style. Bergantino (1978) concludes: "if counselors do not have a keen awareness of their own behavior, they may very well think the behavior of their clients is abnormal" (p. 287).

Much has been written concerning the effects anxiety has on the counselor's behavior and the counseling relationship. Russell and Snyder (1963) explored anxiety in counselors through the measurement of 16 criteria on the Judgement of Verbal Anxiety Scale. In their research, they postulated that trainee anxiety would be manifested in any or all of the following ways:

. . . direct statement of anxiety; asking questions or changing the subject; interrupting; impersonal or premature interpretations; unnecessary reassurance; disapproval; intellectualizing, and not responding to the client's feelings; introjection of references of the counselor's own experiences; unfinished sentences; repeating words or phrases; stuttering; blocking; poor voice quality . . . ; apologizing for some fault in counseling technique; inappropriate laughter. (p. 36)

Bandura (1956) reports that the most frequent reactions observed and described include therapist-initiated interruptions in the form of questions that serve to divert the discussion, premature interpretations that block the client's expressions, paraphrasing the patient's statements without essential clarification and unwitting disapproval. Such reactions not only impede the progress of counseling, but may actually produce a negative counseling affect by reinforcing the strength of the client's anxieties (Roberts, 1977).

In his work in 1956, Bandura was one of the first to conclude that "anxious therapists were rated to be less competent psychotherapists than therapists who were of low anxiety" (p. 336). Since this time, several studies have investigated the relationship between anxiety and counselor performance (Bergin and Solomon, 1970; Fontaine, 1975; Pennscott and Brown, 1972; Rihani, 1973). Although the evidence is not pervasive, some of these studies reported a negative relationship between counselor anxiety and competence in the counseling relationship (Bergin and Solomon, 1970; Fontaine, 1975). Fontaine (1975)

argues that it is possible to conclude that anxiety is an intervening variable to the display of appropriate counselor skills. In addition to her research conclusions, she supports her view by reviewing several recent studies (Fry, 1973; Miller, 1972; Monke, 1971) investigating the topic.

A number of investigators have explored the efficacy of various treatments for reducing anxiety in helping professionals. The treatment approaches investigated include in vivo desensitization (Miller, 1971), alpha wave training (Fontaine, 1975; Meyer, 1973), discussion insight therapy (Gibson, 1977), implosion (Rihani, 1973), differential modeling (Cook, 1975; Riley, 1976) and microcounseling (Briggs, 1975). The treatment approach most often investigated is that of systematic desensitization (Carter and Papas, 1975; Fry, 1973; Miller, 1971; Miller, 1973; Monke, 1971; Rihani, 1973). Of these studies, only two assessed anxiety in an actual counseling interview (Carter and Papas, 1975; Monke, 1971) and of these two, only one (Carter and Papas, 1975) assessed anxiety using the multi-dimensional criteria reflecting cognitive and somatic anxiety states.

The research on treatment to reduce anxiety in trainees has failed to produce wide spread support for any specific approach. Such inconsistent results may arise from a number of factors. Roberts and Bowman (1977) indicate that one possibility is the inconsistency which arises when some researchers

focus on the subjective dimension of anxiety, while others the physiological; and still others may utilize observation of behavioral cues as an indicator of anxiety. Therefore, inconsistent results from differing studies may result because these systems operate at least partially independently. Yet another possibility is the fact that researchers have used a number of different instruments in assessing anxiety which may be focusing on different aspects of anxiety even within the same anxiety dimension. For example, within the subjective dimension, the work of Davidson and Schwartz (1976) has established that self-report measures may vary in their focus on cognitive and somatic anxiety states. Additionally, the literature is not supportive of any one particular technique (e.g. heart rate, blood pressure, temperature, electromyography, alpha wave, etc.) to assess changes in the somatic experience of anxiety. While there exists no preferred mode of treatment for the reduction of anxiety in helping professional trainees, those that have touted a specific approach have failed in yet another dimension--none have established guidelines for its use in training programs. Only recently (Crabbs, Crabbs, and Hopper, 1978) has this topic been given any serious consideration and the approach was largely theoretical and unsupported with research findings.

Statement of the Problem

It has been suggested that anxiety is an intervening variable to the display of appropriate helping skills. This investigation was designed to determine, initially, whether state anxiety can be induced in helping professional trainees through a verbal statement, and secondly whether state anxiety manifested by trainees in the initial interview can be attenuated through training which incorporates electromyographic (EMG) and finger temperature biofeedback principles. A pseudo-counseling interaction involving a confederate client was utilized to simulate an initial interview. Because anxiety was defined as having both cognitive and somatic components, a third aspect of the problem was to establish what relationship exists between the self-report and physiological assessment measures.

Research Questions

In order to consider if state anxiety induction can be attenuated, and if there is a relationship between cognitive and somatic assessment procedures the following research questions were formulated:

- 1) Does a verbal statement designed to induce anxiety, significantly increase state anxiety levels in helping profession trainees?

- 2) Does the treatment condition, electromyographic (EMG) and finger temperature biofeedback training, significantly attenuate state anxiety in helping profession trainees during an initial interview?
- 3) Is there a significant relationship between physiological and self-report measures of state anxiety in helping profession trainees in anticipation of and during the initial interview?

Hypotheses

To examine the above research questions, the following null hypotheses were formulated:

- Hypothesis 1: There is no significant difference in subjects' state anxiety between the baseline and induction phases as measured by electromyographic (EMG) or finger temperature levels.
- Hypothesis 2: There is no significant difference in subjects' state anxiety between the baseline and induction phases as assessed by the A-State scale of the State-Trait Anxiety Inventory (STAI).
- Hypothesis 3: When considering the baseline and induction phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as measured by EMG or finger temperature levels.
- Hypothesis 4: When considering the baseline and induction phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as assessed by the A-State scale of the STAI.
- Hypothesis 5: When considering the induction and interview phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as measured by EMG or finger temperature levels.

- Hypothesis 6: When considering the induction and interview phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as measured by the A-State scale of the STAI.
- Hypothesis 7: There is no significant difference in subjects' state anxiety in the induction phase as a result of the treatment as measured by EMG or finger temperature levels.
- Hypothesis 8: There is no significant difference in subjects' state anxiety in the induction phase as a result of the treatment as measured by the A-State scale of the STAI.
- Hypothesis 9: There is no significant difference in subjects' state anxiety in the initial interview as a result of the treatment as measured by EMG or finger temperature levels.
- Hypothesis 10: There is no significant difference in subjects' state anxiety in the initial interview as a result of the treatment as measured by the A-State scale of the STAI.
- Hypothesis 11: When considering the pre-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the baseline phase.
- Hypothesis 12: When considering the pre-treatment phase, there is no significant relationship between subjects' physiological and self-report measures of state anxiety during anticipation of the initial interview.
- Hypothesis 13: When considering the pre-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the initial interview.
- Hypothesis 14: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the baseline phase.

Hypothesis 15: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during anticipation of the initial interview.

Hypothesis 16: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the initial interview.

As a matter of statistical procedure, appropriate t-tests were performed for the first six hypotheses. Collectively these hypotheses seek to establish whether a verbal statement designed to induce anxiety results in significant increases in state anxiety levels within the subjects. Hypotheses 7-10 were tested through analysis of variance procedures appropriate for the experimental design. The application of analysis of variance to these hypotheses seeks to determine if the treatment, EMG and finger temperature biofeedback training, significantly attenuates state anxiety in the subjects. The final hypotheses, 11-16, which attempt to determine the relationship between self-report and physiological (EMG or finger temperature) measures of anxiety, were tested through the use of the Pearson Product-Moment Correlation Coefficient.

Definitions

In order to establish a common understanding of the principles, procedures, and terms upon which this research investigation is built, the following definitions are given.

1. Anxiety--This term is operationally defined as a feeling or emotional state as well as a physiological-behavioral response to a certain set of conditions or stimuli. A person's predisposition toward anxiety (i.e. anxiety proneness or trait anxiety) is largely responsible for determining the immediate but temporary elevations of anxiety during any given moment (i.e. state anxiety). Anxiety may be manifested in a diffuse nonspecific manner through 1) somatic or bodily tension or discomfort, and/or 2) cognitive or mental turmoil.

2. Biofeedback--This term refers to a process in which physiological information is fed back to the individual generating the information. As a result, biofeedback is conceived as a closed loop system connecting the mind with the body and the body with the mind in a continuous process. Today, awareness of this process is accelerated through the use of electronic equipment designed to monitor and feedback one or more physiological states (e.g. muscle tension, skin temperature, heart rate, etc.)

3. Biofeedback training--Although it begins with the same process as biofeedback this term is distinct. Biofeedback training is the process or technique for learning voluntary control over "automatically, reflexly regulated bodily functions" (Brown, 1977, p. 3). With biofeedback an individual may become aware of a present physiological state; but biofeedback training moves beyond the awareness by permitting the

individual to develop self-regulation techniques for control of bodily functions.

Delimitation

Because of the experimental nature of the treatment condition as well as the relatively homogeneous sample, the reader is cautioned about conclusions inferred from this study. It is not intended that the findings be applicable to any other population other than that from which the sample was drawn. As a result, conclusions, stated or implied, must necessarily be limited to Iowa State University graduate and/or undergraduate students from education and psychology who, with an interest in the helping profession, volunteered to participate in this study.

Overview

In Chapter I were presented the Introduction to the Problem, the Statement of the Problem, the Research Questions to be examined, and the Hypotheses to be tested.

In Chapter II, a review of the relevant literature will include sections which explore the concept of anxiety, anxiety assessment procedures, the effects anxiety has upon helping professionals, and mediation procedures for anxiety reduction.

In Chapter III, details of the design and methodology will be discussed. Particular attention will be addressed to the

following subjects: participants, instrumentation, data collection procedures, treatment, organization of data, and analysis of the data.

Chapter IV will contain the findings of this investigative study. As the data is presented, each hypothesis will be considered individually whether it was rejected or whether it failed to be rejected.

Finally, Chapter V will present a summary of the findings of this study, appropriate conclusions which can be drawn, and recommendations for future research.

REVIEW OF LITERATURE

The purpose of this literature review is to accurately define and explain the problem under investigation in this research. In order to enhance the explanation as well as facilitate understanding of the many dimensions of this study, this literature review is divided into four sections. The first section contains a review of literature which addresses itself to the concept of anxiety, as well as developing a single precise operational definition of this term. Following this, the second section reviews anxiety assessment procedures-- both physiological and cognitive. The third section investigates the effects anxiety has upon helping professionals, particularly as anxiety relates to the counseling interview. Finally, the fourth section discusses the research in which anxiety has been mediated through the use of biofeedback training techniques. Within this last section, the use of electromyographic (EMG) and temperature biofeedback training as an anxiety reduction technique for helping professionals is discussed.

The Dimensions of Anxiety

Historical perspective

Most students of human behavior realize that the concept of anxiety holds a central position in many theories of behavior

and/or personality. Because so much of human behavior is thought to be affected by this emotion, the discussion of this topic has resulted in little agreement as to the nature of the phenomenon (Fischer, 1970). Egyptian hieroglyphics were the first of man's many attempts to clearly reflect on this topic (Cohen, 1969). The medieval 11th century Arab philosopher, Ala ibn Hazm, asserted what he believed to be the universality of anxiety as a basic condition of human existence. In his writings, ibn Hazm proposed that there is "one end in human actions which all men unanimously hold as good, and which they all seek . . . the aim of escaping anxiety." Ibn Hazm further explains that "no one is moved to act, or resolves to speak a single word, who does not hope by means of this action or word to release anxiety from his spirit" (Kritzeck, 1956, p. 573). This notion that anxiety is the basis for all human behavior has been identified as originating within the Islamic thought (Kritzeck, 1956).

It is apparent that early attempts to deal explicitly with anxiety were primarily concerned with the conflicts and crises of the human condition. Because the goal during this age was not the formation of abstract intellectual systems, the most penetrating insights into anxiety and its related problems came from the provinces of philosophy (May, 1950). Although the belief in the rational capacity of the individual was re-established in the Renaissance period, it was not until later

in the seventeenth century that the emergent emphasis on individual reason received its philosophical formulation.

Descartes made individual reason the basis for self-identity when he stated his famous aphorism, "Cogito ergo sum--I think therefore I am" (Runes, 1960, p. 45). This sharp distinction between mind and the process of thought, on the one hand, and physical nature (extension) on the other, was in later centuries to be a focal point for the problem of anxiety (May, 1950). The belief that autonomous reason made possible the control of one's body and physical nature, as well as one's emotions, had vast anxiety dispelling effects. Alluding to the problem, Spinoza concludes that fear, anxiety, pain, and hopelessness arise "from a weakness of mind and therefore does not appertain to the use of reason" (1910, p. 175). His guidance on how to overcome these emotions is consistent with the rational emphasis of the time. That is, emotional control can be accomplished by paying attention to the "ordering of our thoughts and images" (Spinoza, 1910, p. 208).

While Spinoza's confidence in reason as the central issue in emotional control was firmly established, contrasting opinions could be heard throughout the seventeenth century. Blaise Pascal was one intellectual leader who did not share Spinoza's perspective. For Pascal, human nature was not so easily reduced to nor controlled by reason without taking into account the power of the emotions. While emotions were

conceived as both positive and negative, he saw values in emotions that were not comprehended in Spinoza's rationalism. As a result, Pascal concluded that "the heart has reasons which the reason knows not of" (May, 1950, p. 26) to illustrate that emotions often distort and overcome reason, while reason becomes mere rationalization.

The thoughts and ideas of Descartes and Spinoza dominated the seventeenth century. However, as the nineteenth century drew into focus, the earlier belief in the rational control of emotions had given way to the habit of repressing emotions (May, 1950). With disunity arising from this conflict, it is not surprising that anxiety should have emerged as an unavoidable problem in the 19th century. One individual, who sought to reduce this anxiety creating disunity was Søren Kierkegaard. In his writings, Kierkegaard viewed anxiety as the primary manifestation of human freedom or the recognition of the range of man's possibility and the capacity for self-awareness of the possibility. Linking possibility to creativity, Kierkegaard thus views anxiety developmentally. The sense of innocence or immediate unity of a child begins to deteriorate with the knowledge of good and evil. This results in a conscious choice entering the picture of possibility with the conflict in choice between negative and positive. It is within this choice where anxiety becomes evident. But as Kierkegaard concludes, self-hood depends upon the individual's capacity to confront anxiety

and move ahead despite it (May, 1950). Even though anxiety may be an exceedingly painful experience, it provides one's most precious opportunities for education as a human being.

The nineteenth century also witnessed the increasing concern of biologists with anxiety. The contribution of Kurt Goldstein, a neurobiologist, is of some significance because it yields a broad biological base for understanding anxiety. His central thesis is that anxiety is the subjective experience of the organism in a catastrophic condition (Basowitz, Persky, Korchin, and Grinker, 1955). As such, an organism is put into this catastrophic condition when it cannot cope with the demands of its environment and therefore feels a threat to its existence or to some set of values it holds essential for its existence. One particularly important aspect of Goldstein's theory has been highlighted in the writings of Rollo May (1950). Here special attention is given to that aspect of Goldstein's theory which establishes anxiety as an emotion without a specific object. Because anxiety attacks, in May's words, "from all sides at once" (1950, p. 52), attempts to flee are frustrated because the individual does not know where to flee.

When an organism is confronted with a catastrophic condition, certain bodily changes occur in preparation for fighting or fleeing the danger. The autonomic nervous system, thought to be the "bridge between the psyche and the soma" (May, 1950, p. 59) consists of two important divisions--the parasympathetic

and the sympathetic. The affects of stimulation of the former results in comfortable, pleasurable, or relaxed feelings while stimulation of the latter usually give rise to some form of anger, anxiety, or fear. Sympathetic stimulation results in a general state of excitement in the whole body, one which is capable of overruling the parasympathetic. Hence, an anxious individual may experience the accelerated heart beat, rise in blood pressure, or the release of adrenalin into the blood typical of a sympathetic reaction, as well as overruled parasympathetic reactions of inhibited digestion, decreased saliva, or a tendency to void the bladder or bowels (Grossman, 1973).

It appears that human beings vary enormously with respect to their capacity to cope with crisis situations. Why some individuals are so ill-prepared to deal with crises has been the domain of psychologists for some time. However, the formulation of early psychological theories of anxiety has only been accomplished with great difficulty. Two psychologists explore these areas of difficulty in their writing. Hanfmann (1950) speculates that the reason for the difficulty is "the close interrelationships of the phenomenon of anxiety with all other aspects of psychological dynamics, and in the extremely wide connotations of the concept as it is used" (p. 51). Fischer (1970), further developing the ideas of Hanfmann concludes that investigators of anxiety are typically faced with the following difficulties, "each theory starts with a different definitional

conception of anxiety; each poses a somewhat different question to the experiences with which it deals; and each makes its own particular metaphysical commitments" (p. 138).

Given these difficulties, the 20th century unfolded with renewed interest in the concept of anxiety and its impact on human behavior. According to Spielberger (1972), the earliest and most important contributor of this era, Sigmund Freud, moved rapidly to conceptualize anxiety as a discrete clinical syndrome having three distinct forms; reality anxiety, moral anxiety, and neurotic anxiety. Although each type of anxiety has an essential reference to the ego, they may be distinguished by the ego's transactions with a particular world. Hence, in the case of reality anxiety, the ego's concern is the external world; in the case of moral anxiety, it is the ego's dealings with the world of parental values and principles; and finally with neurotic anxiety, the ego's struggle is with the world of instinctual, unchosen, and often times alien needs and cravings (Fischer, 1970, Levitt, 1967). Although Freud's earlier writings attributed anxiety to repressed libido, this present conceptualization--with the focus on the ego--appears to make a more adequate description of the mechanics of anxiety (Fischer, 1970; May, 1950).

Significant contributions also arose from Freud's refinement of his theory of anxiety. Of considerable importance was Freud's view of how anxiety symptoms were formed. Reversing

his earlier belief that repression causes anxiety, anxiety was now viewed as the cause of repression. Implicit within this is that anxiety and its symptoms are no longer seen as merely the outcome of a simple intrapsychic process, but "as arising out of the individual's endeavor to avoid danger situations in his world of relationships" (May, 1950, p. 124). In other areas, Freud endeavored to overcome the dichotomy between internal and external factors in the manifestation of anxiety. Initially, internal danger was viewed as arising from some external situation, which might result in symptom formation--a protection against the anxiety-creating situation. However, the trend in Freud's work was toward a more organismic view of mankind--one that permitted the view of a person in a constellation of his relationships. Hence, the view that anxiety was almost exclusively an intrapsychic process was later modified to the view that "anxiety arises out of the individual's endeavor to relate himself to his environment" (May, 1950, p. 126).

Neo-Freudianism was a movement that sprang to life during the 1930s and 1940s. Its leaders, psychiatrist Harry Stack Sullivan, analyst Karen Horney, and social psychologist Erich Fromm, accepted much of Freud's early theory, but their deviations have resulted in the elaboration of points that can reasonably be spoken of as new ideas (Levitt, 1967; Martin, 1971). Sullivan developed his theory of anxiety upon the

concept of personality as essentially an interpersonal phenomenon. The infant, initially in an intimate relationship with the mother, is at the beginning of those relationships with significant others out of which his personality will be formed. Progressing first through biological needs of satisfaction and security, anxiety arises out of the infant's apprehension of disapproval from significant persons in his interpersonal world (May, 1950). It is upon a system of disapprobation and rewards that the infant proceeds through life while the self unfolds as a direct result of dealing with anxiety-creating experiences. Hence, it is through the self that whatever tendencies to evoke anxiety are excluded or dissociated from one's awareness. As Sullivan elaborates:

The self comes to control awareness, to restrict one's consciousness of what is going on in one's situation very largely by the instrumentality of anxiety with, as a result, a dissociation from personal awareness of those tendencies of the personality which are not included or incorporated in the approved structure of the self (Sullivan, 1947, p. 21-22).

For Horney, anxiety is the reaction to a threat to any pattern which the individual has developed upon which he feels his safety to depend (Horney, 1939). This view of anxiety leads to the formation of neurotic defenses built out of the disturbed relationships between the child and the significant others in his personal environment (i.e. usually his parents). In evaluating the potential conflict anxiety may create in

human behavior, Horney believes it is important to determine what value is being threatened, and specifically what neurotic defense, vital to the preservation of the individual's personality, is being confronted (May, 1950).

Psychological isolation has been the central concern of Erich Fromm's work with anxiety. Sharing Horney's concern for interpersonal relationships and Kierkegaard's emphasis on individuality and freedom, Fromm speculates that increasing freedom (i.e. individuation) is accompanied by threats, potential or actual, in which the individual becomes more aware of being a separate entity, of being alone. This separation from a dependent world is "often threatening and dangerous, creating a feeling of powerlessness and anxiety" (Fromm, 1941, p. 29). Rollo May, in reviewing the work of Fromm, concludes that it is "how the issue is met--whether by new positive relatedness on one hand or by surrendering freedom in order to avoid isolation and anxiety, by developing new dependencies, or by the formation of innumerable compromise solutions which allay anxiety--which will be decisive for the development of the personality" (May, 1950, p. 171). As the personality develops man has many opportunities to increase his market value (i.e. independence) while reducing his isolation. Hence it is the individual's valuation of self and the reflections of what others think, that determine if he/she conforms to cultural patterns. When conformity is chosen, it is done so under the

assumption that the individual becomes one with others in the environment, and therefore should not feel alone and anxious anymore (Fromm, 1941).

O. H. Mowrer, John Dollard, and Neal Miller, are each learning theorists that have addressed the construct of anxiety. In an attempt to reproach the view of American philosopher William James that anxiety was an instinctive unlearned reaction, Mowrer made an important impact on the learning approach to the phenomenon of anxiety (Fischer, 1970). After initial attempts to define anxiety in physiological terms, radical changes occurred in Mowrer's conception of anxiety. Operating under the assumption that anxiety-creating conflicts are of an ethical nature, he believed these sources of conflict to be social fear and guilt. What any individual fears is social punishment and withdrawal of love or approval on the part of significant others. It is these fears and the guilt associated with them which becomes repressed, and in this state turn to anxiety (May, 1950). As a result, this guilt theory of anxiety is seen as playing a constructive, positive role in human development. This positive role that is, to a large extent, learned; can serve to motivate trial-and-error behavior; and reinforce the learning of new habits (Fischer, 1970).

The work of Dollard and Miller, best exemplifies the development of Mowrer's principles. In their book Personality and Psychotherapy Dollard and Miller (1950) argue that learning

occurs when a drive, acting on the person in the form of a stimulus, is reduced as a consequence of a response. When drive reduction follows a particular response, it tends to reinforce that response and thereby increase its probability of recurring. This assumption, "that a sudden reduction in a strong drive acts as a reinforcement" (Dollard and Miller, 1950, p. 42), is fundamental to their approach to anxiety. In this perspective, anxiety is seen not as a primary drive like hunger, thirst, and sex, but as a secondary or acquired drive. Anxiety is learned or acquired through cues (i.e. the stimulus and circumstances surrounding the experience), stimulus generalization (i.e. identification with objects or conditions that are similar to the stimulus), and conflict (i.e. when the organism is motivated simultaneously by two strong competing drives) (Levitt, 1967). In summation, anxiety is seen by behaviorists as a learned secondary drive based upon a tendency to avoid pain which has been attached to a particular stimulus. This anxiety reaction, if strong enough, may be extended to other objects or events.

One final theorist, who has had considerable impact upon the topic of anxiety, is Alfred Adler. Central to his approach is his concept of "inferiority feelings" (Adler, 1917) as the basic motivation for anxiety. Adler believes that humans begin life in a state of biological inferiority and insecurity as is evidenced by the infant's state of helplessness and reliance

upon the parents. The infant's normal progression to overcome helplessness and achieve security is threatened by organic weakness, social discrimination, or by an adverse position in the family constellation. However, it is the individual's subjective attitude toward one's own weaknesses that brings about anxiety (May, 1950). For the anxious individual, anxiety blocks further activity, while serving as a cue to retreat to previous states of security. While used in this manner to avoid decisions and responsibilities, it is also frequently employed as an aggressive means of dominating others (Adler, 1927). Although the application of Adler's work to anxiety lacks the concreteness and specificity of others, May (1950) believes that substantial contribution to the understanding of the hypothetical construct of anxiety has been made "in the realm of the power struggles between persons and their social implications" (p. 135).

Each of the previously reviewed philosophies or theories have made a unique contribution to man's knowledge of the hypothetical construct of anxiety. Ibn Hazm, Descartes, Spinoza, Pascal, and Kierkegaard attempted to establish a philosophical basis for anxiety. The wisdom and rational learning which developed in these early centuries was tempered by an emphasis on the role of emotions, subjective though they are. Goldstein postulated that real understanding of anxiety rested in man's biological reaction to impending doom. With

Freud and Mowrer setting the stage for others, psychologists recognized the importance of human behavior in their efforts to define, analyze and interpret anxiety. Finally, Fromm broadened the perspective to include all mankind and social structures in his attempt to interpret anxiety culturally. In later years, some of these approaches have been substantially modified while others have remained intact. In any event, it should be noted that these early attempts to understand anxiety form the backbone for the contemporary approaches which follow.

Contemporary approaches

The range of possible theoretical approaches to the hypothetical construct of anxiety is, in principle, unlimited, and in practice very broad. As will be evidenced, the contemporary researcher or theoretician selects an approach and defines anxiety in a manner that is most in keeping with a particular theoretical orientation, hunch, whim, previous research, common sense, or personal experience (Levitt, 1967). Because of the extremely wide connotations of this construct, the words stress (Brown, 1977; Selye, 1974), fear (Basowitz, Persky, Korchin, and Grinker, 1955; Brown, 1974; Levitt, 1967; Martin, 1971), and phobia (Brown, 1974; Levitt, 1967; Martin, 1971) appear almost as often in discussions of anxiety as does the word anxiety itself. As a result, considerable confusion and little consensus exists on the use of these words to describe this hypothetical construct. However, in each

instance the important consideration is whether the theoretical approach to or definition of anxiety will eventually predict human behavior.

In general, anxiety may be aroused by any condition which threatens the integrity of the organism. For May (1950) the nature of anxiety can best be understood when one seeks further information about this threat. The threat may be to one's physical being or psychological life (death, or loss of freedom), or it may be to some other value which is identified with one's existence (patriotism, success, the love of another). Hence, May defines anxiety as "the apprehension cued off by a threat to some value which the individual holds essential to his existence as a personality" (May, 1950, p. 191). As a result, in anxiety the danger may be unspecified, vague, or objectless, but the special characteristics experienced by the individual are feelings of uncertainty and helplessness in the face of this threat.

In his theoretical treatment of this subject, May speculates that anxiety is no less intense in its painfulness than other affects. Although the terms "vague" and "objectless" are used as descriptors of this state, they refer to the level in the personality on which the threat is experienced. While the precipitant of some emotions like fear, anger, and hostility, may easily be established, the experience of anxiety is more diffuse and undifferentiated and represents a direct threat to

the individual's security pattern (May, 1950). As he concludes, "since anxiety attacks the foundation (core, essence) of the personality, the individual cannot 'stand outside' the threat, cannot objectify it, and thereby is powerless to take steps to meet it" (May, 1950, p. 192). One can conclude from this, that when anxiety attacks it is difficult if not impossible, for the individual to understand or establish a relationship with a stimuli, and therefore, less able to develop appropriate coping mechanisms.

Basowitz, Persky, Korchin, and Grinker (1955) agree with May's approach to anxiety when they write, "anxiety is . . . the conscious and reportable experience of intense dread and foreboding conceptualized as internally derived and unrelated to external threat" (Basowitz et al., 1955, p. 3). Similarities in these two definitions are found in the emphasis on the diffuse nature of anxiety as well as the manner in which anxiety threatens one's being, core, or essence. Yet Basowitz et al. (1955) draw further conclusions about the unpleasant qualities associated with anxiety. For them, anxiety states are consciously experienced by an individual who can observe and describe the unpleasant feelings and can report the duration of the feeling (Spielberger, 1972). As a result, physiological concomitants of anxiety-sweating, tension, reduced peripheral blood flow, etc.-do not themselves define the condition of anxiety without affect.

Martin (1961) defines anxiety as a learned response to external or internal stimuli. The nature of the reactions is viewed as a complex neurophysiological response that represents only one of many arousal states that can be "differentiated from a more general state of activation as arousal becomes more intense" (Martin, 1961, p. 234). Definitions of anxiety may be stimulus oriented (i.e. defining anxiety in terms of the circumstances--external situations or internal thoughts) or response oriented (i.e. defining anxiety in terms of the responses that compose the anxiety reaction). Martin (1971) employs the response oriented approach.

Hence, anxiety is the same regardless of the stimulus and it is unnecessary to make distinctions between words such as fear or anxiety.

The early work of Mowrer (1950) and Dollard and Miller (1950) have significantly influenced the approach of Eysenck toward the hypothetical construct of anxiety. He prefers to view anxiety as an integral part of neurotic behavior. As Eysenck (1975b) reports, there are three characteristics of neuroticism: 1) neurotic behaviors are learned, 2) neurotic behaviors are maladaptive and do not serve a purpose, and 3) neurotic behaviors involve strong emotions, particularly the emotion of anxiety. In Eysenck's causal theory of personality (Eysenck, 1967), anxiety arises as a result of two important factors. The first of these factors is emotionality

or the degree to which an individual lacks stability of and control over the experience of affect. There is less difference among people on this first measure of stability than there is on the second dimension. The second factor refers to the extrovert/introvert nature of the individual's personality and the experience of anxiety. From this perspective Eysenck concludes that individuals with high emotionality and extraversion typically fail to acquire the conditioned socializing responses which subvert anxiety arousal. Hence the experience of anxiety is a function of the interaction between one's personality and the multiple and complex stimuli from the environment. Such an approach reflects the classical conditioning approaches of the early learning theorists (Eysenck, 1975b).

Another writer who recognizes the complex nature of anxiety as well as the impact of socialization, or the lack of such, is Sarason. However, in his writings, (Sarason, 1975), a unique position is postulated. Childhood fears, if reinforced with effuse expressions of affection by significant others, serve as a clue to the reaction other fears will elicit. When this reinforcement of fears occurs with regularity, the experience of apprehension and tenseness becomes the normal state of the individual. The end product is anxiety which appears to have no identifiable noxious or frightening stimuli. Indeed, when this occurs, anxiety is marked by diffuse emotional reactions, feelings of uncertainty, and helplessness. The anxiety

reaction is complex, Sarason (1975) concludes, because the individual has been forced to adapt to multiple stimuli with little or no validation for the emotional uncertainty and worry which is experienced. One final statement by Sarason delineates the impact of this hypothetical construct on one's day to day experiences.

In anxiety, we see not only tendencies toward avoidance responses, but also tendencies toward approach responses which . . . pose conflicts of values for the individual. Anxiety is a potent influence in life, not only because of the people and situation we desire to influence. In some situations we may become more anxious over something we want to do to someone else than over what someone else might do to us. In other situations both of these tendencies may occur simultaneously (Sarason, 1975, p. 182).

As indicated earlier, the word "stress" is frequently used synonymously with "anxiety" as a description of an emotional state. However, the value of the word stress, noted by Aiken (1961), appears to be that its syntactical properties permit the writer to employ more graceful phrasing (e.g. "stressful" rather than "anxiety-evoking"). In any event, Hans Selye, called the father of stress theory (Dudley and Welke, 1977), has made a significant contribution which has a bearing on the hypothetical construct of anxiety.

Simply stated, Selye defines stress, albeit anxiety, as "the nonspecific response of the body to any demand made upon it" (1974, p. 27). Whether the stimuli is viewed as pleasant or unpleasant is immaterial, rather, an important consideration

is the organism's need to perform adaptive functions which re-establish normalcy. Among Selye's contributions to the literature of this field, is his belief that the body's stress reactions can exhaust themselves if overworked. This belief is built upon his understanding of the general adaptation syndrome which is a biological interpretation of the stress reaction. An individual responds to a stressor (i.e. stimuli) in a sequence of alarm, resistance, and finally exhaustion. Properly handled, stress is the spice of life, yet many individuals "burn the candle at both ends" and squander their adaptability recklessly.

For Selye, complete freedom from stress is death. According to this hypothesis, deprivation of stimuli, as well as excessive stimulation, are both accompanied by an increase in stress, frequently to the point of exhaustion. Yet, stress is not merely the physical manifestation of nervous tension. Rather it is the body's reactions to stressors which activate "the physiological apparatus involved in emotional or arousal reactions to threatening or unpleasant factors in the life situation as a whole" (Mason, 1971, p. 324). Finally, from this perception, stress is not something that must be avoided; it is even questionable whether it can be avoided. Beyond those times of excessiveness, stress provides the "necessary energy to maintain life, to resist aggression, and to adapt to constantly changing external influences" (Selye, 1974, p. 32).

Although Selye prefers the word stress to anxiety, a number of common factors exist with those theoreticians who prefer the word anxiety. While Selye defines the stimuli as being largely pleasant or unpleasant, Sarason chooses to use learning theory terms--approach/avoidance--to describe one's dilemma when confronted with stimuli. On yet another point of significance, there appears to be considerable agreement between May, Sarason, Basowitz et al., and Selye on the experience of stress or anxiety in a diffuse, nonspecific manner. In any event, all would agree that in its extreme form, stress or anxiety threatens the integrity of the organism. Theoretical agreement is seen again in the belief that failure to acquire appropriate socialization skills (Eysenck and Sarason) or lack of adaptability (Selye), contributes to the experience of anxiety.

In many instances, contemporary attempts to define and systematize the construct of anxiety have relied upon anecdotal observation as the main source of data. Since this is not the case in the work of Jackson and Bloomberg (1958), they have made a significant contribution to the literature. Their investigation involving 37 psychiatric patients attempted to explore the unitary or multiple dimensions of anxiety. Using a research design employing four supposed indicants of anxiety--digit span, the Taylor Manifest Anxiety Scale (Taylor, 1953), palmer sweating, and blink rate--these intercorrelations failed

to depart significantly from zero. This led the authors to conclude that manifestations of anxiety are "Multidimensional rather than unitary and may even represent uncorrelated dimensions" (Jackson and Bloomberg, 1958, p. 227). Hence, the manifestation of anxiety within an individual may be a function of the environment, the demands upon the individual, and the individual's perception and experience of the situation.

Building upon the work of Jackson and Bloomberg, Cattell and Scheier (1961) first postulated that anecdotal observations are not sufficiently effective in establishing a theoretical approach to anxiety. Rather, they argued that such attempts must be strengthened by an approach which employs statistical techniques to analyze relationships between precise and clinically meaningful measurements. The results of their massive study of the hypothetical construct of anxiety were published in The Meaning and Measurement of Anxiety (Cattell and Scheier, 1961). Although statistical in nature, their investigation also sought to allay common doubt among practitioners regarding the value of tests in anxiety research. Specifically, they worked with two dimensions: 1) trait dimension, where "the anxiety concept is attached to the factor most eminently involving behavior which clinicians agree on calling 'anxious'" (Cattell and Scheier, 1961, p. 25); and 2) type dimension, where the concept of anxiety will be attached to a factor only when scores on that factor significantly discriminate between

a clinical criterion group and normals.

Many writers (Endler, 1975; Izard, 1972; Levitt, 1967; Spielberger, 1972) have discussed the significance of the contribution of these two researchers. Most agree that two significant conclusions have emerged from their research. The first is a definitive statement of the variables of anxiety. From their work, conclusions were drawn that a person experiencing high levels of anxiety will manifest in varying degrees the following: maladjustment, emotional dissatisfaction, compulsiveness, worry, remorse, discouragement, frustration, and tension (Cattell and Scheier, 1961).

While anxiety is recognized as a complex of these variables, Cattell and Scheier have also established a second significant point--there are two distinct anxiety factors. These factors of trait or chronic anxiety and state or acute anxiety have emerged as principal personality factors in the study of anxiety. Many of the variables, previously enumerated, that contribute to state anxiety also have high loadings on trait anxiety (Cattell and Scheier, 1961). However, for both state and trait anxiety the pattern of loadings is quite different and because of this, Cattell and Scheier speculate that it is possible to assess both conditions from a single assessment instrument while remaining congruent with a theoretical approach to this hypothetical construct.

The investigations of Cattell and Scheier established the footings upon which other contemporary approaches have been developed. Levitt (1967) attempted to further define anxiety's two distinct factors. For this investigator, acute anxiety signified high intensity and relatively short duration, corresponding to an individual being anxious at the moment. Chronic anxiety, in contrast, usually reflects lower intensity and indefinite duration, corresponding to an individual being an anxious person in general. Hence, the term chronic is used to mean high proneness or predisposition to the experience of anxiety, whereas the term acute indicates situational anxiety of a relatively transitory nature (Levitt, 1967).

Cattell and Schreier, as well as Levitt's attempts to develop a sound theoretical approach to the hypothetical construct of anxiety has met with some resistance. Epstein (1972) is critical of the aforementioned research for 2 reasons: 1) by trying to assess all the variables of anxiety, one may actually change the experimental condition, and 2) although some interesting and suggestive relationships of variables to the experience of anxiety have been established, little effort has been expended to explore the reasons for the relationship--a short coming of any purely statistical approach in evaluating emotional responses (Epstein, 1972).

Although Cattell and Scheier (1961) initially defined anxiety in terms of its chronic and acute dimensions, it has

been Spielberger (1972) who has developed and enlarged this approach. From his perspective, an adequate theory of anxiety must first distinguish between the transitory and stable nature of this hypothetical construct, and must then differentiate between anxiety states, stimulus conditions which evoke anxiety, and defenses to avoid them (Spielberger, 1966). Preceding with these principles in mind, one must first understand the nature and distinctions between state anxiety and trait anxiety (i.e. acute and chronic anxiety as established by Cattell and Scheier).

State anxiety is conceptualized as an immediate and relatively effemeral state which varies in intensity and fluctuates over time. This condition is characterized by subjective, consciously perceived feelings of tension, apprehension, or foreboding. In other terms, state anxiety is seen as an outgrowth of a stimuli, and is representative of situational anxiety. In contrast, trait anxiety reflects a relatively stable condition which does not vary in time or intensity. Hence, trait anxiety refers to the differences between individuals in their disposition or tendency to perceive a wide range of situations as threatening and to respond with differential elevations of state anxiety. Following, state anxiety corresponds most closely to anxiety proneness (Spielberger, 1966, 1972).

The Trait-State Anxiety Theory, as presented by Spielberger (1972), assumes that arousal of anxiety states involves a process or sequence of events, ordered in time, initiated by external or internal stimuli that are perceived as dangerous or threatening by the individual. Examples of external stressors which might evoke anxiety are the imminent danger of injury or death to the person whose car is stalled on the tracks as the train rapidly approaches, or the threat to self esteem of the student called upon to recite in class. In contrast, the student who suddenly remembers that he or she has failed to prepare for an examination scheduled for the next class period, is experiencing an internal stimulus (Spielberger, 1972).

When the stimulus situation is appraised as threatening, Spielberger makes several theoretical assumptions: 1) a state anxiety reaction will be evoked, and 2) the intensity of this reaction will be proportional to the amount of threat the situation poses for the individual. Carrying this to its natural ends, Spielberger assumes that the duration of the state-anxiety reaction depends upon "the persistence of the evoking stimuli and the individual's previous experience in dealing with similar circumstances" (1972, p. 43). As a result, individuals high in trait anxiety are more likely to respond to threatening situations with elevations of state anxiety. Within these elevations, the individual may be driven to initiate psychological defenses that are effective in the reduction of

state anxiety. Frequently encountered stressful situations are likely to cause the specific coping mechanism to be incorporated into the individual's behavior for subsequent use in similar situations.

It is important to emphasize that Spielberger's belief that anxiety represents an emotional process--stress, perception of danger, and anxiety state reaction--refers to the cognitive, affective, and behavioral responses to a stimuli perceived to be threatening. The resulting anxiety state is the core of this process, the end result of the precipitating stressor (Spielberger, 1972). This view appears to correspond with the view of Selye (1974) as represented by his use of the general adaptation syndrome to define the stress reaction. When comparing the two approaches, stress in Spielberger's anxiety process corresponds to the alarm reaction of the general adaptation syndrome, perception of danger (i.e. activation of defenses) to the stage of resistance, and anxiety state reaction to exhaustion (i.e. behaviors arising from the threatening stimuli). Hence, anxiety as an emotional process provides the framework upon which the anxiety phenomenon may be investigated.

The state-trait, multiple experiential approach of Spielberger limits discussion to the situation in which anxiety arises (i.e. the situation in which the stimuli is perceived as being threatening). Yet anxiety represents only one of many

arousal states that can be differentiated from a more general state of activation as arousal intensifies. Anger, hunger, sex, and affiliation are only a few of the many emotional and motivational states. In contrast to these states, evidence suggests the presence of mode specific manifestations of anxiety in different individuals, or in the same individual at different times (Bowman, Roberts, & Giesen, 1978; Corah, 1964; Davidson and Schwartz, 1976; Eysenck, 1961). Thus it is not uncommon for a person who is physically tired and relaxed to lie down, unable to sleep because of a "racing mind." Alternately, physical discomfort resulting from bodily tension and autonomic stress may be experienced without the accompanying mental activity.

Cognitive anxiety corresponding to the "racing mind" is characterized by unwanted verbal cognitions (e.g. mentally enumerating one thing over and over) and unwanted visual-spatial cognitions (e.g. visual, kinesthetic, and olfactory images) (Davidson and Schwartz, 1976). Somatic anxiety defines the second of the mode specific manifestations of anxiety. In this instance, anxiety is characterized by diffuse bodily tension or stress without the accompanying cognitive symptoms.

Operational definition of anxiety

As has been alluded to earlier, the study of human anxiety has been handicapped by the absence of a consensual operational

definition. The multiplicity of definitions and their failure to define the subject in a comprehensive manner leads to confusion and difficulty in understanding conflicting experimental findings (Bowman, Roberts, & Giesen, 1978; Davidson and Schwartz, 1976; Levitt, 1967). However, Patterson (1966) establishes several critical elements which are mandated in theory formulation in general, and the definition of terms and concepts specifically. Acknowledging this, one must form an operational definition in a manner that "relates the concepts to observational data and thus make possible the study of the concepts in research or experimentation" (Patterson, 1966, p. 4). As a result, a succinct, yet comprehensive, definition permits the construction of hypothesis which can be tested.

The theoretical concept of this research leads to the following operational definition of anxiety. Anxiety is a feeling or emotional state as well as a physiological-behavioral response to a certain set of conditions or stimuli. In general a person's predisposition toward anxiety (i.e. anxiety proneness) is largely responsible for determining the immediate but temporary elevations of anxiety during any given moment. The experience of anxiety is manifested in a diffuse nonspecific manner through 1) somatic or bodily tension and discomfort, and/or 2) cognitive or mental turmoil. In this way, anxiety is viewed as a hypothetical construct. Lacking the physical properties of a book or stone, the construct includes a

multiple experiential base as well as mode specific manifestations which are necessary elements in the description of this phenomenon.

The Measurement of Anxiety

The term anxiety has enjoyed widespread popularity within the writings and research endeavors of psychologists, educators, theoreticians, and others. At the same time, procedures for measuring this emotional state have emerged from very tentative and highly questionable practices, to more sophisticated techniques employing electronic instruments and factor analyzed paper and pencil measures. While there appears to be evidence that these techniques will become more refined in the future, the purpose of this section is to abstract from the literature major trends, currently in practice today, in the assessment of anxiety.

Following the principles previously enumerated by Patterson (1966), conclusions can be drawn that one's theoretical or definitional approach to anxiety influences how one goes about measuring it. Martin (1961) carries this principle a step further when he wrote "that this formulation, rough as it is, cannot include all that anxiety means to all people" (Martin, 1961, p. 234). Therefore, to make this review of anxiety measurement procedures manageable, it is necessary to consider those techniques and procedures that are congruent

with this study's operational definition. As a result, physiological as well as psychological measurement procedures will be reviewed in terms of their relationship to the multiple experiential (i.e. state or trait) dimension of anxiety.

Physiological measures

The validity of self-report measures, in general, and subjective reports of feelings of anxiety in particular, have typically been the subject of controversy (Brown, 1970; Levitt, 1967). Because of the common use of denial as a defense mechanism and the belief that the individual will respond to self-report measures in a biased manner, physiological measurement techniques have been widely used to quantify the experience of anxiety. The reactions of the autonomic nervous system, which can seldom be controlled voluntarily and are seen by some (Levitt, 1967) as being immune from denial, are assessed to answer the question: Do distinctive patterns of responses emerge which are indentifiable as reflecting anxiety?

A number of measures of autonomic nervous system activity have been employed in an effort to establish the physiological factors in the anxiety experience. In most instances, these procedures were implemented in research designs investigating state anxiety. However, because there is considerable support for the concept postulated by Jacobson (1958)--that anxiety and relaxation are mutually exclusive--many investigators have

approached the hypothetical construct of anxiety by focusing on its absence, albeit relaxation.

Several early studies attempted to distinguish between two arousal states, one of which was represented as anxiety, through the use of a variety of physiological measures. Ax (1953) designed a study in which normal subjects were presented conditions in counterbalanced order designed to elicit reactions of either anxiety or anger. The anxiety condition in this instance was the subject's unsubstantiated belief that they were in danger of receiving an electric shock. In contrast to this, the anger condition was aroused by a particularly obnoxious laboratory assistant who attempted to insult and belittle the subjects. In the analysis of the difference scores (pre-stimuli to post-stimuli) the significant changes occurring in blood pressure, heart rate, palmar conductance, galvanic skin response, and muscle tension were directly attributable to the anxiety and anger conditioning.

Schachter (1957) replicated Ax's earlier study. However, he added a pain experience (cold pressor test) which was administered to all subjects in each of the three groups--hypertensive, potentially hypertensive, and normotensive subjects. In this investigation significant changes in heart rate, cardiac output, hand temperature, palmar conductance, and respiratory rate were acknowledged to result from the anxiety, anger and pain stimulus conditions.

Another study which provides similar results is the work of Funkenstein, King, and Drolette (1957). In this investigation, college students were stressed and then interviewed to determine if anger or anxiety was experienced. Objective physiological measurements of blood pressure, heart rate, and cardiac output were recorded for all subjects. Analysis of the percentage change from pre-stress levels indicated significant differences were readily apparent in these physiological measurement techniques.

Martin (1961), in his review of these and other studies employing physiological measures, concluded that there "does appear to be distinguishable response patterns that can be tentatively associated with the constructs of fear (anxiety) and anger" (Martin, 1961, p. 236). Heart rate, cardiac output, palmer conductance, respiration rate and muscle tension each increased significantly more in anxiety than anger.

In a series of three studies in the early 1950s, Lacey (Lacey, 1950; Lacey and Van Lehn, 1952; and Lacey, Bateman, & Van Lehn, 1953) used a variety of anxiety-evoking stressors with college students and mothers of children. Although one writer (Roberts, 1977) speculated that the stimuli were not clearly anxiety arousing, Lacey found that different subjects have different patterns of autonomic response. Hence, one subject may respond to an anxiety evoking stimuli with a marked elevation in heart rate and only a slight increase in skin

resistance, while other subjects may respond with the opposite pattern. From his work, Lacey inferred that one should not expect intercorrelations of autonomic change scores to be very substantial. The real impact of his investigations is summarized in the following statement: "The point remains clear, . . . for a given individual some physiological measures may be much more sensitive of change in anxiety level than others" (Roberts, 1977, p. 43).

The focus of the previously reviewed investigations has been anxiety assessment resulting from a stimulus situation. In each instance, the attempt to quantify the experience of anxiety established physiological measures which could successfully accomplish this. Other studies, although somewhat difficult to compare with those previously reviewed, have made similar attempts to quantify the experience of anxiety by assuming its presence by virtue of a psychiatric diagnosis.

In a study by Wenger (1957), resting physiological measures were taken on over 800 subjects. When comparing groups of anxious hospitalized patients with Army Air Force cadets, Wenger determined that 10 physiological measures--salivary output, systolic and diastolic blood pressure, sinus arrhythmia, heart period, sublingual temperature, finger temperature, respiration period, and tidal air mean--significantly discriminate between these groups. Further investigating these results, Wenger used a repeated measures design at a later time

with the hospitalized anxious patients. He discovered that only three of 20 variables originally assessed--palmar conductance, heart period and finger temperature--showed significant changes of lessened arousal.

Using physiological assessment procedures selected on the basis of Wenger's earlier work, Gunderson (1953) obtained measurements from both schizophrenics and normals during a non-arousal period. Nine measures--salivary output, dermographic latency, dermographic persistence, systolic and diastolic blood pressure, finger temperature, heart rate, respiration rate, and sublingual temperature--were significantly different. With the exception of sublingual temperature, all were in the direction of greater arousal for schizophrenics. Interestingly, Gunderson subsequently repeated the assessment procedures for a group of the same anxious schizophrenics diagnosed now as less anxious. He concluded that clinical improvement (i.e. lessened anxiety) had been accompanied by a decrease in arousal on the physiological measures.

The studies currently considered have established that a variety of physiological procedures can be used successfully to assess the anxiety experience. However, Martin (1961) speculates that different factors are in operation when an experimenter records resting state measures, in contrast to change scores associated with experimentally induced anxiety. In any event, when viewed in their entirety, these studies establish a

sound experimental foundation for anxiety assessment by physiological measurement procedures. It is important to emphasize that the focus of these studies was the attempt to determine the variety of techniques which could successfully discriminate the anxiety experience. In most instances, the use of such physiological measurement equipment would be impractical, as well as costly, in settings other than hospitals or similar medical facilities. Today's psychological or educational investigator is then faced with the dilemma of selecting physiological measurement procedures which can be adequately instrumented within the limitations of the research design. In the review of literature which follows, consideration will be given to forearm muscle tension and finger temperature as physiological measurement procedures which effectively assess the anxiety experience.

High levels of muscle tension and low finger temperature recording are a common denominator for many individuals suffering from anxiety (Brown, 1974, 1977; Davidson and Schwartz, 1976; Green, Green, and Walters, 1970). Muscle tension is measured by the electrical activity of skeletal muscular responses (i.e. electromyography--EMG) and is a widely employed physiological measurement procedure. Finger temperature measurement is accomplished by attaching a thermister to the finger which in turn feeds the signal to the monitoring unit. This information on peripheral vascular functioning (Brown,

1977; Lynch and Schuri, 1978) and muscle tension provide two easily instrumented physiological appraisals of the experience of anxiety. In the review of significant findings to date, considerable attention will be given to the use of these assessment procedures as integral parts in efforts to quantify and mediate the experience of anxiety.

Several years ago, Green et al. (1970) established that "through EMG and temperature feedback training, the peripheral nervous system is relaxed. Anxiety tension is reduced" (p. 160). Yet, only recently, with the succinct statement of Lynch and Schuri (1978), has the relationship between muscle tension and finger temperature been exhaustively explored. In a treatise that includes conclusions drawn from a review of the literature, as well as their own studies, muscular tension is seen as having two distinct effects upon circulation. Within the muscle, high levels of muscular tension as manifested by contraction instigates a rise in blood pressure and an increase in temperature. However, in nonactively constricted areas, including other muscles and limbs, a compensating constriction of blood vessels occurs. As a result, constriction of a muscle increases the demand for blood to that site, while reducing the flow through the muscle to other areas of the body.

In a recent study by Raskin, Johnson, and Rondestvedt (1973), electromyographic assessment procedures were used in assessing the anxiety experience. While attempting to reduce

anxiety in 10 chronic anxiety patients, it was determined that EMG was an appropriate procedure. Although the results of the study failed to establish a relationship between the absence of muscle tension and subjective reports of the same, there were important physical signs--reduction of insomnia and tension headaches--which supported the efficacy of this modality.

Another recent investigation (Leboeuf, 1974) also implemented EMG as a procedure to assess anxiety primarily through visceral symptoms in contrast to anxiety manifested as mainly muscular symptoms. After establishing a baseline through 3 months of recording procedures, the subjects received the treatment--relaxation training for home use and EMG biofeedback training. Results of this investigation indicated fairly clearly that EMG procedures were effective in establishing significant changes in both symptoms and generalized anxiety among those subjects with muscle symptoms as manifestations of anxiety. Leboeuf was not able to draw similar conclusions regarding the group whose experiences was predominantly manifested through visceral symptoms.

Determining differences between clinically anxious subjects and normals is yet another demonstration of the appropriateness of EMG measurement procedures. Kelly, Brown, and Shaffer (1970) set about to establish differences among the 20 paid volunteer subjects and the 30 emergency clinic patients who had major symptoms of anxiety. Surface electrodes were

located on the right forearm extensor muscle and measurements were recorded during rest and experimental stress. The results of this investigation indicated that EMG was significantly correlated with resting forearm blood flow, which in turn was found to differentiate significantly between the two subject groups. It was speculated by the authors that the effect of the use of EMG procedures was to establish that anxious subjects have higher resting EMG levels than nonanxious subjects. This conclusion is consistent with an earlier study by Sainsbury and Gibson (1954) and suggests that special consideration be given to the distribution of subjects among experimental or control groups.

A recently published study by Miller, Murphy, and Miller (1978) examined EMG measures in a dental setting with patients experiencing anxiety stress. Making the assumption that when one is free from anxiety (or when anxiety is reduced) progressively lower levels of EMG activity will be recorded, the experimenters established a set of treatment procedures for the 21 subjects. In a treatment regime that included EMG biofeedback training or progressive relaxation, experimental subjects experienced significant reductions in anxiety stress reactions. Throughout the study, EMG levels of the experimental group indicated a significant decreasing linear trend across training sessions. On the basis of this evidence and observation of the subjects in dental treatment, EMG physiological measures were

consistent with patient's self-report of less dental anxiety. An important point, arising from this study, was that EMG procedures effectively assessed the experience of anxiety with subjects "under natural conditions, which to them were highly stressful" (Miller et al., 1978, p. 1297). These results follow closely the suggested research procedures delineated by Gambrill (1977) that anxiety should be measured in the situation in which it is currently experienced. The work of Miller et al. (1978) has served to strengthen the implementation of EMG procedures within this type of experimental design.

Other studies have used EMG measurement procedures with alcoholics (Eno, 1975), introverts and extraverts (Leboeuf, 1977), anxious college students (Teague, 1976), and chronically anxious patients (Gallon and Padnes, 1976; and Lavalley, 1977). In each instance these procedures were used first to assess the experience of anxiety and then to record changes attributable to the experimental treatment. One final study implemented EMG measurement procedures in a treatment program designed to reduce test anxiety in medical students. Providing treatment conditions which included cognitive coping and EMG biofeedback training or progressive relaxation (Papsdorf, Gibson, and Gibson, 1978), medical student's anxiety reaction during the administration of a series of test (i.e. within a natural setting) was monitored. The results appear consistent with previous studies: reduction of anxiety, albeit test anxiety,

assessed through EMG procedures was consistent with objective appraisal of improvement in academic performance and subjects' self reports of reduced test anxiety.

As previously indicated, there appears to be a relationship between finger temperature and the experience of anxiety. Brown (1974, 1977) and Green, Green, and Walters (1970) have each discussed this relationship in their reviews of relevant research. However, before the review of this topic begins, the role of anxiety in headache pain must be established for the reader. Wickramasekera (1976) indicates that for many individuals correlated personality variables (i.e. anxiety and depression) may precipitate or exacerbate headache pain. In these instances in which anxiety serves as a precipitating factor, the manifestation of pain commonly occurs as migraine headaches in females, cluster headaches in men, and tension headaches in either gender. Recognizing, once again, the principle that anxiety and relaxation are mutually exclusive and are contraindicators of one another (Jacobson, 1958), much of the research in this area has implemented temperature measurement procedures to control headache pain. One needs only to recall the mode specific dimension of the operational definition of anxiety to understand that headache pain is simply the manifestation of the somatic experience of anxiety. The review of research on the use of temperature assessment procedures will include studies of this physiological

behavioral response to stimuli as well as studies where anxiety reduction is the primary focus.

The most comprehensive research in which temperature assessment procedures were used to study anxiety reduction was reported by Thompson (1976). Previously grouped into two levels of anxiety, high or low, thirty five experimental subjects received finger temperature training sessions during which they were instructed to raise their finger temperature. Appropriate control groups were established in order to assess the change attributable to the training process. Thompson noted that subjects who were highly anxious had significantly lower initial baseline temperature readings than those who were low in anxiety. Further experimental observations led Thompson to conclude that there is a "clear relationship between finger temperature and anxiety" (1976, p. 37). Yet another observation made was that highly anxious subjects showed significantly greater attained temperature readings in initial training than those of lower anxiety. However, Thompson correctly speculates that this was not a result of any real learned ability to control finger temperature, but more likely a function of lessening of anxiety in the high anxiety group as they became more acclimated to the laboratory environment. This conclusion appears to be validated by Wilder's law of initial values which states:

Given a standard stimulus and a standard period of time, the extent and direction of response of a physiological function at rest depends to a large measure on its initial (pre-experiment) level. The relations are as follows: the higher the initial value, the smaller the response to function-raising, the larger the response to function-depressing stimuli. Beyond a certain medium range of initial values, there is a tendency to paradoxical (reversed) responses, increasing with the extremeness of initial values (Wilder, 1967, p. 95).

The work of Thompson (1976) is the most complete and thorough investigation of the relationship between finger temperature and anxiety that has been reported in recent years. Although anxiety is somewhat of a nebulous concept with various shades of meaning, this research supports the claim that peripheral vasomotor functioning (e.g. hand temperature) is closely related to the experience of anxiety. This conclusion draws further support from the work of Russell (1972) who investigated the relationship between topical material of therapy interviews and anxiety. Using finger temperature measures as a dependent variable, it was discovered that subjects would experience 7-23°F decreases in finger temperature during discussion of conflictual material. Russell makes the observation that "all subjects reported impressions of increased freedom from feelings of 'psychic tension' with descriptions of mood state ranging from 'enjoyable' to 'euphoric'" (1972, p. 2729). Although Russell's statement is somewhat unclear and he does not speculate on the relationship, be it positive or negative, this investigation does confirm the existence of a relationship

between finger temperature and anxiety.

Bloom and Trautt (1977) provide additional insight into the assessment of anxiety by peripheral vasomotor functioning. While these investigators chose to use finger pulse volume rather than finger temperature in anxiety assessment, the procedures are enough similar to warrant inclusion in this review. Recalling that Lynch and Schuri (1978) believe contracted muscles inhibit the normal flow of blood to various body parts including the limbs, finger pulse volume and finger temperature each measure peripheral vasomotor functioning in a different manner. The distinction is further clouded by the writings of Bloom and Trautt (1977) when they alluded to the phenomenological experience of decreased finger pulse volume as cold hands. Hence, it is apparent that reductions in finger pulse are manifested by similar reductions in finger temperature--that is, finger pulse and finger temperature both measure blood flow to the extremities.

Working with 32 males and 32 females enrolled in a introductory psychology course, Bloom and Trautt (1977) randomly assigned subjects to eight conditions formed by the following factors: amount of threat (high or low), sex of subject (male or female), and type of feedback (suggestion or no suggestion). Following establishment of baseline finger pulse volume measures, subjects were exposed to the experimental conditions--threat or lack of threat of shock and

suggestion to remain "calm and relaxed" or lack of suggestion. During the presentation of the stimulus conditions, physiological measures of pulse rate and finger pulse volume were recorded. Initial analysis of the results indicate that there was no differential performance by sex on data collected from pulse rate or finger pulse volume measures. Further statistical consideration led the authors to conclude that "FPV (finger pulse volume). . . appeared sensitive to the experimentally manipulated stress" (Bloom and Trautt, 1977, p. 543). When comparing response to changes in physiological conditions, finger pulse volume proved to be more sensitive to experimentally induced anxiety than did pulse rate. The findings of this experiment buttresses the assertion concerning the relationship between stress, albeit anxiety, and peripheral blood flow, and is consistent with Thompson's (1976) work with finger temperature.

One study (Papsdorf, Gibson, and Gibson 1978) previously reviewed used finger temperature measurements adjunctively to EMG feedback for an additional anxiety measurement. In conjunction with an earlier study by two of the aforementioned authors (Gibson and Papsdorf, 1977), several important concepts have been established regarding finger temperature as an anxiety assessment procedure. In the latter study in which subjects were drawn from a graduate level counseling practicum class, these investigators randomly assigned subjects to one of

the three treatment groups: stress inoculated therapy with biofeedback, nonspecific discussion insight, and a no treatment control group. Baseline finger temperatures were compared with post treatment finger temperature recordings in a rather typical pre-post control group design. The findings from this study supported the primary treatment modality as more effective in the reduction of anxiety among participants. Finger temperature measurement procedures may, as concluded from both studies, serve as a basis for hypotheses generated regarding personality correlates associated with the mediation of anxiety. In this instance (Gibson and Papsdorf, 1977) those subjects who successfully increased finger temperature while experiencing corollary reductions in anxiety, were characterized by stability, introversion, belief in external locus of control, right hemispheric brain preference and preference for the use of projection as a defense mechanism. The use of finger temperature responses as indicators of anxiety further establishes the accuracy of the proposition that finger temperature increases under relaxed conditions and decreases under stressful, anxiety-evoking stimuli (Boudewyns, 1976). It is to this latter concept--warm hands, mean a cool quiet head (Anderson, 1971)--that this review of literature turns in attempting to evaluate the impact of finger temperature measures on headache pain in which the precipitant is anxiety.

A classic study exploring the relationship of finger temperature and migraine headaches was begun in 1969 and first reported three years later (Sargent, Green, and Walters, 1972). This early review of results arising from the pilot study was followed a year later (Sargent, Walters, and Green, 1973) by a comprehensive accounting. The investigators believed that psychologic stress, formed as a result of the perception of a stimuli as threatening, contributed to physiologic responses which were manifested as migraine headaches. The hypothesis they sought to test was that training for finger warmth is effective in amelioration of the migraine. (Note: the authors actually use the term hand warmth even though the measurements were recorded from the right index finger of each subject.) Extensive relaxation procedures were used with the 75 participants in this study, each of which had indicated severe pain associated with headache. Of these 75 subjects, a full 81%, followed for a period of 150 days, were helped to a significant extent. In this investigation, the use of finger temperature feedback procedures proved to be a facilitator to the acquisition of warm hands and the mediation of the inversely associated headache pain. From their experiences with 150 subjects over a 4 year period, the authors concluded that "all normal individuals have the physiologic capability to produce warmth in their hands. Psychologic factors seem to be important in determining success or failure in learning to increase blood

flow into hands. Persons who were comfortable with the hypothesis that thoughts and feelings have an influence over bodily process seemed to learn much faster. Also, it seems as though psychologic-mindedness is helpful in learning psychosomatic self-regulation (Sargent, Walters, and Green, 1973). While having no systematic data to support their latter intuitive conclusions, the authors speculate that rigidity in the application of a person's life values, particularly as this increases with age, and the need to be in command of situations are inhibitors to finger temperature warmth and reduced headache pain.

Although the work of Sargent et al. (1973) has had considerable impact on the treatment of headache pain, other researchers have attempted to confirm the efficaciousness of their preliminary findings. One study (Blanchard, Theobald, Williamson, Silver, and Brown, 1977) sought to isolate finger temperature feedback to subjects as being responsible for the reported improvement. Recruiting volunteers through local advertisement, 37 subjects were accepted into the study. The treatment conditions--autogenic and biofeedback training or relaxation training--were administered to the subjects previously assigned to one of the two groups. Recognizing that all of the data regarding headache pain (the dependent variable) was self-report in nature, both treatment conditions led to significant improvement of patients compared to a third,

untreated control group. Although there was an initial definite advantage for relaxation only training over biofeedback with autogenic training, these advantages appeared to dissipate after three months although the patients were still improved. The authors are reluctant to make judgements concerning the differential success between subjects, yet they do make relevant and pertinent observations. These observations tend to support the fact that finger temperature assessment procedures can accurately account for changes in anxiety as manifested in reduced frequency of headache pain and improved self-confidence and self control.

Diamond and Franklin (1976) appear to have arrived at similar conclusions working with a markedly different sample. Beginning with a group of 32 children with an average age of 14 years and 3 months (the youngest of which was 9 years old) all subjects were treated with biofeedback training (i.e. finger temperature and EMG feedback). Although the study relied upon the subjective appraisals of the authors in the determination of the relative success of the treatment (rather than statistical tests), they concluded that finger temperature and EMG biofeedback training is "the treatment of choice in children with migraine" (Diamond and Franklin, 1976, p. 5).

One final study (Sheridan, Boehm, Ward, and Justesen, 1976) explored this same topic in an exhaustive manner. While focus was on the effects autogenic training had on hand

temperature, the foundation was built upon Sargent, Walters, and Green's (1973) work on migraine headache. Using 40 students enrolled in an introduction to psychology course, the investigators monitored finger temperature during autogenic and autogenic with biofeedback treatment conditions. Following statistical analysis of the gathered data, the research concluded that autogenic methods only were superior to autogenic with biofeedback in producing warming of hands. While the data suggests a sex differential, the authors speculate that biofeedback is ineffective only with short term training such as the 5 day duration of this study. In any event, the purpose of this review is to further establish the finger temperature measurement as a frequently used modality in the assessment of anxiety as manifested by migraine headache.

Psychological measures

Before reviewing assessment instruments, it is important to recall the operational definition of anxiety upon which this research is undertaken. In general, a person's predisposition toward anxiety (i.e. anxiety proneness) is largely responsible for determining the immediate but temporary elevations of anxiety during any given moment. The experience of anxiety is manifested in a diffuse nonspecific manner through 1) somatic or bodily tension and discomfort, and/or 2) cognitive or mental turmoil. The previous pages have reviewed the literature in

relationship to the somatic appraisal of anxiety. At this point, consideration is given to assessment of the cognitive aspects of state and trait anxiety.

The most popular device for the measurement of cognitive anxiety in experimental situations remains the inventory, scale, or questionnaire. Levitt (1967) reports that the popularity of the inventory is a function of its outstanding research advantages. Ease of administration and scoring, reliability, and the fact that the inventory is less affected by extraneous variables, all serve as factors in the decision to use an inventory. On the other hand, response sets, the tendency to agree or acquiesce, the effect of social desirability, as well as the self-report nature of the inventory make the findings suspect. Over the years, any number of instruments have been used in the study of the anxiety experience. Levitt (1967) includes the following among those typically employed: the Manifest Anxiety Scale, the Institute for Personality and Ability Testing (IPAT) Anxiety Scale, S-R (stimulus-response) Inventory, Fear Survey Schedule, Affect Adjective Check List, Subjective Stress Scale, Freeman Manifest Anxiety Test, State-Trait Anxiety Inventory, Test Anxiety Questionnaire, Achievement Anxiety Test, and certain MMPI anxiety measures. Because of the variety available, the researcher should give special attention to the theoretical and methodological nature of any instrument under consideration. An instrument must be used

that is amenable to the goals of the research as well as important operational definitions.

Although many purport to measure anxiety, few instruments approach anxiety assessment from the mode specific manifestation (i.e. cognitive or somatic) of anxiety upon which this research relies. Davidson and Schwartz (1976) completed an analysis of the percentage of somatic, cognitive, and somatic/cognitive items in two of the most widely used anxiety questionnaires. Without going into detail regarding the scoring procedures, the results indicated that the "Manifest Anxiety Scale (Taylor, 1953) was composed of 30 percent somatic items, 44 percent cognitive items, and 26 percent cognitive/somatic items . . . the State-Trait Anxiety Inventory (Spielberger, Gorsuch, and Lushene, 1970) consisted of 15 percent somatic items, 55 percent cognitive items, and 30 percent cognitive/somatic items" (Davidson and Schwartz, 1976, p. 488). Although both inventories tap both cognitive and somatic items, the State-Trait Anxiety Inventory represents an easily administered assessment of cognitive anxiety. As a result, this instrument was selected to use concurrently with the somatic measures of electromyography and finger temperature in the quantification of the experience of anxiety. The State-Trait Anxiety Inventory is, therefore, most in keeping with the goals of this study as well as the operational definition of anxiety. The purpose of this section, is to review research investiga-

tions in which the State-Trait Anxiety Inventory has been used in the assessment of anxiety.

The State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, and Lushene, 1970) was developed to provide reliable, relatively brief measures of both state (A-State) and trait (A-Trait) anxiety. On the basis of knowledge gained in the early development of the STAI, a strategy was employed which favored selecting one set of items that was the best that could be developed for the measurement of A-State, and another set for the measurement of A-Trait. While a few items (5 in number) are either worded the same or contain the same key words, the remaining items are sufficiently different in content and/or connotation to be regarded as independent items. Subjects respond to each scale item (e.g. "I lack self-confidence") by checking one of the following: "almost never," "sometimes," "often," "almost always" (Spielberger, 1972, p. 36).

Individual items were selected for the A-Trait scale on the basis of significant correlations with the two other widely used and accepted measures of A-Trait anxiety, the Manifest Anxiety Scale (Taylor, 1953) and the IPAT Anxiety Scale (Cattell, 1957). Because this scale assesses individual differences in anxiety proneness, the items are thought to be impervious to situational stress and relatively stable over time. Several representative items from the STAI A-Trait scale

are indicated below:

I feel that difficulties are piling up so I cannot overcome them.

I worry too much over something that really doesn't matter.

I lack self-confidence.

I feel secure.

I take disappointments so keenly I can't put them out of my mind. (Spielberger, Gorsuch, and Lushene, 1970, p. 21).

State anxiety (A-State) has been previously defined as a relatively transitory emotional condition or feeling state that is characterized by subjective, consciously perceived feelings of increased somatic or physical tension and/or mental turmoil. The experience of state anxiety may vary in intensity and fluctuate over time as a function of the stimuli. Because of the focus of this scale (i.e. "How you feel right now."), items were included if they accurately reflected a subject's level of anxiety (A-State) in a priori stressful situations. The STAI, which measures changes in the intensity of transitory or situational anxiety over time, may be given on each occasion for which an A-State measure is needed (Spielberger, 1972). Several representative items from the STAI A-State scale are indicated below:

I feel calm

I feel over-excited and "rattled."

I am tense.

I am presently worrying over possible misfortunes.

I feel pleasant. (Spielberger, Gorsuch, Lushene, 1970, p. 22).

In the development and standardization of the STAI, a total of 3,300 high school and college students were tested. Norms are provided by sex for these populations as well as norms that are based upon the responses of 600 neuropsychiatric patients, general medical and surgical patients, and 200 young prisoners. A subject's raw score on each scale is used to find either a normalized T-score or a percentile rank.

While the authors sought to develop an instrument which could be easily administered in a relatively short period of time, considerable attention was given to the inventory's reliability. Test-retest procedures with subjects from the college student normative group were implemented to determine reliability. Table 1 indicates the reliability coefficients for this situation. As may be noted, the test-retest correlations for the A-Trait scale were reasonably high, ranging from .73 to .86 while those for the A-State scale were low, from .16 to .54. The low reliability coefficients were expected by the authors, because "a valid measure of A-State should reflect the influence of unique situational factors existing at the time of testing" (Spielberger et al., 1970, p. 9). However, the authors employed yet another measure of reliability, the Alpha coefficient of internal consistency, and discovered that this coefficient ranged from .83 to .92 for each scale. One can conclude that the test-retest reliability (stability) is relatively high for the A-Trait scale and very low, as would

Table 1. Test-retest reliability for college undergraduates
on the State-Trait Anxiety Inventory

Time Lapse:	1 hour T/R		20 day T/R		104 day T/R	
	N	r	N	r	N	r
<u>A-Trait</u>						
Males	88	.84	38	.86	25	.73
Females	109	.76	75	.76	22	.77
<u>A-State</u>						
Males	88	.33	38	.54	25	.33
Females	109	.16	75	.27	22	.31

be expected, for the A-State scale. The latter scale, which is influenced by situational factors, as well as the former scale each have a high degree of internal consistency (Spielberger et al., 1970).

As earlier noted, items selected for the A-Trait scale had a high correlation to other anxiety instruments. Evidence of the construct validity of this scale is noted in the following correlations between the STAI A-Trait scale and the Manifest Anxiety Scale (Taylor, 1953), .79 for males and .80 for females, as well as the IPAT Anxiety Scale (Cattell, 1957), .76 for males and .75 for females (Spielberger et al., 1970, p. 10). These concurrent validity data were based upon 126 females and 80 male college students.

Evidence of A-State construct validity is also provided by the authors. However, because of the volume of the data available and the nature of this paper, a brief review will suffice. The A-State scale was administered to 109 male and 88 female college students after each had experienced the experimental conditions. These stimuli, previously judged to be stressful or nonstressful, contributed Alpha reliabilities of .89 to .94 for males and .83 to .93 for females. From these findings, where the stressfulness of the experimental conditions had previously been determined, the authors concluded that the high Alpha reliabilities indicate appropriate construct validity for the A-State scale.

In the years since the publication of the STAI, the scale has been used to measure state and trait anxiety in several hundred research studies (Spielberger, 1972). The accumulated data regarding the use of this instrument indicates that the A-Trait scale is highly correlated with other measures of trait anxiety, and that the A-State scale provides a valid measure of changes in transitory anxiety in response to experimental or real life stress. The following represents several research studies illustrating how the STAI has been employed as a measure of anxiety.

Hodges and Felling (1970) administered the STAI and a stressful situations questionnaire to 228 undergraduate psychology students. The latter instrument was composed of 40 items which described stressful situations (e.g. "skiing out of control" and "taking a test you expect to fail"). After the subjects rated their apprehension or concern felt for each situation, correlations among the ratings for different situations were calculated. From the correlation matrix four factors were extrapolated: apprehension about classroom participation, concern about social and academic failure, apprehension in dating situations, and concern over pain and physical danger. The findings indicated that the STAI A-Trait scale correlated significantly with the first three factors, but no relationship existed with the physical danger or pain factor. The authors conclude that only situations that involve the possibility of

loss of self-esteem as a result of ego-involvement will be perceived as threatening to subjects.

Ninety male students enrolled in an introductory psychology course were the subject of a 1970 study by Snyder and Katahn (1970). The purpose of their investigation was to assess the experience of anxiety with situationally specific measures. A learning task was administered to each student with the variables being three levels of feedback (e.g. negative, average, and positive) and two levels of self-report (e.g. report or no report) describing how they felt at that moment. Through analysis of their data, the authors concluded that using a situational index of anxiety such as the STAI "high anxiety was associated with poorer performance" (Snyder and Katahn, 1970, p. 244). Hence, the speculation of anxiety theorists, (Spence and Spence, 1966) that high-anxiety subjects react more to stress than low-anxiety, and these responses result in poorer performance on complex learning tasks, was upheld. One noteworthy point made by the authors, was that A-State measures were significantly related to performance, while scores on the report scale collected during performance were not.

Lewis, Biglan, and Steinbock (1978) also sought to confirm the multiple experiential dimension of anxiety. Based upon the state-trait concept, measures of A-State were expected to decline following relaxation training, while A-Trait

measures were expected to remain unchanged. The 61 subjects recruited were placed into one of the treatment conditions-- self-administered progressive relaxation, self-administered progressive relaxation with money deposit, client devised relaxation plus money deposit, and self-monitoring (control)-- and were administered the STAI in pre-post treatment fashion. The results of this study confirmed the announced purpose-- measures of A-State fell following relaxation while A-Trait remained largely unchanged. It should be noted that the treatment conditions were differentially effective in the reduction of state anxiety. The self-administered progressive relaxation and client devised relaxation were more effective in reduction of state anxiety than were the same conditions with money deposit or self-monitoring.

In a study previously reviewed (Miller, Murphy, and Miller, 1978), biofeedback training, progressive relaxation training, or no training was used with three groups of patients experiencing a dental stress reaction. The STAI was administered to the patients prior to (and with anticipation of) dental treatment. Following the conclusion of this initial appointment the treatment conditions were administered over a 4 week period. Within two weeks of completion of the biofeedback or progressive relaxation training, subjects were seen for a second dental appointment. The STAI was again administered prior to the dental treatment in an identical manner to

the initial visit. The results indicate that the treatment groups of progressive relaxation and biofeedback training both showed significant decreases in A-State though the reductions shown did not differ significantly from one another. The authors also confirmed a similar result for A-Trait across all three groups. However, a number of factors made this reduction in trait anxiety suspect: the change, though significant was minimal and not nearly as great as state anxiety, and the study lacked adequate controls for the effects of testing (Campbell and Stanley, 1963) (i.e. the first experience with the dentist may have lessened the anxiety reaction in anticipating the second). With these points in mind, Miller et al. (1978) reported findings that were consistent with the operational definition of anxiety including the multiple experiential dimension of anxiety.

The possibility that the personality dimension of introversion-extraversion might account for individual differences in response to biofeedback training was the subject of Leboeuf's (1977) study. In this investigation, 16 introverts and 16 extraverts were administered the STAI before and after each of 5 EMG biofeedback training sessions. Analysis of the collected data indicated that introverts showed a significant decrease in state anxiety, while the extroverts failed to report significant decreases. When EMG pre-post measures were examined both group of subjects showed significant reductions

in muscle tension. The author did not speculate why such conflicting and confusing data resulted from his investigation. However, it is relevant to observe that the reduction in the manifestation of anxiety (i.e. muscle tension) in one group was quite apparently identified by the STAI with a corollary reduction in self-reported state anxiety.

The previous experimental investigations of anxiety phenomena using the STAI have produced findings which are generally consistent with the operational definition of anxiety adopted for this research. Other studies have employed the STAI with alcoholics in a relaxation training program (Eno, 1975), with counselors-in-training seeking to reduce their anxiety prior to practicum (Miller, 1971, Monke, 1971; Riley, 1976); and with college students seeking to relax aided by music (Stoudenmire, 1970). Three studies (Fontaine, 1975; Meyer, 1973; and Valle and De Good, 1977) explored the relationship between self-reported state and trait anxiety and the ability to enhance or suppress alpha wave density in a bio-feedback situation. It is apparent from this review that the State-Trait Anxiety Inventory is a consistently employed and well respected measure of anxiety proneness and situational anxiety. One noted theoretician believes the STAI to be the "most carefully developed instrument, from both theoretical and methodological standpoints" (Levitt, 1967, p. 71) of those instruments that are available.

The foregoing analysis of physiological and psychological measures of the experience of anxiety suggests a pattern of responses associated with this arousal state. That is, in spite of individual variations in response to real or experimentally induced anxiety, does a distinctive physiological-psychological response set emerge? One might assume that there would be cause to believe that substantial correlations exist between physiological and psychological measures of anxiety. However, Martin (1961) reports that "research thus far gives little ground for optimism that these variables will correlate very highly, if at all" (Martin, 1961, p. 243). From his perspective the problem of lack of correlation presents itself on two fronts: 1) few researchers have attacked this problem directly and as a result direct evidence is lacking, and 2) there appears to be individual variation in response to anxiety as measured by these assessment procedures. The latter point warrants further explanation. Martin (1961) speculates that those measures which show the most or least increase vary from person to person. Although Martin's (1961) review of the literature is generally supportive of this statement, research since this date has attempted to provide additional information to establish the relationship, if any, which exists between physiological and psychological anxiety assessment procedures.

It is apparent from a review of more recent research studies that this issue has not been adequately resolved.

Diblin (1970), while working with counselors-in-training, assessed physiological anxiety through heart rate and galvanic skin response procedures and psychological anxiety through the use of the STAI. She found a significant relationship between scores on both A-State and A-Trait and the measures of heart rate and galvanic skin response. Thompson (1976) concluded from his work with college students that trait anxiety assessed by the STAI was positively related to finger temperature readings. Although this significance was found only in the first of four temperature training sessions, it does provide substantive data. Finally, in an exhaustive study completed by Kelly, Brown, and Shaffer (1970), a significant positive relationship was found between self-ratings of anxiety at rest and forearm blood flow at rest, and self-ratings of anxiety during stress and heart rate during stress. However, there were many additional opportunities for these data to demonstrate correlations between these dimensions, yet no conclusion beyond those indicated should be considered. Interestingly, observer rating of anxiety in subjects appeared to correlate more closely with physiological measures than did subject appraisal. While these studies provide some indication of the relationship between physiological and psychological anxiety assessment, they fail, individually or collectively to establish, beyond a doubt, the nature and extent of the relationship.

Brown (1977) reviewed a number of studies on this topic and concluded there is a "puzzling general lack of correlation" (Brown, 1977, p. 70) between somatic and cognitive measurement procedures. More recently, other investigators have been "puzzled" with this lack of significant correlation. Rachman (1968), in a review of relevant research noted that colleagues observed a lack of correspondence between subject's reported feelings of calmness and EMG readings. The subjects stated they felt calm and relaxed, yet EMG reading showed no decline in muscle tension. Similar conclusions were stated by Leboeuf (1977). In this research, rank-ordered correlations between changes in subjective anxiety and EMG for extraverts (-.03) and introverts (.41) were both nonsignificant, although the latter was just short of significance. Bloom and Trautt (1977) using college students, reported correlations between physiological and psychological measures which were generally small and nonsignificant across baseline and experimental periods. These researchers speculate that the specific design of their study may have attenuated correlations between these indices. That is, a suggestion that subjects could remain calm and relaxed during anticipation of a threat, may have influenced the subject's self-reports but not physiological activity. Johnson and Spielberger (1968) also failed to find a relationship as they had expected. However, they noted that Lazarus and Opton, had made the following statement regarding the response to

stress.

The maximum correlations between various indicators of autonomic nervous system reaction are probably only modest even under the most favorable conditions. The discrepancies between stress-reaction indicators are even more marked and obvious when we compare different level of analysis, for example, the physiological and the behavioral response (Lazarus and Opton, 1966).

From the above it is apparent that the relationship between somatic and cognitive anxiety appraisal techniques is unclear and often confusing. Eysenck (1975a) addresses this problem in a straightforward manner. He concluded that many of these correlations had been worked out in a laboratory situation where the stimuli are artificially contrived. Psychometrically, this restriction on the range of the anxiety experience is known to reduce the size of the correlation drastically. He speculated that similar research, conducted in truly anxiety evoking situations (e.g. war), would lead to much high correlations. However, the real solution to this dilemma lies elsewhere. Eysenck postulates that "what we can legitimately conclude is that our theoretical understanding of the dynamics of the measuring situation is imperfect. In other words, what is required for proper measurement is a deeper theoretical understanding; without such understanding no proper measurement is possible" (Eysenck, 1975a, p. 454).

The Impact of Anxiety on Helping Professionals

In general, it is agreed that anxiety serves as an important motivational determinant in the development of behavior patterns (Bandura, 1956). At low levels, anxiety stimulates an individual's sensitization to outside events while enhancing one's ability to cope with ambiguous, abstract, or even dangerous situations (Basowitz, Persky, Korchin, and Grinker, 1955). This heightened arousal results in the integration of behavior and an increase in the ability for productive performance. However, as anxiety mounts, the individual's behavior loses its spontaneity, flexibility, and efficiency. In addition to the typical physiological reactions of rapid heart, rapid or irregular breathing, intense perspiration, and dizziness, an individual experiencing anxiety may report apprehension, restlessness, nightmares, fatigue, or forgetfulness (Martin, 1971; Spielberger, 1972). At this stage, responses are rigid and mechanistic in manner with reduced ability to improvise and a tendency to be inhibited (Hanfmann, 1950).

Anxiety also plays an important role in the learning experiences of helping professionals in training. Bandura (1956) suggests that counseling effectiveness is dependent upon modification or elimination of the client's underlying anxiety. As a result, the goal for helping professionals should be to respond to the client in a permissive and nonanxious manner.

This approach is consistent with the later work of Truax and Carkhuff (1967) in which they established the principle of reciprocal affect. This principle states that in any interpersonal situation, the affect elicited in one person is in kind and proportion to the affect being transmitted by the other. The impact of this principle is that helping professionals who are aware of anxiety in their own behavior will be better able to adapt their reactions for therapeutic ends. Much has been written and a considerable body of research results has been collected concerning the effects anxiety has on helping professionals and on the counseling relationship. This section will review the relevant research on this topic.

Several studies have investigated the relationship between empathy and counselor anxiety (Bergin and Solomon, 1970; Fontaine, 1975; Fry, 1973; Pennscott and Brown, 1972; Rihani, 1973; and Roberts, 1977). Fry (1973) for example, attempted to reduce anxiety manifested on four dimensions of the interactional process (emotional tone of voice, facial expression, eye contact, and posture) while raising levels of empathy, genuineness, and concreteness. Using the experimental conditions of desensitization and no treatment, the findings indicated that the experimental group was significantly more empathic, genuine, and concrete than the untreated control group. Because anxiety was not measured during the counseling interview, the authors could not conclude that the experimental

subjects were less anxious during the interview. As a result, the relationship between anxiety and the facilitative dimensions was not conclusively established by this investigator.

Fontaine (1975) investigated the effects of alpha wave training on the levels of anxiety and empathy in counselors in training. In this investigation, subjects' galvanic skin response was monitored during a counseling interview and a measure of cognitive anxiety was administered upon conclusion of the interview. Although the treatment effect was not significant, some correlations between anxiety and the relationship measures proved to be. Of the possible six correlations, two reached significance, reflecting a negative relationship between anxiety and empathy. Further support for this conclusion is seen by noting that five of the six possible correlations were in the expected negative direction. From these facts, Fontaine concluded that alpha wave training, although nonsignificant, appeared to increase the quality of the counseling relationship and has potential as a tool in anxiety reduction.

Pennscott and Brown (1972) present conflicting conclusions to the study by Fry. Working with 29 counselors in training during a full year guidance and counseling institute, measures of anxiety and empathy were found to have little or no relationship. Although counselor anxiety decreased significantly during this period, gains in empathy were nonsignificant, and

the correlation between anxiety change and empathy gain was low (.015). The authors speculate that the task complexity and personal threat experienced by the participants were not adequately measured by the Manifest Anxiety Scale (Taylor, 1953). Had the assessment occurred during the counseling interview rather than outside the interview, the authors believe that these measures would have been more highly correlated.

Another area of interest, is the relationship between anxiety and counselor competence. One early investigation of this relationship occurred in the work of Bandura (1956). The 42 participants rated themselves and each other on anxiety and insight for three central conflict areas--dependency, hostility, and sexuality. Subsequent to this, the therapists' supervisors rated them on psychotherapeutic competence, the dependent criterion measure. Correlation coefficients established a negative relationship, significant at the .01 level, between competence and anxiety as measured by the three conflict areas. No such relationship was established between insight and competence. As a result, Bandura concluded that "anxious therapists were rated to be less competent psychotherapists than therapists who were of low anxiety" (Bandura, 1956, p. 336).

Using the STAI A-State scale and other measures of ambiguity, semantic differential, and counseling skills. Riley (1976) sought to determine the effects of two peer modeling treatments

on 23 subjects. While the treatments had no effect on reducing any of the aforementioned variables or on counselor competence, other relevant conclusions were drawn. Using independent judges to rate counselor competence, subjects rated more effective within the counseling interview were less anxious. Similar results were found for each of the variables of ambiguity, semantic differential and counseling skills.

The investigation of Cook (1974) stands in contrast to those of Bandura and Riley. This research explored the effect of modeling strategies on counselor performance, anxiety and tolerance of ambiguity using three self-report measures of anxiety and a measure of counselor performance and behavioral anxiety during a 10-minute counseling interview. The results pertinent to this review indicated that persons who had relatively high anticipatory anxiety scores before participating in a counseling interview tended to receive higher counselor performance ratings.

A number of other studies have attempted to establish the effect anxiety has upon helping professionals. One study (Briggs, 1975) found that subjects high in anxiety typically manifested postural rigidity and frequent verbal interpretations (i.e. attempts by the counselor to offer explanations for the client's behaviors). Carter and Papas (1975) measured several indices of counselor anxiety: verbal behavior, body movement, eye blink, and head movement. Using systematic

desensitization, awareness training, and a no treatment control, these investigators successfully mediated speech disturbance, extraneous body and small hand movements through the first two treatment procedures. Monke (1971) evaluated counselor anxiety within subjects' counseling interview by having trained observers use the Judgement of Verbal Anxiety scale (Russell and Snyder, 1963) (e.g. asking questions or changing subject, repeating words or phrases, stuttering, apologizing, inappropriate laughter, etc.). Although the treatment design failed to reduce the manifestation of verbal anxiety, additional support for the debilitating nature of counselor anxiety was established.

In general, these studies tend to support the hypothesis that anxiety does not serve as a positive force when experienced by counselors in a counseling relationship. While these studies establish the diverse ways counselor anxiety may be manifested, other studies designed elaborate treatment conditions to reduce counselor anxiety. Those studies are reviewed in the following section.

Anxiety Reduction Techniques

The foregoing literature review has sought to establish the theoretical antecedents, assessment procedures, as well as the impact on helping professionals of anxiety. Because this concept appears to impair an individual's cognitive and somatic

responses to a variety of stimuli, one can conclude that persons serving as helping professionals should be relatively free from their own anxieties in the counseling interview (Fontaine, 1975; Truax and Carkhuff, 1967). A considerable body of research has been accumulated in which anxiety reduction procedures have been implemented with helping professionals. The purpose of this section is to review relevant mediation procedures for anxiety, particularly as they have been applied to members of the helping professions.

Of the various treatment approaches, systematic desensitization appears to be a frequently used and often investigated technique. Wolpe (1973) first utilized this procedure as a method for breaking down anxiety-response habits in piecemeal fashion. More specifically, systematic desensitization is a weakening of an emotional response by means of muscle relaxation and repeated exposure to a situation which evokes anxiety (Wolpe, 1973). Miller (1973) compared two groups of counselors in training; one of which received systematic desensitization training while the other did not. Using a pre-post control group design, results indicated that the systematic desensitization group achieved a significant reduction (.01 level) of state anxiety as measured by the STAI A-State scale. Miller (1971) and Rihani (1972), each working with 58 and 54 counselors in training respectively, discovered that systematic desensitization failed to produce any significant results. In

the former study, the effects of participation in an in-vivo desensitization, self-desensitization, and a no treatment control group upon subject's performance on several self-report instruments was examined (Miller, 1971). In this instance no significant reductions in anxiety were reported. Rihani (1972) compared the effects of a series of treatment conditions--implosion, systematic desensitization, and no treatment--on accuracy of reflecting and communicating client feelings, in addition to expected reductions in anxiety measures. Once again, systematic desensitization did not produce significant results, although implosion did.

Monke (1971) attempted to reduce the initial anxiety experienced by beginning counselor trainees before and during the first counseling session. Using a combination of relaxation and systematic desensitization procedures, Monke assessed physiological (e.g. galvanic skin response and heart rate) and psychological (e.g. state anxiety) manifestations of the anxiety experience. Although the physiological measures failed to produce any significant experimental and control group differences, the A-State scale of the STAI established that there was a significant difference due to the treatment. These results indicate that systematic desensitization procedures, when compared with a no treatment control group, produced a significant change in self-reported state anxiety without corrolary changes in the somatic state of the counselors in training.

Carter and Papas (1975) assessed anxiety in counselors with a similar set of procedures to that of Monke (1971). Using the multidimensional criteria reflecting subjective and physiological anxiety during the counseling interview, a comparison between systematic desensitization, a placebo awareness treatment, and a no-treatment group was effected. In this study, six indicators of anxiety used as dependent variables were also assessed to determine the effects of the treatment conditions. Results indicated that there was no significance between treatment groups but that the treatment groups were significantly more effective in reducing four of the indicators related to speech disturbance, body movement, and self-reported anxiety. That is, the two treatment groups of desensitization and placebo awareness were equally effective in reducing anxiety.

Another treatment strategy frequently used to reduce anxiety is modeling. Two studies (Cook, 1974; Riley, 1975) have investigated the effect of peer modeling procedures in improving beginning counselor interview performance. Using 30 students enrolled in a Master's degree program, Riley (1975) administered the A-State scale of the STAI and other instruments designed to assess counselor tolerance of ambiguity and self and ideal self-concept. Subjects were assigned to one of three treatment groups: pre-practicum subjects were paired with practicum students in the first, pre-practicum subjects

observed several practicum students in an interview in the second group, and subjects in group three were used as controls (no treatment). The groups were compared before and after treatment as well as a third time after the subjects had conducted three counseling interviews of their own. The counseling interviews were rated by the subjects and by independent judges to assess counseling performance. The results indicated that the two peer model treatments had no effect on any of the dependent measures: tolerance of ambiguity, state anxiety, self or ideal self-concept, anxiety toward the counseling situation, and counseling performance.

Similar results using peer modeling approaches is found in the research of Cook (1974). In this study the treatment groups consisted of subjects assigned to two groups: the first group of subjects viewed videotapes of counselor models who were at first apprehensive, but later coped with various counseling problems; and in group two, subjects viewed videotapes in which the model maintained a calm and competent demeanor, while successfully dealing with several counseling problems. Statistical analysis of the dependent variables--level of anxiety, tolerance for ambiguity, and interview performance--indicated no significant differences between the two treatment groups. One apparent weakness in this study, which prevents the reader from drawing conclusions regarding the effectiveness of treatment was the lack of a control group in the research design.

Although microcounseling procedures may be adapted to meet anxiety training requirements (Crabbs and Jarmin, 1976), only one study has (Briggs, 1975) altered the focus of this largely skill acquisition program in an attempt to reduce counselor anxiety. In this study, 30 counselor trainees were assigned to one of two groups: treatment or no treatment. The treatment group participated in critiques of videotapes made by participants, discussion of anxiety indicators, and practice in reducing the anxiety indicators. Results indicated that counselor trainees who participated in the microcounseling treatment exhibited fewer of the six anxiety indicators on post-test videotapes (as rated by independent judges) than did the control group.

Biofeedback is another approach which has been implemented as a counselor anxiety reduction technique. A number of books (Brown, 1974, 1977; Green and Green, 1977), articles (Henschen, 1976; Peper, 1976), films (Green, 1977) and audio tapes (Danskin and Lowenstein, 1977) have explored the topic and defined its potential. In its simplest form biofeedback refers to "any information that we receive about the functioning of our internal organs, such as the heart, sweat glands, muscles, and brain" (Stern and Ray, 1975, p. 1). Astor (1977) establishes what he believed to be the three goals of biofeedback training--awareness, control, and transfer. Through feedback of biological signals the individual gains information and

becomes aware of internal physiological functioning. The individual controls his/her bodily state by manipulating mental thoughts as well as self regulating internal states while continually receiving new feedback on any physiological change. Through continued training success, the individual is encouraged to transfer the laboratory learning to real life situations where functional benefits can be experienced.

The use of biofeedback procedures for the treatment of health and psychological problems (Winer, 1977) has been hailed as "a new wonder of the world" (Astor, 1977, p. 615). Many have concluded that only now can pathways be established to understand the relationship between mind and body. While the uses and merits of biofeedback in education (Peper, 1976) and counseling (Danskin and Walters, 1975) have been established, the research in the use of biofeedback in the preparation of helping professionals is still in its early stages. Only recently (Crabbs, Crabbs, and Hopper, 1978) have counselor educators been encouraged to use biofeedback as an adjunctive counselor training technique. Although the article by Crabbs et al. (1978) served to establish a rationale and protocol, their approach was largely theoretical and unsupported with research findings. To date, a limited number of research investigations, which are reviewed in the following pages, have explored this topic specifically.

Two recently published studies (Bowman, Roberts, and Giesen, 1978; Bowman and Roberts, 1978) have contributed substantially to the literature of this topic. Although these two studies do not employ biofeedback as a treatment modality, they do use biofeedback assessment procedures in studying anxiety as a variable that may exist within a counselor during a counseling interview. In the first of these studies Bowman, Roberts and Giesen (1978) used 21 students enrolled in a counseling program as subjects. Physiological responses of heart rate and skin conductance were monitored and measures of stress, anticipatory anxiety and task anxiety was administered on a self-report basis. After a baseline was established, subjects were informed that they would be either reading an article or interviewing someone very shortly. Following an anticipation period, subjects were required to perform the task. The major results of this study are: 1) anxiety was found in the subjects during the counseling interview as evidenced by the significance of both physiological and self report measures of anxiety; 2) anticipation of the initial interview contributed to the experience of anxiety as measured physiologically; 3) no significant relationship was established between physiological and self-report measures of anxiety; and 4) subjects could predict to a moderate degree how much anxiety they would experience in the interview. Using very similar procedures to replicate their previous work, subjects were instructed that they would

either be conducting an interview or be a participant in a non-counseling interpersonal conversation. As one might expect, this experiment led to similar results to those just reviewed. In this instance, physiological and self-report data indicate that both situations, interview or conversation, were anxiety provoking for the subjects. Secondly, subjects' level of anxiety in anticipation of the stimulus was highly related to their anxiety levels in those stimulus situations. Finally, it was again determined that subjects could predict to a moderate degree how much anxiety they would experience in the counseling interview. Taken together, these two studies (Bowman et al., 1978; Bowman and Roberts, 1978) suggest that anxiety responses function within a related system. That is, while physiological and self-report measures of anxiety indicate a strong relationship during anticipation and stimulus conditions, each of the two systems--physiological and subjective self-reports--appear to behave in an independent but parallel fashion.

The following three studies, each employs a biofeedback technique to mediate the experience of anxiety in helping profession trainees. In Meyer's (1973) study, 39 employment counselors were randomly assigned to experimental or control controls. The experimental groups received alpha rhythm biofeedback training for three hours or until the criterion level was reached (e.g. 2/1 ratio of alpha to nonalpha production). All subjects were then administered the STAI and heart rate

and galvanic skin response measures were recorded during the viewing of a safety film depicting industrial accidents. Analysis of variance procedures were used to analyze the data collected in the post only control group design. While Meyer reported that the experimental group had significantly lower anxiety scores on the STAI (.01 level of significance), the physiological measures of anxiety failed to indicate any significant differences. From this Meyer (1973) concluded that alpha rhythm training would be useful in reducing trait or generalized anxiety while permitting increased subjective awareness of state anxiety.

Fontaine (1975) examined the effects of alpha wave biofeedback training and empathy skill training on levels of self reported anxiety, physiologically monitored arousal levels, levels of accurate empathy, and the quality of the counseling relationship. Forty beginning counseling students were assigned to the following treatment groups: 1) alpha wave training and empathy training, 2) empathy training, 3) alpha wave training, and no treatment control group. Upon completion of the treatment, subjects conducted a 20-minute counseling "intake interview" with a male confederate client. Galvanic skin response was monitored during the interview and subsequently subjects completed several self-report measures (i.e. Truax Accurate Empathy Scale and S - R Inventory of Anxiousness). The results indicated that there was no significant differences

between control and experimental groups on the anxiety or empathy measures. Further analysis of these data led Fontaine to conclude that there was no significant treatment effects for empathy training and no significant treatment effects for alpha wave training on the physiological measure (galvanic skin response) or on paper and pencil anxiety measures. However, the quality of the counseling relationship was rated significantly better (.05 level of significance) by counselors who received alpha wave training and by the confederate client. Fontaine concluded that "the results of this study support the use of biofeedback alpha wave training as a technique to increase the quality of counseling relationships and as a potential tool in anxiety reduction" (1975, p. 16).

Gibson (1977) undertook an investigation to compare the effectiveness of stress inoculation therapy aided by biofeedback and discussion insight therapy in the reduction of state, performance, and physiological anxiety. The sample consisted of 24 counselors in training who were randomly assigned to the two treatment groups and a third no treatment control group. Pre-post treatment levels of state, trait, performance and physiological anxiety were assessed by the IPAT Anxiety Questionnaire, the Neuroticism Scale of the Eysenck Personality Inventory, videotaped counseling interviews, and variations in peripheral blood flow. The findings of the hypothesis testing were: 1) biofeedback assisted stress inoculation therapy was

more effective than discussion insight therapy in the reduction of performance anxiety associated with counseling, and 2) there were no significant differences between the groups on final measures of state, trait, and physiological anxiety. However, when descriptive statistics were compiled on all dependent measures, Gibson (1977) suggested that the biofeedback aided stress inoculation therapy appeared to be more effective than discussion insight therapy in reducing state, trait, and performance anxiety.

The research on the reduction of anxiety in counselors in training has failed to produce wide spread support for any specific mediation procedure. Roberts and Bowman (1977) indicate that one possibility is the inconsistency which arises when some researchers focus on the subjective dimension of anxiety, while others the physiological; and still others may utilize observation of behavioral cues as an indicator of anxiety. Therefore, inconsistent results from differing studies may result because these systems operate at least partially independently. Yet another possibility is the fact that researchers have used a number of different instruments in assessing anxiety which may be focusing on different aspects of anxiety even within the same anxiety dimension. One need only direct attention to the work of Davidson and Schwartz (1976) to see this occur within the subjective dimension. They established that self-report measures may vary in their focus

on cognitive and somatic anxiety states. Additionally, the literature is not supportive of any one particular technique (e.g. heart rate, blood pressure, temperature, electromyography, alpha wave, etc.) to assess changes in the somatic experience of anxiety.

METHODOLOGY

Purpose of Study

The purpose of this study was to investigate the cognitive and somatic effects that an intervening variable, anxiety, has on helping profession trainees during an initial interview. Initially, a verbal statement was administered to determine if anxiety could be induced in the trainees. Secondly, it was to be determined if state anxiety, manifested by trainees in the initial interview, could be attenuated through training which incorporates electromyographic (EMG) and finger temperature biofeedback training. Because anxiety was operationally defined as having both cognitive and somatic components, the third and final purpose of this study was to determine the existing relationship, if any, between self-report (i.e. cognitive) and physiological (i.e. somatic) assessment measures.

Experimental Design

The experimental design employed for this research investigation was first discussed by Solomon (1949) and represents a combination of the widely used Pretest-Posttest Control Group Design and the Posttest-Only Control Group Design. This procedure, entitled the Solomon Four Group Design (Campbell and Stanley, 1963), was particularly appropriate for this investigation and is represented graphically as follows:

Group	Design				Treatment
1	R_S	O_1	X	O_2	Experimental
2	R_S	O_3		O_4	Control
3	R_S		X	O_5	Experimental
4	R_S			O_6	Control

Where R_S represents the random assignment of subjects after stratification to separate treatment or control groups; where X represents the exposure of a group to an experimental condition; where O refers to a process of observation and measurement; and where the Xs and Os in a given row are applied to the same specific persons.

In this design, groups 1 and 2 (a typical pretest-posttest control group design) were exposed to the same series of conditions to induce anxiety as well as the initial interview (which may be anxiety inducing in itself). Without the addition of groups 3 and 4 the main effects of testing and the interaction of testing and treatment (X) would be indeterminable. The implementation of the Solomon Four Group Design permitted the researcher to proceed with the knowledge that change due to the treatment (X) is not influenced by replication of the process of observation and measurement after the treatment. By using experimental and control groups with and without a pretest there was increased generalizability and prestige (Campbell and Stanley, 1963).

In considering the operational definition of anxiety, Spielberger (1972) has established that anxiety-prone

individuals--those high in trait anxiety--experience state anxiety (i.e. situational anxiety) more frequently than those who are low in trait anxiety. Because it was important to control for the potential variability of trait anxiety between the four groups, the experimental design of this investigation called for a stratification of the otherwise random sample as described by Murthy (1967) and Cochran (1953). In addition to the point made by Spielberger, Wilder's (1967) Law of Initial Value must be considered. This law specified that "given a standard stimulus and a standard period of time, the extent and direction of response of a physiological function at rest depends on its initial (pre-experiment) level. The relations are as follows: the higher the initial value, the smaller the response to function-raising, the larger the response to function-depressing stimuli" (Wilder, 1967, p. viii). Through stratification procedures, this design attempted to insure that subjects were randomly assigned and that each treatment group would not differ significantly on baseline measures of trait anxiety. If such differences were permitted to exist, the results and conclusions would be suspect. The actual stratification procedures are discussed fully in the following section.

Subjects

Because the stated purpose of this study was to investigate the effects of anxiety on helping profession trainees, target populations were established where subjects would be in training for a career in this field. As a result, the departments of Psychology and Counselor Education in Professional Studies at Iowa State University were selected as the populations from which volunteers would be solicited. In the case of Psychology, volunteers were solicited from an undergraduate, upper division, course entitled "Principles and Methods of Interviewing" (Psych 425). For Professional Studies, participants were solicited from students enrolled in introductory but graduate level counselor education courses, "Counseling Theories" (Co Ed 560), "Counseling Adolescents and Young Adults" (Co Ed 561), and "Elementary School Counseling" (Co Ed 565).

Because this study proposed to investigate the effects of anxiety on helping profession trainees, it was important that the subjects be in the introductory stages of their preparation for this field. As a result, it should be noted that when subjects volunteered to participate each was in the pre-practicum stages of training and were not employed in the field for which they were being prepared--counseling or psychology. However, some subjects, having a prior interest in the helping professions, were fully or partially employed as teachers,

resident advisors (dorm assistants), teaching assistants, child care workers, or volunteers for community social service agencies. Yet, all subjects met the criterion for selection, minimal pre-practicum training for entry into the helping professions.

There were 24 subjects who initially volunteered and subsequently completed all requirements for participation. Of these 24, 11 subjects (4 male and 7 female) were enrolled in the psychology class, while 13 subjects (4 male and 9 female) volunteered from the counseling courses. The participants ranged in age from 21 to 43 with an average age of 27.2. Because of the apparent differences in subjects' age, sex, and graduate or undergraduate status, several preliminary statistical tests were conducted with these as the independent variables and subject performance on a self-report measure of trait anxiety as the dependent variable. Consideration was also given to the subject composition of each group in the Solomon Four Group Design. The results of these preliminary tests are reported in the section entitled "Stratification Procedures and Preliminary Data Analysis."

Instrumentation

Because anxiety has been operationally defined as incorporating both cognitive and somatic elements, two groups of instruments were necessary for the completion of this study.

The State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, 1970) was used to assess those unwanted verbal or visual-spatial cognitions indicative of cognitive anxiety. Electromyography (EMG) and finger temperature measures were used to determine change in the subjects' physiological state which was indicative of tension or stress associated with somatic anxiety.

The STAI is a paper and pencil self report measure which consists of two scales: A-Trait and A-State. Each of these two scales were consistent with our operational definition of anxiety. The former scale consists of 20 statements that ask people to describe how they generally feel (i.e. reflecting anxiety-proneness); while the later scale, also consisting of 20 statements, requires the subjects to indicate how they feel at a particular moment in time (i.e. situational anxiety). Although the inventory has no time limits, college students usually require less than 15 minutes to complete both scales (Spielberger et al., 1970). The ability to assess both state and trait anxiety was reason for the selection of this instrument. The second is the fact that the STAI is composed of more cognitive items than other similar instruments (Davidson and Schwartz, 1976).

While the STAI authors sought to develop an instrument to assess both state and trait anxiety, considerable attention was given to reliability, validity, and norming procedures.

Because each of these test development factors were given a complete treatment in the "Review of Literature" section, a brief review of relevant information will suffice at this point. Norms are provided by sex for each of the pertinent norming groups. A subject's raw score on each scale (i.e. A-Trait and A-State) is used to find either a normalized T-score or a percentile rank when compared with the relevant norm group to this study: undergraduate students. Reliability coefficients (test-retest) for the A-Trait range from .73 to .86, while the Alpha coefficient of internal reliability ranged from .83 to .92 for the A-State. When compared with previously judged stressful or nonstressful stimuli, scores on the A-State scale produced Alpha coefficients of .83 to .94. When considering construct validity, the A-Trait scale coefficients ranged from .75 to .80 when compared with two other anxiety inventories-- Manifest Anxiety Scale (Taylor, 1953) and IPAT Anxiety Scale (Cattell, 1957). From these findings, it is evident that reliability and validity coefficients are within appropriate limits for this research. Appendix A contains a copy of the State-Trait Anxiety Inventory.

The somatic dimension of anxiety was measured by electromyographic (EMG) and finger temperature levels. An EMG Feedback Monitor (EDC-22) manufactured by Extended Digital Concepts was used. Nondominant forearm muscle tension signals measured by Silver/Silver Chloride Electrodes (DC-6) were amplified by

a differential amplifier input stage. The signals then pass to a rectifier/integrator circuit, where they were averaged and displayed on a meter. The EDC-22 has a sensitivity of 2uVpp and a threshold level from 2.5uV up.

The Cyborg Feedback Thermometer J42 incorporates advanced biofeedback engineering principles to skin temperature (i.e. peripheral blood flow) measurement. Using the nondominant index finger as the measurement site, the client was connected to the instrument by a tiny temperature probe (thermistor) taped comfortably to the finger. The J42 is completely automatic, tracking absolute temperature continuously. Direction and rate of temperature change are readily monitored at resolutions up to .01 degree in Fahrenheit, with a choice of bi-directional or uni-directional change feedback. Digital temperature is simultaneously displayed and audio feedback is available to reflect directional change with varying pitch. The J42 has a temperature range of 23° - 113°F, with an accuracy of $\pm 0.3^{\circ}\text{F}$ and resolution of $.01^{\circ}\text{F}$. Specifications and other information on these two somatic measurement instruments are available in Appendix B.

Stratification Procedures and Preliminary Data Analysis

Prior to any other involvement in this research, subjects were asked to complete the A-Trait scale of the STAI. Because this scale is a measure of anxiety proneness (i.e. the likeli-

hood that an individual will respond to a given stimuli with elevations in state anxiety), performance on this initial measure was used as an independent variable in the random assignment of subjects to one of the four groups in which the experimenter would assess state anxiety. The stratification procedures were as follows: 1) subjects' raw score on the A-Trait scale were rank ordered from highest to lowest; 2) the rank ordered scores were grouped into fours from highest to lowest; and 3) using a table of random numbers, each score (and therefore each subject) within each group of four was randomly assigned to one of the treatment groups within the Solomon Four Group Design. While it was believed that this procedure would insure that each of the four groups were equal in the likelihood of responding to stimuli with elevations of state anxiety, several statistical test were conducted to establish this conclusively.

The 24 subjects of the sample had an average A-Trait score of 36 which placed the group (both males and females) within the average range (i.e. 42nd percentile) when compared with the most appropriate norm (i.e. undergraduates) of the STAI. The range was 36 with a high score of 58 and a low score of 22. As previously discussed, the factors of age, sex, and graduate or undergraduate status were determined to be variables which could confound the results of this research if their effects were not spread equally among all subjects and groups.

Considering the factor of age, Table 2 reports the results of a oneway analysis of variance between the four groups. Table 3 reports the results of a t-test between male and female performance on the A-Trait scale. Table 4 reports the results of a similar t-test performed with graduate or undergraduate status as the independent variable and performance on the A-Trait scale as the dependent variable. Finally, a oneway analysis of variance was performed between the four groups on A-Trait performance. These data are reported in Table 5. Finally, Tables 6 and 7 provide the reader with summary information regarding the composition of the sample.

Through an examination of these tables it was concluded that the factors of age, sex, and graduate or undergraduate status did not operate as confounding variables on the subjects' A-Trait scale performance. That is, A-Trait scale scores were not significantly effected by these factors. Table 5 reflects an additional statistical test which is relevant at this point. An examination of this table indicates that when subjects were randomly assigned to groups through stratification procedures, no significant difference existed between group performance on the A-Trait scale. Table 6 reports the means and standard deviations for each group's performance on this scale. It reveals a small variation between groups as exhibited by the small range, 2.67, and maximum and minimum scores of 37.67 and 35.00 respectively. The conclusion was drawn from these

Table 2. Oneway analysis of variance for age between groups in the Solomon Four Group Design

Source	df	ss	ms	F	P
Between groups	3	180.46	60.15	1.54	0.23
Within groups	20	779.50	38.98		
Total	23				

Table 3. Separate variance estimates of the t value between male and female performance on the A-Trait scale

Group	n	\bar{X}	s	t-value	2 tailed probability
Female	16	34.50	5.33	-1.22	0.25
Male	8	39.00	9.73		

Table 4. Separate variance estimates of the t value between graduate or undergraduate performance on the A-Trait scale

Group	n	\bar{X}	s	t-value	2 tailed probability
Graduate	13	35.54	9.05	-0.35	0.73
Under-graduate	11	36.55	4.55		

Table 5. Oneway analysis of variance for A-Trait scores between groups in the Solomon Four Group Design

Source	df	ss	ms	F	P
Between groups	3	29.33	9.78	0.17	0.92
Within groups	20	1166.67	58.33		
Total	23	1195.96			

Table 6. Summary information of sample composition and performance on the A-Trait scale

Group	n	\bar{X}	s
Graduate	13	35.54	9.05
Undergraduate	11	36.55	4.55

Male	8	39.00	9.73
Female	16	34.50	5.33

All subjects	24	36.00	7.21
Group 1	6	35.00	6.39
Group 2	6	37.67	11.78
Group 3	6	36.33	5.61
Group 4	6	35.00	4.73

Table 7. Summary information for age across treatment groups

Group	n	\bar{X}	s
1	6	30.67	8.41
2	6	23.00	2.45
3	6	27.83	7.49
4	6	27.33	4.80
All subjects	24	27.21	6.46

statistical test that no significant difference in anxiety-proneness exists between the four groups. Because stimulus conditions are likely to produce similar responses between groups, the effects of the treatment procedures can be accurately measured.

Data Collection

In order to standardize the data collection procedures as well as the biofeedback training experience for the experimental groups, subjects were in contact with the experimenter only. All data collection and training activities involved a single subject and the experimenter, or a single subject and the confederate client (during the initial interview). In all instances, activities of this research study took place in 211 Curtiss Hall, Iowa State University, Ames, Iowa. This room was equipped with two padded arm chairs, table, and two way mirror. While changes in environmental conditions may effect subject performance, the temperature of the room was constantly between 72° and 75°, and within the tolerance zone for this type of research (Lynch and Schuri, 1978). Monitoring of subjects' physiological responses to the stimulus conditions was accomplished by the experimenter recording the electromyographic and finger temperature readings from behind the two way mirror (in an adjacent observation cubicle), while the instrument remained in the same room as the subject. As necessary (e.g. during the

baseline period), a 16mm film projector was brought into the room. Subjects were scheduled at times convenient with their schedule, over the three weeks of this data collection phase. All participants were requested to refrain from smoking, drinking, or eating for at least one hour prior to a scheduled meeting. As far as the experimenter could determine none of the subjects were currently receiving any type of medication.

Pre-treatment phases

Baseline--Phase 1 This phase was designed to permit the experimenter to establish baseline measures, both cognitive and somatic, after a brief period of habituation. To accomplish this, subjects from groups 1 and 2 were each connected to the physiological measurement instruments: the EDC-22 electromyograph and the J42 feedback thermometer. During the viewing of a neutral movie entitled "Fluid Image" (1965), subjects' nondominant forearm muscle tension and nondominant index finger temperature were first recorded at 3, 6, and 9 minutes and later averaged. Upon conclusion of the film, subjects from both groups were administered the A-State scale of the STAI. The results of the cognitive (STAI) and somatic (EMG and finger temperature) measures were reserved for later statistical analysis.

Anxiety induction--Phase 2 Following immediately from Phase 1, anxiety induction was administered to groups 1 and 2 through verbal conditioning procedures. Subjects were

instructed by the experimenter as follows:

I have made arrangements for you to conduct an intake or initial interview with a prospective client for the counseling service. As you may know, the waiting list to see counselors is often quite long and the purpose of this study is to test the efficacy of a rather brief, 15 minute, interview; the impact it has upon you; while also reducing the time prospective clients have to wait without contact from the counseling service. While the client isn't here yet, I expect that he/she will arrive shortly. You can use the next 5 minutes or so to prepare yourself for the interview.

You may adopt any particular interview style that you prefer, drawing from whatever skills and knowledge that you have assimilated so far in your training. The only thing that I ask of you during this waiting period is that you leave the electrodes and thermistor attached to your arm.

At the end of 15 minutes, I will return to the room, stop the interview, dismiss the client, and ask you for recommendations concerning the disposition of the client.

Upon completion of the verbal conditioning, subjects were left alone in the interview room to prepare as they wished for 5 minutes. During this time the experimenter monitored the subjects' EMG and finger temperature levels at 1, 3, and 5 minutes. These recordings were subsequently averaged and reserved for later statistical analysis. After this 5 minute waiting period (i.e. anxiety induction), the subjects were informed that the client had arrived and was waiting outside in the hallway. The A-State scale was then administered before the subject was introduced to the confederate client.

Stimulus interview (trial)--Phase 3 The introduction of a stimulus to the subjects was the goal of this phase. In this instance, the subject was responsible for conducting a 15

minute initial interview according to instructions previously received. However, the client is a confederate, who has participated in a series of training sessions with the experimenter, without the knowledge of the subject. A number of studies have used actors playing clients (Carter and Papas, 1975; Doblin, 1970; Heller, Myers & Kline, 1963; Russell and Snyder, 1963), in what seems to be a normal counseling situation to the subjects. This permitted the manipulation of an independent variable which was uncontaminated by the fact that the counselor knew that he/she was the sole purpose for the study (See Appendix C for actor training procedures).

During this stimulus interview EMG and finger temperature levels were recorded at 3 minute intervals for a total of 5 during the 15 minutes. Subsequently, the recordings were averaged and reserved for later statistical analysis. After the experimenter stopped the interview and the client was dismissed, the subject was administered the A-State scale of the STAI. In order to maintain the integrity of the verbal conditioning procedures, the subjects first discussed and then completed a Client Disposition Form (See Appendix D) supplied by the experimenter.

Post-treatment phases

Because the effects of testing and previous knowledge of the data collection procedures may weaken a research study, the Solomon Four Group Design was selected to control for the

process of observation and measurement during post-treatment data collection. Therefore, post-treatment data collection procedures included all four groups, in contrast to the pre-treatment data collection procedures, where the only subjects involved were from groups 1 and 2. Consideration was given to the assignment of the confederate clients to insure that members of groups 1 and 2 would interview a second client presenting a different problem from the problem presented to subjects in the pre-treatment data collection procedures. Although there was some familiarity with the data collection procedures for groups 1 and 2, this process held that familiarity to a minimum. Confederate clients were assigned to the subjects from groups 3 and 4 as the subjects' schedules would permit.

Baseline--Phase 4 This phase was designed to permit the experimenter to establish baseline measures, cognitive and somatic, after a brief period of habituation. To accomplish this, subjects from each of the four groups were connected to the electromyographic and temperature feedback monitors. During the viewing of a neutral movie entitled "Fluid Image" (1965), subjects' nondominant forearm muscle tension and finger temperature levels were recorded at 3, 6, and 9 minutes and later averaged. Upon the conclusion of the film, subjects from all groups were administered the A-State scale of the STAI.

Anxiety induction--Phase 5 Following immediately from phase 4 anxiety induction was administered by verbal conditioning procedures. Subjects were instructed as follows:

I have made arrangements for you to conduct an intake or initial interview with a prospective client for the counseling service. As you may know, the waiting list to see counselors is often quite long and the purpose of this study is to test the efficacy of a rather brief, 15 minute, interview; the impact it has upon you; while also reducing the time prospective clients have to wait without contact from the counseling service. While the client isn't here yet, I expect that he/she will arrive shortly. You can use the next 5 minutes or so to prepare yourself for the interview.

You may adopt any particular interview style that you prefer, drawing from whatever skills and knowledge that you have assimilated so far in your training. The only thing that I ask of you during this waiting period is that you leave the electrodes and thermistor attached to your arm.

At the end of 15 minutes, I will return to the room, stop the interview, dismiss the client, and ask you for recommendations concerning the disposition of the client.

Upon completion of the verbal conditioning, subjects were left alone in the interview room to prepare as they wished for 5 minutes. During this time subjects' EMG and finger temperature levels were monitored at 1, 3, and 5 minutes and subsequently averaged. After the 5 minute anxiety induction waiting period, subjects were informed that the client had arrived and was waiting outside in the hallway. The A-State was then administered before the subject was introduced to the confederate client.

Stimulus interview (trial)--Phase 6 This final phase of the posttreatment data collection procedures involves the

introduction of the stimulus to the subject. Similar to phase 3, pre-treatment data collection, the situation was an initial interview and the client was a confederate. During phase 5, the subjects had been instructed as to the purpose of the interview and their role in it. Consequently, the confederate client was introduced to the subject and the experimenter left the room to monitor the physiological equipment.

During this stimulus interview EMG and finger temperature levels were recorded at 3 minute intervals for a total of 5 during the 15 minutes. Subsequently, the measurements were averaged and reserved for later analysis. After the confederate client was dismissed, the subject was administered the A-State scale of the STAI and the results were also reserved. Upon completion of the A-State scale all data collection requirements had been met, and as a result the subjects were not required to complete the Client Disposition Form. Since there was no longer a threat to the integrity of the verbal conditioning procedures, subjects were briefly informed as to the purpose of the study, their role as an experimental or control group member, and when results would be available for their inspection.

Treatment of the Sample

Through stratified random sampling procedures, subjects were assigned to one of four groups specified by the Solomon Four Group experimental design. These assignment procedures

resulted in two groups receiving the experimental treatment and two groups serving as a control. Within each division of experimental or control, subjects received the same treatment. The difference within each separate division was manifested in the timing of the observation. In each division, experimental or control, one group was observed in a pre-treatment and post-treatment fashion while the second was observed only in post-treatment. Graphically, these concepts are again represented by:

<u>Group</u>		<u>Treatment</u>			
1	R_s	O_1	X	O_2	Experimental
2	R_s	O_3		O_4	Control
3	R_s		X	O_5	Experimental
4	R_s			O_6	Control

Where R_s represents the random assignment of subjects after stratification to separate treatment or control groups; where X represents the exposure of a group to an experimental condition; where O refers to a process of observation and measurement; and where the Xs and Os in a given row are applied to the same specific persons.

Control group treatment

The use of a control group within an experimental design is quite common and purposeful. In this case, the control group design was selected to enable the investigator to determine significant differences as a direct result of a treatment applied to the experimental group. It is quite common for

changes in the experimental group to be compared with changes (or lack of change) in the control group. In this instance, the control group received no treatment (i.e. the absence of any experimental conditions).

Experimental group treatment

The literature was not supportive of any one particular technique to mediate state anxiety. However, because of advances in biomedical engineering, the application of biofeedback principles as an attenuator to the experience of anxiety in helping profession trainees had recently been explored (Fontaine, 1975; Gibson, 1977; Meyer, 1973). The implementation of this type of experimental treatment, while obviously tentative in nature, must adhere to previously established principles. Of considerable importance to this research was the principle that subjects respond differentially to various forms of biofeedback training (Schwartz, 1973). This research circumvented this problem by providing biofeedback training experiences employing two different modalities--electromyography and finger temperature--recommended by Green, Green, and Walters (1970). This unique application to anxiety reduction in helping profession trainees necessitates the analysis of significant effects attributable to the "biofeedback training package" rather than the individual components.

In this treatment, biofeedback training provided information about electrical activity of skeletal muscular responses,

as manifested by tension or lack of tension in the muscles (electromyography), and peripheral blood flow (finger temperature) to the person whose response it is (Brown, 1974).

Through the use of the EDC-22 EMG feedback monitor and the J42 feedback thermometer, the subject's present physiological state was assessed and depicted through a visual display or auditory signal. As signals were sensed by the individual, an awareness of the interrelationship between one's present cognitive and somatic states was developed. Through continued training the subject may learn to control muscle tension and finger temperature with a great deal of sophistication in real and imagined situations. It was hypothesized that learned control of these physiological states contributes to the reduction of anxiety (Green, Green, and Walters, 1970. Rachman, 1968) in trainees. Two recent articles (Crabbs, Crabbs, and Hopper, 1978; Pulvino, 1975), which provided the theoretical basis for the use of these procedures within a counselor training program, formed the basis for the use of these techniques as the treatment for the experimental group.

The following steps represent the treatment procedures to be used with experimental groups 1 and 3.

Introductory session

1. During this initial one hour meeting, the investigator provided explanation and discussion of the effects of tension and stress upon individuals. In order to provide the same

content material a audio tape recording was made and the initial presentation was made by this means. Cognitive and somatic manifestations of stress were defined and examples provided. Special consideration was given to the effect stress and anxiety has upon counselors in a counseling relationship.

2. The influence of EMG and finger temperature biofeedback training on the reduction of anxiety was explored with particular emphasis applied to helping profession trainees. The roles of the participant and the investigator were defined and the extent of participation and involvement noted.

3. The training procedures for the subsequent meetings were explained and a specific schedule, including length and duration of sessions was agreed upon. Subjects were requested to refrain from smoking, drinking, or eating for one hour prior to and during each session. At that time the investigator made a determination whether the subject was under medication.

4. Equipment was demonstrated by the investigator and each subject had an opportunity to observe physiological changes in their present state. Ample time was provided for each subject to experiment with both the EMG and feedback thermometer to insure that there was a full understanding of the visual and auditory signals.

5. The final topic of this initial meeting was a discussion of the homework assignment. Subjects were instructed that they are to practice 30 minutes each day the tension relaxation

procedures each employed during the biofeedback training sessions. Although subjects did not have the EDC-22 or J42 instruments available for home use, such practice insured the generalization of the tension reduction procedures to the subject's own environment. Each subject was instructed that the home training, as a complement to the biofeedback training, should occur at about the same time of the day to be most effective. Record keeping and notation procedures were suggested to facilitate the subject's commitment to home practice.

Training sessions

1. All experimental subjects from groups 1 and 3 participated in three 35 minute training sessions involving EMG and finger temperature biofeedback training. Subjects scheduled training sessions 2 to 5 days apart with not more than 5 days between the final training session and the post-treatment data collection procedures. Prior to initiation of biofeedback training in the second and final sessions, the experimenter discussed the home practice with each subject. In all instances, the experimenter encouraged continuance of this activity and provided any additional information or suggestions to the subject as needed.

2. Each of the biofeedback training sessions consisted of a baseline habituation period of 5 minutes duration without biofeedback. Following this, subjects were provided with 15 minutes of EMG training followed by 15 minutes of finger

temperature training.

3. Following the 5 minute habituation period, the following verbal instruction were given to the subjects training on the EMG.

Now that you are aware of the auditory and visual signals, try to get the needle down to zero (Green, Walters, Green, and Murphy, 1969).

In an effort to have this experience generalize to the initial counseling interview, the subjects were instructed in the following manner after 7½ minutes.

You have half of your training time with the EMG remaining. During these next few minutes, while continuing to get the needle down to zero, I would like you to imagine that you are conducting an initial interview with a client. As much as possible, put yourself into the scene. Use your imagination and conduct this interview as you would like to. Imagine the dialogue and the behaviors of yourself and the client. Be aware of your physical, emotional, and mental presence as you continue to try to get the needle on the EMG down to zero.

At the completion of the 15 minute EMG biofeedback training period, subjects were encouraged to interact with the investigator regarding the nature of their successes or failures. Following this interaction, subjects were once again provided the opportunity to train on the feedback thermometer to learn control of nondominant index finger temperature. In this instance subjects were first given the following instructions:

Now that you are aware of the auditory and visual signals, try to make the present reading on the instrument rise to 95°.

Once again, to have this experience generalize the initial interview, the subjects were instructed in the following manner after 7½ minutes:

You have half of your training time remaining with the feedback thermometer. During these next few minutes, I would like for you to use a similar process to what you have just completed with the EMG. That is, I would like you to continue to focus on raising your hand temperature to 95°. As you do this, I would like you to imagine that you are conducting an initial interview with a client. Put yourself into the scene as completely as possible. Using this fantasy that you have formed conduct this interview as you would like to. Imagine the dialogue and the behaviors of yourself and the client. Be aware of your physical, emotional, and mental presence as you continue to raise your hand temperature.

Following the conclusion of this 15 minutes training session with the feedback thermometer, the investigator once again focused on successes or failures to warm the nondominant index finger.

4. Upon completion of the biofeedback training, subjects were reminded of the homework (i.e. practice) to be completed on a daily basis during the intervening time before the next training.

The above procedures were applicable to each of the biofeedback training sessions and were replicated in their entirety each time. At the conclusion of the training, post-treatment data collection sessions were scheduled with each subject within 5 days.

Organization of Data

Two sets of data were collected from each subject in this study: self report assessment of state anxiety (i.e. A-State scale of the STAI) and physiological measurement of state anxiety (i.e. electromyography and finger temperature). Before proceeding to the statistical analysis, it was necessary to transform this data into a form appropriate for computer analysis. Because this process varied with the data, the following deals with the types of data collected and their transformation.

Data from the A-Trait scale of the STAI was used only during the stratification of the random sample and subsequently during the computer analysis to determine any differences between groups in the Solomon Four Group Design. As a result, the A-Trait scale required the same process of transformation as did the A-State scale, which was employed in the hypothesis testing. Simply, this required the investigator to score each administration of these scales and determine a subject's raw score according to the recommended procedure (Spielberger, Gorsuch, and Lushene, 1970). This raw score was used in later computer analysis.

Electromyographic measurements of state anxiety were taken on subjects during the baseline, induction, and interview phases of this study. In each of the first two of these phases, 3 readings were recorded and later averaged. Five readings

were collected during the interview phase and were also averaged in a similar fashion. This process resulted in one indicator of the electrical activity of the muscles (i.e. muscle tension) which was an average of the measures within each phase. This average level of electromyography was represented in microvolts and used in later computation.

The transformation of the data collected from the feedback thermometer was accomplished in a similar fashion to that just described. Readings taken during each phase were averaged for each subject. In this instance, the averaged temperature was recorded in degrees Fahrenheit and used in the computer analysis.

Analysis of Data

Because this study employed the Solomon Four Group Design, the number of measures taken from each subject was determined by the subject's position in the design. With these comments in mind, Table 8 reflects the dependent measures taken on each group of subjects within this design. As indicated by Campbell and Stanley (1963), when the Solomon Four Group Design is used there is no single statistical procedure which make use of all observations simultaneously. Consequently, the discussion of procedures for the analysis of data will be organized around the stated hypotheses.

Table 8. Summary^a of dependent measures taken on each group of subjects within the Solomon Four Group Design

Group	Pre-treatment								
	Phase 1 Baseline			Phase 2 Induction			Phase 3 Interview		
	SR	EMG	TEMP	SR	EMG	TEMP	SR	EMG	TEMP
1	O ₁	O ₂	O ₃	O ₄	O ₅	O ₆	O ₇	O ₈	O ₉
2	O ₁	O ₂	O ₃	O ₄	O ₅	O ₆	O ₇	O ₈	O ₉
3									
4									

^aWhere SR represents the self-report measure (A-State scale of the STAI); where EMG represents electromyographic measurement procedures; where TEMP represents finger temperature measurement procedures; where O reflects the dependent measure at any point of time for a given group during pre-treatment or post-treatment; and the subscript is used to indicate the separateness of each dependent measure.

Treatment	Post-treatment								
	Phase 1 Baseline			Phase 2 Induction			Phase 3 Interview		
	SR	EMG	TEMP	SR	EMG	TEMP	SR	EMG	TEMP
X	O ₁₀	O ₁₁	O ₁₂	O ₁₃	O ₁₄	O ₁₅	O ₁₆	O ₁₇	O ₁₈
	O ₁₀	O ₁₁	O ₁₂	O ₁₃	O ₁₄	O ₁₅	O ₁₆	O ₁₇	O ₁₈
X	O ₁₀	O ₁₁	O ₁₂	O ₁₃	O ₁₄	O ₁₅	O ₁₆	O ₁₇	O ₁₈
	O ₁₀	O ₁₁	O ₁₂	O ₁₃	O ₁₄	O ₁₅	O ₁₆	O ₁₇	O ₁₈

Hypotheses 1 and 2

The first two hypotheses represent an inference about the difference between two means using dependent samples. The observations were collected on the same group of subjects before and after procedures to induce anxiety had been administered. This type of pairing reduced extraneous influences on the dependent variable: both physiological and self-report levels of anxiety (Glass and Stanley, 1970; Nie, Hull, Jenkins, Steinbrenner, and Brent, 1975). As a result, this procedure, frequently called the correlated or matched t-test with dependent samples, is represented by the following equation:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (u_1 - u_2)}{s_{\bar{X}_1 - \bar{X}_2}}$$

$$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{(s_1^2 + s_2^2 - \frac{2\sum x_1 x_2}{n-1})}{df = n - 1}}$$

where X_1 = the first observation of the group

X_2 = the second observation of the group

s = the standard deviation

s^2 = the variance

x = the difference from the mean of the observation

n = the number of pairs

u = the population grand mean.

Hypotheses 3, 4, 5, and 6

These hypotheses attempted to determine if significant differences between experimental and control groups existed. If such conditions existed and were not incorporated into later analysis procedures, results of the treatment would be suspect. In this instance, change scores for experimental and control subjects were calculated between baseline and induction phases, and the induction and interview phases. The change scores were then analyzed by the t-test for independent samples with common variances. (Variances of the samples were calculated and tested to insure that there was no significant difference.) The t-test that was used is represented by the following equation:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (u_1 - u_2)}{s_{\bar{X}_1 - \bar{X}_2}}$$

$$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{s_1^2/n_1 + s_2^2/n_2}$$

$$df = n_1 + n_2 - 2$$

where X_1 = the change score for group 1

X_2 = the change score for group 2

s = the standard deviation

s_i^2 = the variance of the group

n_i = the number in each group

u = the population grand mean.

Hypotheses 7, 8, 9, and 10

These hypotheses attempted to establish the treatment effects. Because of the asymmetries of the design, analysis of variance of gain scores is no longer appropriate (Campbell and Stanley, 1963). However, by disregarding the pre-tests, except as another "treatment" coordinate with X, the post-test scores can now be treated with a simple 2 x 2 analysis of variance design. The procedure is represented graphically by:

Solomon Four Group Design

<u>Group</u>	<u>Treatment</u>				
1	R_s	O_1	X	O_2	Experimental
2	R_s	O_3		O_4	Control
3	R_s		X	O_5	Experimental
4	R_s			O_6	Control

Where R_s represents the random assignment of subjects after stratification to separate treatment or control groups; where X represents the exposure of a group to an experimental condition; where O refers to a process of observation and measurement; and where the Xs and Os in a given row are applied to the same specific persons.

Analysis of Variance

	No treatment	Treatment
Pretested	O ₄	O ₂
Unpretested	O ₆	O ₅

From the column means, estimates of the main effect of the treatment are calculated, from row means, the main effect of pretesting, and from all means the interaction of testing with treatment.

Following these procedures, six separate analysis of variance were performed: EMG, finger temperature, and self-report measures of anxiety in anticipation of the interview (i.e. induction phase), and EMG, finger temperature, and self report measures of anxiety during the initial interview (i.e. trial). The analysis of variance model, best described by Glass and Stanley (1970), is represented as follows:

$$X_{ijk} = u + A_i + B_j + A B_{ij} + e_{ijk}$$

where X_{ijk} = subject performance

u = grand mean

A_i = effects of pre-test or no pre-test

B_j = effects of treatment or no treatment

$A B_{ij}$ = effects of the interaction of testing and treatment

e_{ijk} = pooled error term.

Hypotheses 11, 12, 13, 14, 15, and 16

These six hypotheses, which attempted to determine the relationship between self-report and physiological measures of anxiety, were tested through the use of the Pearson product-moment correlation coefficient. The correlation coefficient was calculated between the dependent variables--self-report and physiological (i.e. EMG and finger temperature) assessments of anxiety--for each of the three phases--baseline, induction, and interview--occurring during pre-treatment and post-treatment. Because of the nature of the design, correlation coefficients calculated pre-treatment included subjects from groups 1 and 2 only, while those calculated post-treatment included subjects from all four groups. These coefficients determined the probability of viable associations between cognitive and somatic assessment of anxiety, as calculated from the following formula:

$$r = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\left[\sum_{i=1}^N (X_i - \bar{X})^2 \right] \left[\sum_{i=1}^N (Y_i - \bar{Y})^2 \right]}}$$

where X_i = the i th observation of variable X

Y_i = the i th observation of variable Y

N = the number of observations

\bar{X} = $\sum_{i=1}^N X_i / N$ = mean of the variable X

\bar{Y} = $\sum_{i=1}^N Y_i / N$ = mean of the variable y

FINDINGS

Introduction

The research undertaken in this investigation was designed to determine, initially, whether state anxiety could be induced in helping profession trainees; and secondly, whether state anxiety manifested by trainees in an initial interview could be attenuated through training which incorporated electromyographic and finger temperature biofeedback principles. Because this research was based upon an operational definition of anxiety which included both cognitive and somatic components, a third aspect of the research determined the relationship between the self-report and physiological assessment measures. An initial counseling interaction, involving a confederate client, was utilized to simulate, as closely as possible, the natural setting in which helping profession trainees practice their skills.

The purpose of this chapter is to examine the results of the statistical analysis of data collected in this investigation. Hence, the remainder of this chapter reviews the findings pertinent to the 16 stated hypotheses. In presenting these results, the discussion is organized around each null hypothesis, followed by an examination of the statistical test performed. In each instance, a statement indicates whether the test performed rejected or failed to reject the null

hypothesis. For the purpose of this research, the .05 level of significance was used to determine rejection or no rejection. Because of the experimental nature of this treatment process, and as an aid to examining the findings, the actual probability level found for each statistical test is reported.

In the process of analyzing data collected for the acceptance or rejection of null hypotheses, it was possible to examine data not specifically related to the hypothesis being tested. As appropriate, the researcher included this information and labeled it accordingly.

Results of the Statistical Analysis

Hypothesis 1: There is no significant difference in subjects' state anxiety between the baseline and induction phases as measured by electromyographic (EMG) and finger temperature levels.

This hypothesis represented an inference about the difference between two means using dependent samples. Because of the nature of the Solomon Four Group Design, pre-treatment observations were collected on groups 1 and 2 and were examined as one group. This hypothesis the effects of anxiety induction on both electromyographic and finger temperature measures. Because the effects on these physiological measures were analyzed separately, the findings are reported here (and similarly in later hypotheses) as distinct results of the two dimensional hypothesis.

In the case of electromyographic measurement, a t-value of -2.16 with 11 degrees of freedom was reported. In order for this two tailed t-test to be significant a value of +2.201 was necessary. Although the statistical test failed to reject the null hypothesis at the .05 level of significance, attention is drawn to Table 9. This table indicates that the actual probability for this hypothesis was .054, slightly below that needed for rejection.

In the case of finger temperature measurement, a t-value of 3.47 with 11 degrees of freedom was reported. Again, the two tailed t-test performed required a value of +2.201 for rejection of the hypothesis. In this instance, the hypothesis was rejected, indicating a significant difference between the subjects' state anxiety during the baseline and induction phases. Table 9 indicates the results of the statistical analysis.

In conclusion, the null hypothesis was rejected for finger temperature measurement but not for electromyographic measurement. While the t-test failed to reject in the latter case, attention should be drawn to the actual probability level of the t-test for electromyographic measurement. Although a clearly significant difference was not indicated, the proximity of the t-value to the rejection value does indicate that a substantial change occurred on electromyographic, albeit non-significant, and finger temperature measures of state anxiety between the pre-treatment baseline and induction phases.

Additional findings When the pre-treatment baseline and interview phases were compared, a significant difference in state anxiety existed on both electromyographic [$t_{(11)} = -3.05, p < .05$] and finger temperature [$t_{(11)} = 3.90, p < .01$] measures. As a result, the conclusion is drawn that subjects' experience of anxiety on these two physiological measures was significantly higher in the initial interview than it was during the baseline phase.

In a similar comparison between the pre-treatment induction and interview phases, a significant difference failed to be reported for electromyography [$t_{(11)} = -0.79, p > .05$] while the significance of finger temperature [$t_{(11)} = 3.48, p < .01$] was clearly established. Hence, while the subjects continued to maintain relatively high levels of muscle tension during the interview phase, there was a significant change in state anxiety as measured by finger temperature. Tables 10 and 11 report the results of these additional findings.

Hypothesis 2: There is no significant difference in subjects' state anxiety between the baseline and induction phases as assessed by the A-State scale of the STAI.

While hypothesis 1 represented an inference about the difference of two means occurring on the physiological measures, hypothesis 2 examined differences which were manifested in the cognitive appraisal instrument, the A-State scale of the STAI. In this case, a t-value of -4.43 was reported with 11 degrees of freedom. The two tailed t-test required a value of +2.201

Table 9. Differences between pre-treatment baseline and induction phases on three measures of state anxiety

Variable		n	\bar{X}	s	t-value	df	P
EMG	Baseline	12	4.51	2.42	-2.16	11	0.054
	Induction	12	9.18	7.47			
Finger temp.	Baseline	12	85.67	8.55	3.47**	11	0.005
	Induction	12	83.23	7.44			
A-State	Baseline	12	35.17	8.15	-4.43**	11	0.001
	Induction	12	45.33	11.59			

** Significant at the .01 level.

Table 10. Differences between pre-treatment baseline and interview phases on three measures of state anxiety

Variable		n	\bar{X}	s	t-value	df	P
EMG	Baseline	12	4.51	2.42	-3.05*	11	0.011
	Interview	12	11.42	6.96			
Finger temp.	Baseline	12	85.67	8.55	3.90**	11	0.002
	Interview	12	80.07	7.19			
A-State	Baseline	12	35.17	8.15	-1.28	11	0.227
	Interview	12	39.33	13.36			

* Significant at the .05 level.

** Significant at the .01 level.

Table 11. Differences between pre-treatment induction and interview phases on three measures of state anxiety

Variable		n	\bar{X}	s	t-value	df	P
EMG	Induction	12	9.18	7.47	-0.79	11	0.447
	Interview	12	11.42	6.96			
Finger temp.	Induction	12	83.23	7.44	3.48**	11	0.005
	Interview	12	80.07	7.19			
A-State	Induction	12	45.33	11.59	2.35*	11	0.038
	Interview	12	39.33	13.36			

* Significant at the .05 level.

** Significant at the .01 level.

for this hypothesis to reach significance. As a result, the null hypothesis was rejected and a conclusion was formed that a significant increase in state anxiety occurred between the pre-test baseline and the induction phase. Table 8 reports these results.

Additional findings When comparing the pre-treatment baseline and interview phases, a significant difference in state anxiety as measured by the S-State Scale of the STAI was not apparent [$t_{(11)} = -1.28, p > .05$]. However, examination of the induction to interview changes in state anxiety, leads to the conclusion that there was a significant difference in state anxiety between these two phases [$t_{(11)} = 2.35, p < .05$]. Tables 10 and 11 report the findings of these additional data.

Hypothesis 3: When considering the baseline and induction phases, there is no significant difference in the average change in state anxiety between the experimental and control group as measured by EMG or finger temperature levels.

This hypothesis sought to establish that pre-treatment differences between the experimental and control groups resulting from the anxiety induction procedures were nonsignificant. If such differences were found prior to treatment, their effects would serve to confound post-treatment data analyses. As a result, change scores between the baseline and induction phases were calculated on each of the physiological measures and the appropriate two tailed t-test was performed. The analysis of these results (see Table 12) indicated that for

both electromyographic [$t_{(10)} = -0.30, p > .05$] and finger temperature [$t_{(10)} = -0.10, p > .05$] measures, the hypothesis was not rejected. It was concluded that the pre-treatment anxiety induction procedures does not produce any significant effects between the experimental and control groups.

Hypothesis 4: When considering the baseline and induction phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as assessed by the A-State scale of the STAI.

In a similar fashion to the above, this hypothesis sought to establish that the pre-treatment anxiety induction procedures did not confound experimental and control group performance on the A-State scale of the STAI. In this instance, the t-value of -1.18 with 10 degrees of freedom is indicated in Table 11. The two tailed t-test required a value of +2.228 for this hypothesis to reach significance. As a result, the t-test failed to reject this hypothesis and it was concluded that pre-treatment anxiety induction procedures did not significantly influence either group more than the other on this self-report measure of state anxiety.

Hypothesis 5: When considering the induction and interview phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as measured by EMG or finger temperature levels.

Although similar to the previous two, this hypothesis investigated whether pre-treatment change occurring in state anxiety for experimental and control groups was sufficient to

Table 12. Pre-treatment baseline to induction change score differences between experimental and control groups on three measures of state anxiety

Variable		n	\bar{X}	s	t-value	df	P																				
EMG	Experimental	6	-5.35	6.75	-0.30	10	0.771																				
	Control	6	-4.00	8.78				Finger temp.	Experimental	6	2.37	2.47	-0.10	10	0.923	Control	6	2.51	2.63	A-State	Experimental	6	-12.83	8.33	-1.18	10	0.264
Finger temp.	Experimental	6	2.37	2.47	-0.10	10	0.923																				
	Control	6	2.51	2.63				A-State	Experimental	6	-12.83	8.33	-1.18	10	0.264	Control	6	-7.50	7.23								
A-State	Experimental	6	-12.83	8.33	-1.18	10	0.264																				
	Control	6	-7.50	7.23																							

confound the results. More specifically, this hypothesis compared the physiological responses to determine if change between the induction and initial interview phases produced significant differential responses between the two groups. The findings of the two tailed t-test which was performed are reported in Table 13. From these data, it was established that the hypothesis was not rejected for either electromyographic [$t_{(10)} = 0.08, p > .05$] or finger temperature [$t_{(10)} = 1.59, p > .05$] measures. As a result, it is concluded that no significant difference existed between the experimental and control groups which could be directly attributable to the effects of the pre-treatment initial interview.

Hypothesis 6: When considering the induction and interview phases, there is no significant difference in the average change in state anxiety between the experimental and control groups as measured by the A-State scale of the STAI.

This hypothesis tests the effect the initial interview had on the experimental or control group subjects. However, in this instance the effects were assessed by the self report instrument used in this study. The hypothesis was not rejected for the A-State scale of the STAI [$t_{(10)} = 0.91, p > .05$]. In conclusion, no significant difference existed between the experimental and control groups which was directly attributable to the effects of the pre-treatment initial interview. These data are reported in Table 13.

Table 13. Pre-treatment induction to interview change score differences between experimental and control groups on three measures of state anxiety

Variable		n	\bar{X}	s	t-value	df	P
EMG	Experimental	6	-2.00	10.52	0.08	10	0.939
	Control	6	-2.47	10.06			
Finger temp.	Experimental	6	4.52	3.57	1.59	10	0.144
	Control	6	1.82	2.17			
A-State	Experimental	6	8.33	9.50	0.91	10	0.385
	Control	6	3.67	8.26			

Hypothesis 7: There is no significant difference in subjects' state anxiety in the induction phase as a result of the treatment as measured by EMG or finger temperature levels.

This hypothesis attempted to establish the treatment effect upon state anxiety as manifested in the physiological responses of electromyography and finger temperature. When assessing the treatment effects on the post-treatment induction phase, the pre-test (i.e. baseline, induction and interview phases) was analyzed as another treatment condition. In this way, the post-test scores were then analyzed using a simple 2 x 2 analysis of variance design. These procedures were recommended in keeping with the comments by Campbell and Stanley (1963) for the Solomon Four Group Design and were replicated for hypotheses 8-10. Descriptive data for each of this study's four groups on the post-treatment assessment modalities are reported in Table 14. Once again this information is relevant to hypothesis 7 as well as hypotheses 8, 9, and 10.

Hypothesis 7 addressed itself specifically to the physiological responses which occurred in the post-treatment induction phase. In this case, neither the electromyographic [$F_{(1,20)} = 1.12, p > .05$] nor the finger temperature [$F_{(1,20)} = 1.46, p > .05$] measures rejected the null hypothesis. Further examination of Tables 14 and 15 revealed that there was no effect on subjects' post-treatment physiological response which

Table 14. Post-treatment baseline, induction, and interview phase means and standard deviations for each group in the Solomon Four Group Design^a

Phase	Variable		Experimental 1	Control 2	Experimental 3	Control 4
Baseline	EMG	\bar{X}	2.38	5.62	12.30	3.30
		s	.72	4.50	23.38	1.63
	Finger temp.	\bar{X}	85.04	80.06	88.87	84.80
		s	9.30	9.38	4.94	10.53
	A-State	\bar{X}	28.00	32.00	30.83	34.83
		s	4.94	10.00	6.34	7.44
Induction	EMG	\bar{X}	6.17	5.57	23.78	7.28
		s	8.76	2.88	38.16	5.21
	Finger temp.	\bar{X}	84.49	78.98	84.69	82.51
		s	9.09	7.41	4.05	9.46
	A-State	\bar{X}	34.83	33.17	42.00	37.83
		s	7.47	11.27	9.38	12.19
Interview	EMG	\bar{X}	9.93	8.10	25.43	8.12
		s	9.47	2.58	37.42	4.26
	Finger temp.	\bar{X}	81.92	78.20	81.84	79.86
		s	8.17	6.80	7.82	7.27
	A-State	\bar{X}	34.83	32.67	36.50	35.00
		s	9.62	10.52	10.62	13.78

^aFor each group n = 6; EMG figures indicate microvolts; finger temperature figures indicated degrees Fahrenheit; and A-State scale scores represent the raw score averaged within each group.

Table 15. Post-treatment induction phase analysis of variance for electromyography

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	438.61	1	438.61	1.119	0.303
Pre-test	560.67	1	560.67	1.430	0.246
2-way interactions					
Treatment with pre-test	379.22	1	379.22	0.967	0.337
Residual	7840.63	20	392.03		
Total	9219.13	23	400.83		

was attributable to the pre-treatment condition (i.e. of groups 1 and 2) or the interaction of the pre-treatment condition with the treatment. The conclusion was reached that the biofeedback training employed as a treatment in this study did not produce significant reductions in physiological manifestations of state anxiety during the induction phase.

Hypothesis 8: There is no significant difference in subjects' state anxiety in the induction phase as a result of the treatment as measured by the A-state scale of the STAI.

An analysis of variance of the dependent variable, A-State scale performance, was conducted to measure treatment effects on this self-report measure of state anxiety. These data are reported in Table 17. An F-ratio of 4.35 with 1 and 20 degrees of freedom was required for significance at the .05 level. The obtained F-ratios of 0.487 and 2.004 indicated a lack of evidence to reject hypothesis 8 for effects due to treatment and pre-testing. In addition, the obtained F-ratio of 0.089 for the interaction effect between the treatment and pre-testing, failed to be significant. From this it was concluded that the biofeedback training employed as a treatment in this study did not produce significant reductions in state anxiety as measured by a self report instrument.

Hypothesis 9: There is no significant difference in subjects' state anxiety in the initial interview as a result of the treatment as measured by EMG or finger temperature levels.

Table 16. Post-treatment induction phase analysis of variance for finger temperature

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	88.66	1	88.66	1.457	0.241
Pre-test	20.86	1	20.86	0.343	0.565
2-way interactions					
Treatment with pre-test	16.66	1	16.66	0.274	0.607
Residual	1216.60	20	60.83		
Total	1342.77	23	58.38		

Table 17. Post-treatment induction phase analysis of variance for A-State scale performance

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	51.04	1	51.04	0.487	0.493
Pre-test	210.04	1	210.04	2.004	0.172
2-way interactions					
Treatment with pre-test	9.38	1	9.38	0.089	0.768
Residual	2096.50	20	104.83		
Total	2366.96	23	102.91		

In contrast to hypotheses 7 and 8, this hypothesis addressed itself specifically to the physiological responses which occurred in the post-treatment interview phase. In this analysis of variance a F-ratio of 4.35 with 1 and 20 degrees of freedom was needed to reach significance at the .05 level. In this case, neither the electromyographic [$F_{(1,20)} = 1.45$, $p > .05$] nor the finger temperature [$F_{(1,20)} = 0.86$, $p > .05$] F-ratios were sufficient to reject the null hypothesis. Further examination of data reported in Tables 18 and 19 revealed that there was no effect on subjects' post-treatment physiological response which was attributable to the pre-treatment condition (i.e. of groups 1 and 2) or the interaction of the pre-treatment condition with the treatment. In conclusion, biofeedback training employed as a treatment in this study did not produce significant reduction in the physiological measures of electromyography and finger temperature during the interview phase.

Hypothesis 10: There is no significant difference in subjects' state anxiety in the initial interview as a result of the treatment as measured by the A-State scale of the STAI.

This hypothesis, as distinguished from hypothesis 9, used of the analysis of variance testing procedures on the self report indications of state anxiety rather than the physiological measures. In this case, the obtained F-ratio of 0.159 was not sufficient to reject the null hypothesis for effects due to the treatment. In addition, data reported in Table 20

Table 18. Post-treatment interview phase analysis of variance for electromyography

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	550.08	1	550.08	1.452	0.242
Pre-test	361.15	1	361.15	0.954	0.340
2-way interactions					
Treatment with pre-test	359.60	1	359.60	0.949	0.341
Residual	7574.68	20	378.73		
Total	8845.51	23	384.59		

Table 19. Post-treatment interview phase analysis of variance for finger temperature

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	48.76	1	48.76	0.859	0.365
Pre-test	3.77	1	3.77	0.066	0.799
2-way interactions					
Treatment with pre-test	4.57	1	4.57	0.081	0.779
Residual	1134.75	20	56.74		
Total	1191.85	23	51.82		

Table 20. Post-treatment interview phase analysis of variance for A-State scale performance

Source of variation	SS	df	MS	F	P
Main effects					
Treatment	20.17	1	20.17	0.159	0.694
Pre-test	24.00	1	24.00	0.190	0.668
2-way interactions					
Treatment with pre-test	0.67	1	0.67	0.005	0.943
Residual	2529.67	20	126.48		
Total	2574.50	23	111.94		

reveals that there was no effect on subjects' post-treatment A-State scale performance which was attributable to pre-testing or the interaction of treatment with pre-testing. From these data, it was concluded that biofeedback training did not produce significant reductions in state anxiety during the initial interview as measured by a self-report instrument.

It has been concluded that the treatment procedures did not mediate the experience of anxiety for the subjects. However, if hypothesis testing had been conducted for variability rather than central tendency, the results may have been different. This conclusion is supported by the application of Hartley's F_{\max} procedures (Glass and Stanley, 1970) to the data of Table 14. In this instance, the test indicates that the variances for EMG in the baseline [$F_{(4,5)} = 1054.44, p < .01$], induction [$F_{(4,5)} = 175.56, p < .01$], and interview phases [$F_{(4,5)} = 177.98, p < .01$] are heterogeneous. As a result, one of the assumptions of analysis of variance--homogeneity of variances--has been violated. With this violation apparent, significance testing of variability may have resulted in a different conclusion regarding the effects of the treatment procedures.

Hypothesis 11: When considering the pre-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the baseline phase.

Hypothesis 11 investigated the relationship that existed between the cognitive and somatic manifestations of state

reveals that there was no effect on subjects' post-treatment A-State scale performance which was attributable to pre-testing or the interaction of treatment with pre-testing. From these data, it was concluded that biofeedback training with treatment groups 1 and 3 did not produce significant reductions in state anxiety during the initial interview as measured by a self-report instrument.

It has been concluded that the treatment procedures did not mediate the experience of anxiety for the subjects. However, if hypothesis testing had been conducted for variability rather than central tendency, the results may have been different. This conclusion is supported by the application of Hartley's F_{\max} procedures (Glass and Stanley, 1970) to the data of Table 14. The formula for Hartley's F_{\max} statistic is represented by the following equation:

$$F_{\max} = \frac{\text{largest of } k \text{ variances}}{\text{smallest of } k \text{ variances}}$$

$$df = k \text{ and } n-1$$

where k = the number of variances

n = the number of observations

In this instance, the test indicates that the variances for electromyography (EMG) in the baseline [$F_{(4,5)} = 1054.44$, $p < .01$], induction [$F_{(4,5)} = 175.56$, $p < .01$], and interview

phases [$F_{(4,5)} = 177.98, p < .01$] are heterogeneous. As a result, one of the assumptions of analysis of variance--homogeneity of variances--has been violated. With this violation apparent, significance testing of variability may have resulted in a different conclusion regarding the effects of the treatment procedures.

Hypothesis 11: When considering the pre-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the baseline phase.

Hypothesis 11 investigated the relationship that existed between the cognitive and somatic manifestations of state anxiety. In this instance and for hypotheses 12 and 13, the relationship between the dependent variables, electromyography, finger temperature, and A-State scale performance, was examined for the 12 subjects (i.e. groups 1 and 2) included in the pre-treatment assessment procedures. Hence, this hypothesis was tested by comparing the Pearson Product-moment Correlation Coefficient with values necessary for statistical significance. Thus, with 10 degrees of freedom, a Pearson's r of .576 was necessary to reach significance at the .05 level.

The matrix which results when the dependent variables relationship to each other is examined in each of the three phases, baseline, induction, and interview in the pre-treatment appears in Table 21. However, only these findings which are

Table 21. Pearson Product-moment Correlation Coefficients for three dependent variables within each pre-treatment phase

	B1	B2	B3	I1	I2	I3	T1	T2	T3
B1	1.00								
B2	-0.37	1.00							
B3	-0.22	0.02	1.00						
I1	0.15	0.23	0.11	1.00					
I2	-0.33	0.96**	0.03	0.33	1.00				
I3	-0.13	0.12	0.73**	-0.09	0.11	1.00			
T1	-0.22	0.34	0.30	0.08	0.50	0.05	1.00		
T2	-0.15	0.81**	-0.19	0.33	0.91**	-0.12	0.54	1.00	
T3	-0.52	0.25	0.54	-0.24	0.24	0.76**	0.05	0.10	1.00

Key: B1 = Baseline EMG
 B2 = Baseline finger temperature
 B3 = Baseline A-State scale performance
 I1 = Induction EMG
 I2 = Induction finger temperature
 I3 = Induction A-State scale performance
 T1 = Interview EMG
 T2 = Interview finger temperature
 T3 = Interview A-State scale performance

** Significant at the .01 level.

relevant for hypothesis 11, and similarly for those that follow, are discussed. Comments concerning other relationships are reserved for the section entitled "Additional findings."

For hypothesis 11, the Pearson Product-moment Correlation Coefficient for the baseline dependent variables were as follows: EMG with finger temperature, $r = -0.37$; EMG with A-State, $r = -0.22$; and finger temperature with A-State, $r = 0.02$. Clearly, none of these correlation coefficients were significant. Because the first dependent measure can account for 13.7%, 4.8%, and .04% of the variability of the second (respectively), the null hypothesis was not rejected. It is concluded that there was no relationship between the three dependent variables during the pre-treatment baseline phase.

Hypothesis 12: When considering the pre-treatment phase, there is no significant relationship between subjects' physiological and self report measures of state anxiety during anticipation of the initial interview.

This hypothesis examined the relationship which existed during the induction phase of the pre-treatment assessment procedures. The Pearson Product-moment Correlation Coefficient of the induction phase dependent variables were reported in Table 21 as: EMG with finger temperature, $r = 0.33$; EMG with A-State, $r = -0.09$; finger temperature with A-State, $r = 0.11$. Because none of these coefficients reached the critical level needed for significance, 0.58 with 10 degrees of freedom, the hypothesis was not rejected. Further evidence was gained for

the lack of relationship between these variables by the following: there was 10.9% shared variance between EMG and finger temperature; .8% shared variance between EMG and A-State scale performance; and .12% shared variance between finger temperature and A-State scale performance. From these data it was concluded that no significant relationship between the three dependent variables during the pre-treatment induction phase existed.

Hypothesis 13: When considering the pre-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the initial interview.

This hypothesis examined the third phase, the initial interview, of the pre-treatment assessment procedures to determine the relationship which existed between the three dependent variables. During this stimulus condition, the Pearson-Product-moment Correlation Coefficient for EMG with finger temperature was 0.54; for EMG with A-State scale performance it was 0.05; and finally, for finger temperature with A-State scale performance it was 0.10. Again, none of these coefficients reached the critical level necessary for rejection of the null hypothesis. In this instance, the aforementioned variables shared only 29.2%, .3%, and 1% respectively, of the variance. As a result, it was concluded that there was no significant relationship between the three dependent variables during the pre-treatment initial interview.

Additional findings While each of the three previous hypotheses was not rejected, an examination of the correlation matrix reproduced as Table 21, indicated several significant relationships. The relationships between EMG during the baseline and induction phases, A-State scale performance during the baseline and induction phases, EMG during the induction and interview phases, EMG during the baseline and interview phases, and A-State scale performance during the induction and interview phases reached significance at the .01 level. Thus it was concluded that in several instances there was a significant relationship between a subjects' initial level of state anxiety and later measures on that same dimension, i.e. electromyography, finger temperature, or A-State scale performance.

Hypothesis 14: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self report measures of state anxiety during the baseline phase.

This hypothesis, as well as the two which follow, investigated the relationship which existed between the three dependent variables of this study during the post-treatment baseline, induction and interview phases across all four groups. These hypotheses were tested by comparing the Pearson Product-moment Correlation Coefficient with values necessary for statistical significance. In this case, with 22 degrees of freedom a Pearson's r of 0.40 was necessary to reach significance at the .05 level and reject the null hypothesis. These data are

presented in Table 22 in matrix form to depict the dependent variables relationship to each other was examined in each of the three phases--baseline, induction and interview--of the post-treatment procedures. Again only the findings appropriate to these hypotheses are discussed in this section. Comments concerning other relationships are reserved for the section entitled "Additional findings."

For hypothesis 14, the Pearson Product-moment Correlation Coefficient for the baseline dependent variables were as follows: EMG with finger temperature, $r = 0.16$; EMG with A-State, $r = -0.13$; and finger temperature with A-State, $r = -0.07$. None of these coefficients reached the critical value of .40 necessary to reject the null hypothesis. Indeed, EMG and finger temperature shared only 2.6% of the variance; EMG with A-State performance 1.7%; and finger temperature with A-State performance .5%. Hence, it was considered that there was no significant relationship between the three dependent variables during the post-treatment baseline phase.

Hypothesis 15: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during anticipation of the initial interview.

In this instance, the Pearson Product-moment Correlation Coefficients were calculated for the three dependent variables during the induction phase, rather than the baseline phase, as was the case previously. These data are reported in Table 22.

Table 22. Pearson Product-moment Correlation Coefficients for three dependent variables within each post-treatment phase

	B1	B2	B3	I1	I2	I3	T1	T2	T3
B1	1.00								
B2	0.16	1.00							
B3	-0.13	-0.07	1.00						
I1	0.93**	0.11	-0.12	1.00					
I2	0.16	0.95**	-0.07	0.11	1.00				
I3	-0.06	-0.04	0.74**	0.05	-0.11	1.00			
T1	0.92**	0.17	-0.04	0.91**	0.19	0.08	1.00		
T2	0.32	0.83**	-0.08	0.26	0.93**	-0.15	0.32	1.00	
T3	-0.11	0.04	0.60**	-0.12	0.02	0.66**	0.03	-0.02	1.00

Key: B1 = Baseline EMG
 B2 = Baseline finger temperature
 B3 = Baseline A-State scale performance
 I1 = Induction EMG
 I2 = Induction finger temperature
 I3 = Induction A-State scale performance
 T1 = Interview EMG
 T2 = Interview finger temperature
 T3 = Interview A-State scale performance

** Significant at the .01 level.

The reader can note the following correlation coefficients: EMG with finger temperature, $r = 0.11$; EMG with A-State scale performance, $r = 0.05$; and finger temperature with A-State scale performance, $r = -0.11$. None of these coefficients reached the significant level and therefore, the null hypothesis was not rejected. Further examination indicated that only 1.2%, .25%, and 1.2% of the variance was shared, respectively, between each of the paired variables. From these statistics, it was concluded that there was no relationship between the three dependent variables during the post-treatment induction phase.

Hypothesis 16: When considering the post-treatment phase, there is no significant relationship between subjects' EMG or finger temperature levels and self-report measures of state anxiety during the initial interview.

This final hypothesis examined the relationships which exist between the dependent variables during the initial interview phase of the post-treatment procedures. Subjects' exposure to this stimulus condition resulted in the following Pearson Product-moment Correlation Coefficients: EMG with finger temperature, $r = 0.32$, EMG with A-State scale performance, $r = 0.03$; and finger temperature with A-State scale performance, $r = -0.02$. In addition, only 10.2%, .09%, and .04% of the variance was shared, respectively, between each of the paired variables considered. As a result, it was concluded that there was no significant relationship

between the three dependent variables during the post-treatment initial interview. These data are reported in Table 22.

Additional findings Although each of the three previous hypotheses failed to be rejected, several significant relationships were established. When considering the relationship of each variable to itself in the three phases, electromyography, finger temperature, and A-State scale performance were significant at the .01 level. That is, the Pearson Product-moment Correlation Coefficient established that there was a direct positive relationship on each assessment measure with itself during post-treatment baseline, induction, and interview phases. The strength of these correlations was apparent with from 36% to 90% of the variability of the second can be accounted for by the first. Interestingly, the coefficients are much stronger for the physiological or somatic assessment procedures than they are for the cognitive or self-report measure. In addition, no significant correlations between the three dependent variables, across all phases concurrently (e.g. baseline finger temperature does not significantly correlate with interview A-State scale performance, are indicated in Table 22. From this discussion it was concluded that there was a significant relationship between a subject's initial level of state anxiety and later measures on that same dimension, i.e. electromyography, finger temperature, or A-State scale performance.

Summary

This study was undertaken to determine if state anxiety induced through a verbal statement could be attenuated by biofeedback training procedures. Concurrently, the relationship between the cognitive or self report and somatic or physiological measures of state anxiety were examined. Sixteen hypotheses were formulated and the findings reported in this chapter.

The first two hypotheses were formulated to determine if state anxiety could be induced in helping profession trainees. Results of the t-tests indicated that state anxiety was clearly present when finger temperature measures and A-State scale performance were assessed. Although electromyographic measures did not establish without question the presence of state anxiety, the t-value just missed being significant at the .05 level.

Hypotheses 4-6 sought to establish that differences between experimental and control groups resulting from the pre-treatment assessment procedures were nonsignificant. If such differences were found, their effects would serve to confound the post-treatment data analyses. Each of these null hypotheses were not rejected, indicating no significant differences between the two groups.

Hypotheses 7-10 investigated the treatment effects upon state anxiety as manifested in the physiological responses of electromyography and finger temperature and as manifested in

the self report responses of the A-State scale. Both post-treatment phases of induction and interview were examined and the significance testing failed to reject any of these four hypotheses. From this it was concluded that biofeedback training did not produce significant reductions in state anxiety during the post-treatment induction or interview phases.

Finally, hypotheses 11-16 studied the relationship between the dependent variables--electromyography, finger temperature, and A-State scale performance--which existed during each of the three phases--baseline, induction, and interview--both pre-treatment and post-treatment. Pearson Product-moment Correlation Coefficients were calculated, but were of too small a magnitude to reject these 6 hypotheses.

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

The purpose of this study was to investigate the cognitive and somatic effects that an intervening variable, anxiety, had on helping profession trainees during an initial interview. To assess these effects a verbal statement designed to induce anxiety was administered following a baseline habituation period. Each subject's manifest state anxiety was monitored through electromyographic and finger temperature physiological measures as well as a cognitive self-report instrument, the A-State scale of the State-Trait Anxiety Inventory. Subsequent to anxiety induction, each subject's state anxiety was monitored during an initial interview with a coached client. In each of the pre-treatment and post-treatment phases, data collection procedures enabled the investigator to examine the relationship between physiological and self-report indicators of state anxiety.

Through stratified random sampling procedures, subjects were assigned to one of four groups specified by the Solomon Four Group Design. The stratification procedures resulted in two groups receiving the experimental treatment and two groups serving as the no treatment control groups. The experimental treatment, biofeedback training, was used to provide information about electrical activity of the skeletal muscular responses, as manifested by tension or lack of tension in the muscles (electromyography), and peripheral blood flow (finger

temperature) of the person whose response it was. Each member of the two experimental groups received a one hour introduction session, including information on anxiety and biofeedback training, and three 35 minute training sessions involving EMG and finger temperature biofeedback training. Subjects were encouraged to practice and strengthen acquired skills through home practice of 30 minutes each day. Within 5 days of the conclusion of the biofeedback training, post-treatment data collection phases were again implemented to assess the viability of the experimental treatment.

The subjects who participated in this investigation were pursuing a career in the helping profession. Of the 24 subjects who volunteered and subsequently completed all requirements for participation, 11 were enrolled in an upper division psychology course and 13 volunteered from 3 graduate level counselor training courses. Of these 24 subjects, 8 were males and 16 females and the participant age range was from 21 to 43 with an average age of 27.2. The volunteers were initially administered the A-Trait scale of the State-Trait Anxiety Inventory. These scores were then rank ordered and the subjects randomly selected into one groups of the Solomon Four Group Design.

Two sets of data were collected for each subject of this study: self-report assessment of state anxiety (i.e. A-State scale performance on the STAI) and physiological measurement of

state anxiety (i.e. electromyography and finger temperature). These measurements of state anxiety were taken on subjects during the baseline, induction, and interview phases of this study, both pre-treatment and post-treatment. Three types of statistical tests were conducted to analyze data and test hypotheses. The t-test procedure was used to determine if state anxiety was induced within subjects. Analysis of variance was used to determine if the experimental treatment produced significant reductions in state anxiety. Finally, the Pearson Product-moment Correlation Coefficient was employed to ascertain the relationship that existed between physiological and self-report measures of state anxiety.

Summary

Sixteen null hypotheses were formulated to examine the three research questions of this investigation. In presenting this summary of findings, the discussion is organized around each research question, followed by an examination of the hypotheses which addressed the question.

Research Question 1: Does a verbal statement designed to induce anxiety, significantly increase state anxiety levels in helping profession trainees?

The first six hypotheses were formulated to examine this research question. Hypotheses 1 and 2 evaluated the effects of anxiety induction on the physiological and self-report measures.

The null hypothesis was not rejected for electromyographic measures (although the t value was just slightly below that needed for hypothesis rejection). However, with both finger temperature and self-report measures there was a significant increase in state anxiety levels in helping profession trainees. Thus, hypothesis 1 was rejected for finger temperature measures and was not rejected for electromyographic measures; hypothesis 2 was rejected for the self-report measure of state anxiety. Although the hypothesis just missed rejection for EMG, it is apparent that all three assessment modalities are valid through convergent methods. Hence, it is concluded that a verbal statement designed to induce anxiety does significantly increase state anxiety levels.

Hypothesis 4-6 sought to establish that differences between the experimental and control groups resulting from the anxiety induction procedures were nonsignificant. If such differences were found, their effects would serve to confound the post-treatment data analysis if not adequately controlled for. None of these null hypotheses were rejected at the .05 level of significance. Further support for the conclusion generated by hypothesis 1 and 2 was found in these results. That is, there was no difference between experimental and control groups' change in state anxiety as a result of the administration of a verbal statement. Change occurred uniformly between groups and was manifested by increases in A-State scale performance and decreases in finger temperature.

Research Question 2: Does the treatment condition, electromyographic and finger temperature biofeedback training, significantly attenuate state anxiety during an initial interview?

This second research question sought to ascertain if biofeedback training was a viable treatment for the reduction of state anxiety. Hypotheses 7-10 were developed to examine this question. When considering the two types of data collected--physiological and self-report measures--during the post-treatment phases of induction and interview, the significance testing failed to reject any of these four hypotheses. That is, no significant difference between the experimental and control groups on the manifestation of state anxiety during the post-treatment phases were found. From this it is concluded that biofeedback training with electromyography and finger temperature did not serve as a viable treatment for the reduction of state anxiety in helping profession trainees during an initial interview.

Research Question 3: Is there a significant relationship between physiological and self-report measures of state anxiety in helping profession trainees in anticipation of and during the initial interview?

Anxiety has been previously defined as having both cognitive and somatic components. This research question, and hypotheses 11-16 which were formulated to answer it, addressed the issue of whether the cognitive and somatic appraisals of state anxiety were related in a clear and defined way. That

is, does a relationship exist between individual physiological response and cognitive self-report to a stressful stimulus. Pearson Product-moment Correlation Coefficients were calculated between each of the three dependent variables--electromyography, finger temperature, and A-State scale performance--during each of the pre-treatment and post-treatment phases--baseline, induction, and interview. For each of these six hypotheses the correlation coefficients were not of a significant magnitude and, therefore, failed to reject the null hypothesis.

Discussion

The opportunity to practice helping skills in actual client interviews is required in most training programs. Many writers have speculated that helping profession trainees are less effective when experiencing high levels of anxiety. While a number of studies (Fry, 1973; Pennscoff and Brown, 1972; Rihani, 1973) have examined the relationship between the use or attainment of appropriate helping skills and trainee anxiety, few have done so within an actual counseling interview. The present study has documented that anticipation of an initial client interview causes elevations of state anxiety in helping profession trainees. This result is consistent with the current literature of the field which indicates that an individual's expectations and appraisal of a situation influence that person's reactions to it (Bowman, Roberts, and Giesen, 1978;

Spielberger, 1972). This finding supports those who advocate use of techniques aimed at changing the trainees expectations regarding the counseling interview in general, and the initial interview specifically. It would appear that training programs for the helping professions would benefit when such techniques are incorporated.

It is apparent that individuals respond differentially to state anxiety assessment modalities. In this study there was a significant increase in state anxiety as measured by finger temperature and a cognitive appraisal instrument. The state anxiety increase on the electromyographic measure failed to reach significance, although it approached the .05 level. It is this investigator's conclusion that forearm electromyography, while appropriate for relaxation training (Kelly, Brown, and Shaffer, 1970; Leboeuf, 1974) is a poor modality to use for anxiety assessment within an actual interview. This conclusion is based upon the investigator's individual observations and debriefing sessions with the subjects. Many of the participants were concerned with holding their forearm motionless, often in an uncomfortable or unnatural position. The slightest movement to adjust the positioning of the arm was read indiscriminantly as increased muscle tension on the electromyographic unit.

Following the anxiety induction phase, the participants conducted an initial interview with a client with anxiety data

being collected. These data when compared with baseline data, confirmed the presence of state anxiety in the subjects. However, only pre- and post- physiological measures were significantly different. The self-report instrument showed non-significant differences between baseline and interview phases. This is in apparent conflict with other reported research findings (Bowman and Roberts, 1978; Bowman, Roberts, and Giesen, 1978) in which both physiological and self-report measures detected significant increases in state anxiety during an interview. The limitation of the research cited above is apparent when one realizes that the self-report measures were questionnaires developed by the investigators for use in their research. No indications of reliability and validity were presented for these instruments. As a result, the author suggests that these questionnaires may not be free from experimenter bias. This is not the case in this investigation where a previously developed instrument was employed.

Beyond these differences, the findings that self-report measurement did not establish the existence of state anxiety is consistent with random comments made by the subjects to the investigator. Several subjects indicated that once they began to establish the relationship with the client, less anxiety was experienced. Some indicated that their own talking served to reduce the cognitive experience of anxiety through a refocusing of one's mental set. Because the instrument was administered

after the interview was concluded that the client had departed, several subjects experienced a great wave of relief. These individuals may have responded to the A-State scale from the frame of reference of being finished and the associated good feelings, rather than responding with the feelings associated with the recent interview.

A conclusion which might be drawn from this discussion is that anticipation of an initial interview may create more trainee anxiety than the interview itself. This was supported by additional statistical tests conducted on these data collected. Since only two of the three anxiety measures confirm this, the conclusion is considered tentative and speculative. Although this conclusion requires further documentation, one implication is that trainees who experience high levels of anticipatory anxiety may be identified prior to interview experiences and remediation techniques may be employed. In any event, further research into the concept of anticipatory anxiety in helping profession trainees is warranted.

Another purpose of this investigation was to determine the merits of an experimental treatment to reduce the manifestation of state anxiety in anticipation of and during an initial interview. As a result, the treatment exposed helping profession trainees to biofeedback training procedures which attempted to facilitate the acquisition of control over anxiety. The results failed to confirm that this treatment procedure was

capable of significantly reducing the experience of state anxiety on three dependent variables. In each instance, analysis of variance of electromyography, finger temperature, and A-State scale performance between the four groups of the study failed to establish significant reductions in state anxiety manifested in the experimental group of helping profession trainees.

The results, while not surprising, are disappointing. Much of the literature in this field provides contradictory reports of the relative success of a variety of anxiety reduction techniques employed with helping profession trainees. The results of this study appear to be consistent with some studies which have employed nonbiofeedback treatments (Cook, 1974; Miller, 1971; Rihani, 1972; Riley, 1975) and in conflict with others (Miller, 1973; Monke, 1971). When the literature is examined more narrowly, and the results of this study are compared with others implementing biofeedback training procedures, there is considerable agreement. Meyer (1973), who employed alpha wave training, found significant reduction in anxiety on a self-report measure and nonsignificant results on physiological measures. Fontaine (1975) failed to reduce state anxiety using alpha wave training although a significant increase in the quality of the counseling relationship was apparent. And finally, Gibson (1977), using modified temperature biofeedback, failed to establish significant reductions in state anxiety among subjects.

The post-treatment descriptive statistics reported in Table 14, page 156, provide little additional information for consideration. This table indicated that both experimental groups had higher mean finger temperatures during the induction and interview phases than did the two control groups. Typically, elevations in finger temperature indicate relaxation, which is considered an inhibitor to the experience of anxiety (Brown, 1974). Further examination of these descriptive data was inconclusive when electromyography and A-State scale performance are considered. Because these results correspond with those from previous studies, the use of biofeedback training techniques as a mediator to the experience of state anxiety in helping profession trainees was not established. However, this study and those by Fontaine (1975), Gibson (1977), and Meyer (1973) should be considered tentative explorations into new methods of reducing anxiety in helping profession trainees. In any event these studies lay the foundation for further research on this topic.

The foregoing discussion has explored the effects of both anxiety induction and a treatment to mediate state anxiety. At times during this analysis these data collected from the physiological and psychological measures of state anxiety may have suggested a pattern of responses associated with this arousal state. One might assume that there would be substantial correlations between these measures. A brief examination

of Table 14, which contains post-treatment descriptive data, indicates that as finger temperature falls for each of the four groups electromyography rises. Although surface comparisons are confusing, it appears that there may be some relationship trends present. However, in all instances, dependent variables data failed to be significantly related during any of the pre-treatment and post-treatment phases. While finger temperature and electromyography had larger pre-treatment Pearson Product-moment Correlation Coefficients than others, it was nonsignificant, and the directionality of the correlation changed from one phase to another.

It is apparent that the issue of correlation between various measures of state anxiety has not been resolved. Although a number of recent studies have reported significant findings (Diblin, 1970; Kelly; Brown, and Shaffer, 1970; Thompson, 1976), the results of this research corresponds to the growing body of literature which indicates that correlations between anxiety assessment measures are generally small and nonsignificant at worst, and unclear and confusing at best (Bowman, Roberts, and Giesen, 1978; Johnson and Spielberger, 1968). It is difficult to speculate on the reasons for such findings, however, this conclusion appears to be consistent with the operational definition of anxiety previously presented. That is, anxiety may be experienced somatically and/or cognitively, while either one may be experienced exclusive of the

other. This is supported by the investigators debriefing of subjects within this experiment. Many subjects reported feeling at ease with the client (i.e. low cognitive anxiety) although physiological measures indicated otherwise. At best, it can be concluded that the relationship between anxiety assessment measures is dependent upon a diverse set of variables: the subject (including a wide range of personality factors and response patterns), the stimulus condition, the appropriateness of the assessment measures to the subject, and the accuracy of the instruments measuring state anxiety.

The previous discussion focused on the correlations between the various dependent measures of this study. However, when attention is focused on the relationship between any one dependent variable and subsequent measures on that same variable, different conclusions were drawn. In this study, a significant relationship existed at the .01 level, for each variable with later measures of the same variable. These correlations, from .60 to .95, were always positive with the first measure accounting for a considerable amount of the variability of the second. These findings were consistent with other reports (Bowman and Roberts, 1978; Spielberger, 1972), and suggest that anxiety responses function within a related system. The implication for this are apparent: graduate training programs in the helping professions can use baseline state anxiety data to identify counselors who may experience high levels of

anxiety during an initial interview. These identified helping profession trainees may profit from a differential application of techniques for anxiety reduction.

Recommendations

Based upon the findings of this study, as well as the investigator's insights, several recommendations for future research are suggested. The first two areas involve correcting certain limitations of the present study. One suggestion is that future studies in this area should include a criterion for minimal performance during the biofeedback training which served as the treatment. In this way, generalizations regarding the effects of treatment would be substantiated by the fact that subjects were able to demonstrate self-regulation at minimal levels. The real question is whether this learning would be transferred by subjects to an initial interview.

While the investigator is satisfied with the experimental design as well as the data collection techniques, it is suggested that the A-State scale be administered midway through the initial interview. The investigator who gathers self report cognitive data at this time, is likely to obtain a more valid measure of state anxiety within the interview. This procedural change was supported by subject comments made during debriefing.

The design of this research included a somewhat neutral stimulus condition in the initial interview. This approach was based upon the investigator's belief that subjects would "make themselves anxious" even given a rather low stress task to perform. Future research might be conducted with confederate clients playing both friendly and hostile roles. The supposition is that there would be differences in anxiety reactions in the two types of interviews which would add another dimension to the investigation of anxiety.

Finally, it is suggested that future research vary the physiological assessment modalities, lengthen treatment until criterion is obtained, and include a control group of non-helping profession trainees. In addition it is suggested that the effects of training be longitudinal and focus on trainee change throughout one's academic preparation. Such procedures might be incorporated into practicum or internship settings.

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APPENDIX A: THE STATE-TRAIT ANXIETY INVENTORY

SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and "rattled"	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④



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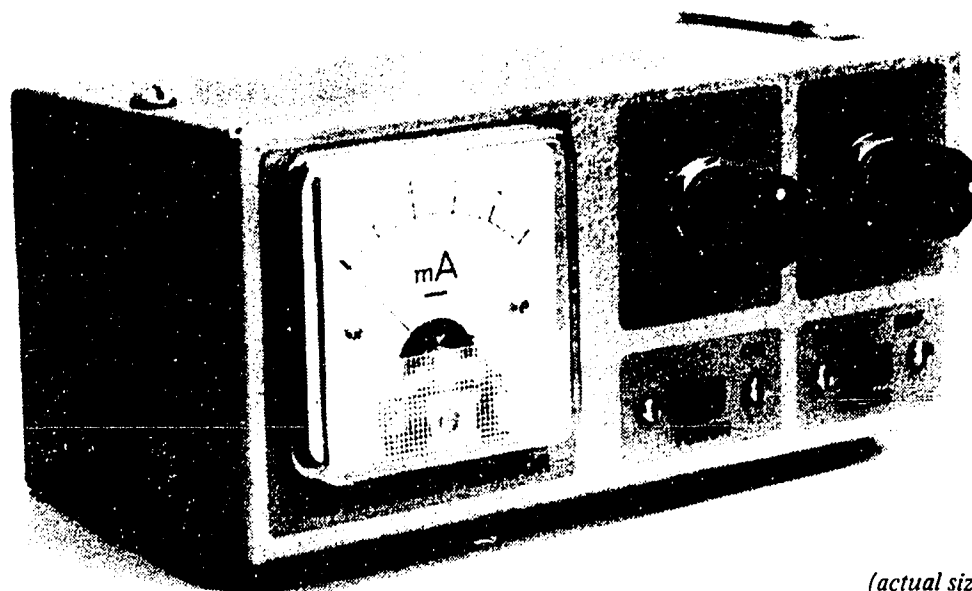
SELF-EVALUATION QUESTIONNAIRE
STAI FORM X-2

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

APPENDIX B: INFORMATION ON PHYSIOLOGICAL INSTRUMENTS

EMG FEEDBACK MONITOR KIT EDC-22*(actual size)*

★ HIGH PERFORMANCE

2 μ V Sensitivity
80 db CM Rejection
Noise less than 1 μ V

★ LOW COST KIT FORM

★ COMPACT SIZE

★ EASE OF ASSEMBLY

★ FLEXIBLE OPERATION

Variable Integration Control
Adjustable Sensitivity/Threshold
Audio and Visual Feedback

★ BATTERY POWERED

★ UNIQUE CIRCUIT DESIGN

★ FULL PARTS WARRANTY

Until recently, good quality biofeedback instruments have been exorbitantly high priced. Now, with the introduction of the EDC-22 even the budget minded researcher and experimenter can obtain the same kind of performance offered by expensive EMG monitors but at a fraction of the cost. For greater flexibility and ease of operation, the EDC-22 incorporates several control functions with both visual and audio feedback modes. To best demonstrate the unusual capabilities of the EDC-22, one need only compare our specifications with other devices costing several hundred dollars and more. It will be apparent that only the most costly lab type equipment offers substantially better performance. Our low price is accomplished through the use of an efficient and sophisticated circuit design. For additional savings, the monitor is supplied in kit form, complete with all parts and accessories, including a detailed, illustrated construction manual for easy assembly. Evaluate our EMG monitor carefully, and we think you will agree the EDC-22 represents a major cost breakthrough in biofeedback instrumentation.

The May, 1975 issue of POPULAR ELECTRONICS magazine will feature an article about our circuit design. The article will discuss EMG feedback in general and detail construction and use of this kit.

208
EDC-22 FEATURES

SPECIFICATIONS:

- Input Impedance – 100 K-ohm
- CM Rejection Ratio – 80 db @ 60 Hz
- Noise Level – Less than 1 μ V pp (referred to input)
- Sensitivity – 2 μ V pp
- 60 Hz Suppression – -31 db
- Filter Passband – 200 Hz to 1000 Hz
- Low Filter Roll-off – 15 db/octave
- High Filter Roll-off – 6 db/octave
- Power Requirements – two 9V batteries (not included)
@ 11 mA

CIRCUIT DESCRIPTION:

Muscle signals picked up by the electrodes are amplified by a differential amplifier input stage. The signals then pass to a rectifier/integrator circuit, where they are averaged and displayed on a meter, and at the same time drive a variable audio 'click' rate oscillator. Changes in muscle tension are indicated by a changing meter reading and click rate.

CONTROL FUNCTIONS:

- Integration – Allows reading of average muscle activity over a variable time period.
(range .005 to .5 seconds)
- Sensitivity/ Threshold – Adjustable range for full scale meter readings (10 μ V – 1000 μ V)
also adjusts threshold level from 2.5 μ V up.
- Input Mode – Active/reference switch permits simple check of circuit noise.

OUTPUT MODES:

- Visual – Built in panel meter with linear calibrations.
Output reading corresponds to EMG input level.
- Audio – Low frequency pulses drive a crystal earphone.
Click rate (5 to 30 pulses/sec) corresponds to EMG Input level

DIMENSIONS: 5" x 2¼" x 2¼" (9 oz.)

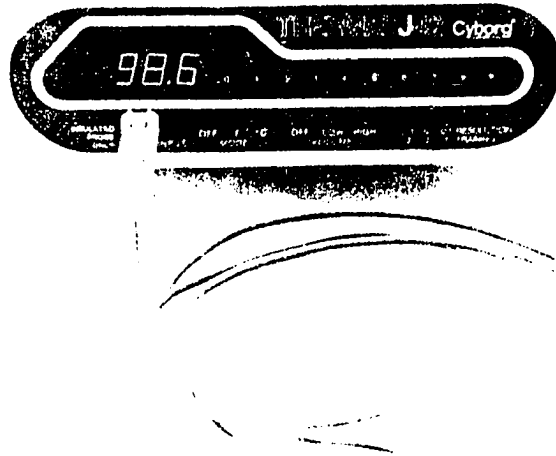
PRICE: EDC-22 EMG Feedback Monitor Kit \$69.50 pp

Complete kit includes all electronic components, PC board, silk-screened enclosure, assembly manual and instructions, hookup wire, electrode gel, and a set of Ag/AgCl disposable type electrodes, and crystal earphone. Batteries and solder not included.

All components covered by 90 day replacement warranty.

PARTS & ACCESSORIES for EDC BIOFEEDBACK MONITOR KITS

DC-6	Permanent Silver/Silver Chloride Electrodes. Superior performance, long life, <i>DC-6 (pair)</i>	\$15.95
DC-9	Electrode Contact Gel: Use with all our electrodes, provides proper contact, <i>DC-9 (1 oz. bottle)</i>	\$.75
	<i>DC-9x (4 oz. bottle)</i>	\$ 2.50

Cyborg J42 Feedback Thermometer

Specifications

Temperature Range.....	23°-113°F, 0°-45°C
Accuracy.....	±0.3°F, ±0.15°C
Resolution.....	0.01°F, 0.01°C
Audio Frequency Range.....	200 Hz to 1KHZ
Thermistors.....	YSI 700 series
Size.....	.7" x 2" x 4"
Weight.....	.1 lb
Batteries.....	2:9v

APPENDIX C: ACTOR TRAINING PROCEDURES

Actor Training Procedures

The use of a confederate client in research on the counseling relationship appears to be a commonly accepted procedure. Heller, Myers, and Kline (1963) used student actors to portray several standardized client roles from which interviewer behavior was assessed. Russell and Snyder (1963) trained students from a theater arts course to display specific affect states. Doblin (1970) and Carter and Papas (1975) each used confederate clients to avoid the confounding effects upon interviewer behavior of actual clients presenting diverse problems.

For the purposes of this study, cooperation from the Department of Speech, Iowa State University, was sought and three actors (1 male and 2 female) agreed to participate as confederate clients. In each instance, the actors were selected for their ability to assume the required role while playing it in a spontaneous and real life manner. The student actors were paid for their work in order to maintain their interest and participation in this research.

The client's role

The purpose of this study was to investigate helping profession trainees' anxiety in anticipation of and during an initial interview. Because the focus of the study is on the subjects and how they interpret and experience the impending

interview, the source of anxiety falls largely within each subject. As a result, a rather neutral role, one that neither heightens or lessens the anxiety level of the subjects, was deemed most appropriate for the actors to assume.

Research indicates that hostile client behavior typically elicits significantly more anxiety in counselors than does friendly client behavior (Heller, Myers, and Kline, 1963; Russell and Snyder, 1963). With this in mind the following actor role descriptions are designed to provide rather neutral, but friendly responses for the helping profession trainees. Because of the pretest posttest design of group 1 and 2's participation, it was necessary to have two role descriptions available as appropriate. The two actor roles follow:

Role description #1

Presenting the Problem. As the client you are to appear warm, friendly, but conforming and introspective during the interview. You are seeking assistance and direction with the problem you are presenting. While listening very carefully to any suggestions or alternatives the counselor may offer, careful consideration of each will lead to their rejection. However, this is to be done in a manner in which the counselor will not personally be offended but continue to think well of you. During these times, you may act nervous and unsure of yourself. Smile throughout much of the interview indicating your willingness and agreeableness. You are quite responsive to the counselors' questions and comments and as appropriate you volunteer new information spontaneously. You do not expect a solution to the problem to be agreed upon in the interview, but you will continue to give the problem considerable attention throughout the school year.

The Problem. As a senior in the College of Science and Humanities, you expect to graduate this Spring (1979). Although school has never been easy for you,

your GPA is 2.68, while being very involved in various campus organizations--Senior Senator GSB, Campus Chest, Racketball Club, and a volunteer at Beloit of Ames. The dilemma that you are faced with involves your indecision about a career objective. More specifically, you are completely at a loss about what to do after graduation.

During your 4 years as a student you have changed majors from English to Psychology to Sociology (your present major). Your indecision in deciding upon a major appears to have confused you about a possible career goal. You wonder how your experiences, both academically and socially, will contribute to making you a productive employee for some company. You are well read in the social science area but fail to see how this will help you find a job, or even determine what area you would like to work within. You know that you want something better than the job you presently hold--delivering pizza for Paul Revere's Pizza--one that you have held for 3½ years.

During high school, you can recall taking a couple of interest inventories (you think they are the Strong and OVIS but you are not sure) but the results were largely inconclusive. For several years now, you have toyed with the idea of becoming an attorney, but you are uncertain whether you have the verbal and academic skills to be successful in law school, let alone the GPA to be admitted.

You would like to arrive at a career goal or objective before the end of the school year, but you don't want to be pressured into something that you don't think you will like. You welcome suggestions but most seem inappropriate for you. You leave the session with the counselor expecting that it will take you many more months of thinking to arrive at something that fits for you.

Role description #2

Presenting the Problem. Once again, the task is to present the problem indicated below in a manner that appears to be quite open to the counselor you will be interviewed by. You should respond to questions in such a way that the nature of the problem is maintained. Don't feel that the counselor has to "pull" things from you, but as appropriate you may volunteer relevant information as it serves to maintain the role you are

constructing. Please keep in mind, however, that you are not to agree to do anything (i.e. take any specific action) other than to see an assigned counselor that will be assigned to you through the counseling center.

The Problem. As a senior, you recognize and look forward with interest to graduating at the end of the Spring quarter. You have some tentative plans about what you would like to do in terms of a career and you share those with the counselor (i.e. you can share from your own perspective and using your own plans for post-graduation activities).

The real problem that you have is your ability, or rather lack of ability, to get along well with people. For a number of years you have not had very many friends and have a reputation among those that are acquainted with you of being a loner. Seldom do you take part in any campus or community activities, preferring to spend time alone with a good book, studying, listening to music or meditating. When you are with people you seem to be very intolerant of others ideas, and have a somewhat rigid and unbending opinion of current news topics or topics being covered in class. [Although you are rigid in your approach in this interview you are able to recognize this in yourself,] but appear to be quite perplexed about how to change yourself and reach the point of having more people that you enjoy being around and that enjoy being around you.

Some examples of things that have happened in the past are: --You use to live with a room mate in a campus-town apartment, however, you refused absolutely to permit your room mate's friends to drink, smoke dope, or have friends spend the night on the couch. As a result of this considerable friction between you and your room mate developed as a result of your rather rigid perception of the negative effects to the body of drinking and smoking dope. After considerable arguing reaching the point of one time threatening to call the police and report your room mate and friends you moved out and have returned to your room in your parents home where they essentially leave you to yourself.

-----Working on any type of committee seems to cause considerable problems for you. In one recent class, you were assigned to a committee and after the initial meeting refused to participate. The instructor was not sympathetic to your complaint that you and the

others on the committee could not work together. He, the instructor, insisted that you try again. After another two meetings you simply left the committee during a session, and dropped the course. This was a year or so ago and you're not real sure how the instructor or other students reacted. You really didn't care at that time.

Training the student actors

Orientation and discussion During this hour, the student actors and the investigator met individually to discuss the proposed role. Further explanation was provided by the investigator as needed. Questions were dealt with regarding the mode of presentation and concerns the student actors had. The actors were encouraged to react spontaneously in filling in the missing elements in their stories by relying upon the "background" material. The student actors were not informed of the purpose of the study, only that they were to portray a typical client who has sought help from the counseling service.

Practice This two hour block of time, each student actor had the opportunity to practice the roles with an advanced graduate student serving as a helping profession trainee. During these sessions the graduate student tried to anticipate the kinds of interviewer behavior the student actors might meet and prepare them for as many contingencies as possible. During this role played situation, when the student actors have met the specific role definition they will be pretested.

Pretest During this phase of the training, the student actors were observed portraying each of the two roles by two judges. While each student actor was interviewed by an advanced graduate student for 15 minutes for each role, the judges were to evaluate whether the actors stayed "within character." The judges agreed in each instance that the three student actors were capable of portraying the two different roles as described. It was not necessary to return to the practice phase for additional training for one or more of the student actors. As necessary, the judges offered helpful comments to the student actors about how to deal with a particular question or comment from the interviewer.

APPENDIX D: CLIENT DISPOSITION FORM

CLIENT DISPOSITION FORM

Please complete the following questions regarding the client you have just seen. As indicated previously, the research that we are conducting is designed to test the efficacy of a 15 minute interview to reduce the waiting list for counselors in the counseling service and to effect a proper disposition of the client.

 (Your Name)

 (Client's Name)

1. Briefly describe the problem that the client presented.

2. To whom should the client be referred:
 - a career counselor
 - a personal social counselor
 - a measurement person for test and evaluation
 - an academic advisor
 - a study skills counselor
 - other _____
 - need not be referred

3. Describe your reactions to the 15 minute screening interview that has just been completed.

4. Describe your feelings regarding being in this situation.

APPENDIX E: DEMOGRAPHIC DATA

DEMOGRAPHIC DATA

Group	Member	Age	Class	Sex	Confederate Role #1	Client Role #2	Sex
1	1	27	Co Ed	M	F		M
1	2	38	Co Ed	M	F		M
1	3	43	Co Ed	F	M		F
1	4	31	Psych	F	F		M
1	5	22	Psych	M	F		F
1	6	23	Psych	M	F		M
2	1	24	Co Ed	F	F		M
2	2	27	Co Ed	M	F		F
2	3	21	Psych	F	M		F
2	4	21	Psych	F	M		F
2	5	22	Psych	F	M		F
2	6	24	Psych	F	F		F
3	1	39	Co Ed	F			M
3	2	27	Co Ed	M			M
3	3	35	Co Ed	F			M
3	4	23	Co Ed	F			M
3	5	21	Psych	F			F
3	6	22	Psych	M			M
4	1	23	Co Ed	F			M
4	2	34	Co Ed	F			M
4	3	26	Co Ed	F			M
4	4	32	Co Ed	F			F
4	5	22	Psych	M			F
4	6	27	Psych	F			M