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EFFECTS OF OPEN FOCUS RELAXATION TRAINING ON FRONTALIS EMG, SUBJECTIVE REPORTS OF STRESS, STATE-TRAIT ANXIETY AND ACADEMIC PERFORMANCE

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EFFECTS OF OPEN FOCUS RELAXATION TRAINING ON FRONTALIS EMG, SUBJECTIVE REPORTS OF STRESS, STATE-TRAIT ANXIETY AND ACADEMIC PERFORMANCE

By

Brenda J. White

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ABSTRACT

EFFECT OF OPEN FOCUS RELAXATION TRAINING
ON FRONTALIS EMG, SUBJECTIVE REPORTS OF
STRESS, STATE-TRAIT ANXIETY
AND ACADEMIC PERFORMANCE

By

Brenda J. White

This study investigated the effects of relaxation training on stress reduction and academic performance of highly stressed graduate students in a counseling course and in a statistics course. It was hypothesized that Open Focus relaxation training would reduce frontalis EMG, subjective reports of stress, state-trait anxiety and improve academic performance.

The subjects chosen for the study were seven volunteer graduate students enrolled in the College of Education at Michigan State University. Criteria for sample selection were (1) Score above the fifthieth percentile on the State-Trait Anxiety Inventory based on norms for college students, (2) Score a minimum of 150 on the Social Readjustement Rating Scale which indicated the chance of health change or illness due to stress, (3) No participation in any other relaxation program during the duration of the study, (4) Sign a consent form, and (5) Availability for participation in the study Spring Term, 1978.

The Open Focus relaxation training was taught in two phases. One phase was three weeks in length and the other was two weeks.

Other experimental sessions included a baseline phase implemented prior to the relaxation training sessions and two placebo phases occurred between the relaxation training phases. During the baseline phase, frontalis muscle EMG observations were made for each subject. Subjects also reported subjective levels of stress during this phase of the study and each subsequent phase. In the second phase or the placebo phase each subject was presented a revolving disc and asked to focus on the disc. It was explained that the disc was a mechanism utilized to facilitate relaxation. Subjects listened to Open Focus recordings during the third phase which was a treatment phase. The fourth phase was a return to the placebo phase where they watched the revolving disc. In the fifth phase subjects again listened to the Open Focus relaxation tapes. Electromyographic responses and subjective self-report data for each subject were collected during each phase of the study. In addition, the subjects practiced relaxation at home using tape recordings of Open Focus during the treatment phases. A log was kept by each student of their home practice sessions.

The criteria measures utilized in this study to evaluate the effects of Open Focus were frontalis EMG to measure continuous frontalis muscle tension; State-Trait Anxiety Inventory for pre- and post-testing of state and trait anxiety; stress scale for measuring subjective reports of stress; mid-term and final examinations to determine academic performance; and the number of home practice sessions.

Primarily, two analyses were performed on the data. The first was the median slope trend and was called for by the intensive design used in this study. The median slope trend evaluated the effects of Open Focus on frontalis EMG and subjective reports of stress. The second analysis was a non-parametric signed rank test which compared pre- and post-test observations of the State-Trait Anxiety Inventory. A comparison was made between the percentage of correct items answered on the mid-term examination taken by each subject and the percentage of correct items answered on the final examination of the same course to determine the effects of the treatment procedure on academic performance. Another analysis was made of home practice sessions. The analysis focused on the number of times the subjects listened to Open Focus recordings. Mean ratings of home practice sessions were computed for each subject during the two-treatment phases.

The results of the study indicate that the treatment procedure produced significant decreases in frontalis EMG microvoltage data, as well as subjective reports of stress. The subjects also exhibited significant change as measured by differences in the pre- and post-test scores on the State-Trait Anxiety Inventory. The performance by subjects on the final examination was found to be enhanced when comparison of the percentage of correct items answered on a mid-term examination with the percentage of correct items answered on a final examination were made. Based on the results of the number of home practice sessions for each subject, there appeared to be no definitive effect between number of practices of Open Focus,

DEDICATION

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To my husband, Clark, and daughters, Kenya Ife and Tsigie N'kolo for their patience and most of all their love, I give a very special thank you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Legend

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION AND REVIEW OF THE LITERATURE

The effects of stress and its role in human health and emotional well being have become increasingly evident as the western world has experienced accelerated change during the twentieth century. Studies have been and are being conducted into the possible role of stress in precipitating various life-threatening illnesses, the intensity of stressful forces in different occupations, and the effects of stress on individuals in executive or decision-making positions. Since stress apparently influences human beings in these areas, correct management of stress should lead to less stressful and more productive lives. Of particular interest and a worthy topic of investigation is Open Focus Relaxation training in the management of stress. It is the focus of this study to investigate the effects of relaxation on the stressful lives of university students.

This chapter will (1) investigate the concept of stress and anxiety, (2) examine the effects of stress reactions on university students, (3) review the psychological and physiological effects of stress on learning and performance, (4) evaluate the value of relaxation training on performance, (5) review the research on autogenic training, and (6) propose a rationale for the research based upon the review of the literature.

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The Stress Concept

Stress has received a considerable amount of systematic investigation within the framework of its effect on psychological and physiological activation and its subsequent effect on learning and performance. Since the first identification of the problem (Selye, 1976), a growing interest has emerged as evidenced in the literature. During the last decade major research has concentrated on the alleviation of stress (Davidson, 1978; Zenmore, 1975; Monat & Lazarus, 1977; Brown, 1978, Pelletier, 1977). There can be little argument that humans are exposed to stressful life events. Modern society has become so industrialized and complex that many individuals are unable to adjust to the stress brought on by rapid social change and the mechanization of life. The effects of stress are potentially lethal. In fact, Pelletier (1977) states that the major stress-induced disorders are cardiovascular disorders, cancer, arthritis, and respiratory diseases (including bronchitis and emphysema). Blythe (1973) points to the fact that up to 70% of patients being treated by general practitioners are suffering from conditions related to unrelieved stress. Other empirical studies are punctuated with information to support the assertion that stress leads to episodes of physical illness (Solomon, Amkraut & Kasper, 1974; Holmes & Masuda, 1974; Rahe, 1974; Hinkle, 1974) and psychiatric symptomatology (Markush & Favero, 1974; Meyers, Lindenthal & Pepper, 1974).

The problem of stress occupies a significant position in the theory of psychophysiology and social psychology. The development of

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stress theories and psychosomatic models of illness have progressed at a remarkable pace. Since Selye wrote his first article on stress around 1938, there have been over 110,000 scientific publications related to stress (Morse & Furst, 1979). Despite the research, the meaning of stress is still elusive.

Stress has been defined in a number of ways in the history of stress research. For example, stress is thought to be the threat to the fulfillment of basic needs, to the maintenance of regulated (homeostatic) functioning, and to growth and development (Basowitz, Persky, Korchin & Grinker, 1955). A similar view of stress was suggested by Lazarus, Deese, and Osler (1952) and Cofer and Appley (1964). They speculated that stress exists when the well-being or integrity of an individual is intimidated or the attainment of a goal is threatened and he must devote all of his energies to its protection. Selye (1976), an early pioneer in stress research, hypothesized that stress is a common element in all adaptive reactions in the body. He developed what he called a more precise definition stating that stress is "the state manifested by a specific syndrome which consist of all the nonspecifically induced changes within a biological system" (Selye, 1956, p. 54). Selye's work has recently initiated a rapid expansion in the area of stress research and theoretical development.

In view of Selye's work, change became a central issue in the concept of stress in the research of Holmes and Rahe (1967); Dohrenwend and Dohrenwend (1970); Fröberg, Karlson, Levi and Lieberg (1971); Pelletier (1977); and Sylvester (1977). In other words, for

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an event to be classified as stressful, change and adaptation must occur in an individual's life regardless of whether the occurrence is positive or negative.

To summarize, stress is a broad term defined in a variety of ways. Generally, stress is an individual's physiological and psychological response to environmental demands that can be continual and cumulative. For the purpose of this study, stress will be defined as the discomforting responses of persons in a particular situation.

Stressors

Investigators who have worked in the field suggest that stressors are any set of circumstances that create change and adaptation in an individual's ongoing life (Selye, 1976; Holmes & Rahe, 1967; Rabkin & Struenig, 1976; Pelletier, 1977). When an individual must adapt or make frequent alterations in his/her life events, stress and tension result. Stress, in this context, refers to any discomforting responses of persons in particular situations. It is a physiological reaction that may occur when a person experiences a threatening or unfamiliar situation.

In Western society with its ever-increasing technological advancements, stress has become a dangerous phenomenon (McQuade, 1972). Psychiatric literature is filled with abundant documentation dealing with the stressfulness of common experiences. Rapid social change, environmental change, present economic conditions, and job demands have been cited as general stressors. Olson (1959) suggest that stress originates from various experiences when he states that:

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> The circumstances under which many persons live and work . . . sensory bombardment, frustration, conflicts of interest, and excessive demands for quality and quantity of input . . . tend to produce tension and increase blood pressure (p. 24).

Likewise, positive events are stress inducing. Included in these are achievements, promotions, vacations, recreational activities, marriage, and pregnancy (Holmes & Rache, 1967). All of these events signify or trigger physiological and psychological adaptation.

Model of Stress

The idea of stress as a precipitating element in the onset of psychosomatic illness has gained tremendous acceptance among the healing professions. Many researchers even postulate that stress can be a major factor in any disease, not just those classified psychosomatic. Dodge and Martin (1970) suspect that many of the chronic diseases, are etiologically linked with excessive stress which is a product of specific socially structured situations inherent in the organization of advanced societies. What is needed then is a formulation of a model to explain the relationship between environmental stress, induced situations, and illness onset.

Generally, the model follows this pattern of conditions:

1. Presentation of social stressor
2. Mediating factors which affect individual's perception of stressful conditions
3. Stress
4. Onset of illness

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First in the formulation of the model is the social stressor which refers to stressful environmental conditions. The characteristics of social stressors which affect the coping process include source, nature, duration, timing, intensity, frequency, rarity, and ambiguity (Lumsden, 1975). The social stressor, itself, does not cause disease but serves as a precipitating factor.

Mediating factors are those characteristics that affect the perception of the stressor by the person. Rabkin and Struening (1976) suggest there are two categories of mediating factors: personal or internal (biological and psychological threshold sensitivities, intelligence, verbal skills, past experience, sense of mastery of one's fate, psychological defenses, and other similar variables) and interpersonal or external, (for example, social isolation, marginal social status and status inconsistency).

Stress signaled by anxiety refers to a person's response to the social stressor. The response consists of psychophysiological reactions which are both immediate and delayed, while the onset of illness refers to the clinical diagnosis of the disease.

Fehmi (1975) in a discussion on the etiology of functional tension seems to suggest that this illness onset is similar to what he calls a "symptom of stress" and that the illness actually reflects a disease of attention, habitual rigidity of scope or field attention. In the development of this rigidity or narrow focus, he suggests that as humans are initiated into social activities, they are encouraged or exhorted to "pay attention," to "try to focus," to "be careful" and

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to "watch out." Such phrases communicate an effort to focus on certain stimuli while excluding other existing stimuli. Fehmi points out that as a result, a repression or resistance occurs for certain attractive or distractive stimulation in favor of focusing upon environmental stimulations which are consistent with those valued by family or society. Consequently, this narrowing of focus becomes reinforced by many social factors and facilitates the learning of how to narrow and direct attention.

> Narrow focus represents the inhibition or repression of most modalities of sensation in favor of attention to and amplification of a limited number of elements in one modality. When one habitually functions in the mode of narrow focus, this repression, which is physiologically represented as tension, accumulates as a result of this increasing chronic tension, one gradually loses his facility to include a wider scope of his sensory environment (Fehmi, 1975, p. 9).

Stress and Anxiety

Much of the preceding discussion implies that stress involves change, either psychological or physiological. It is interesting to note that anxiety is the usual result of any change (Brier, 1951; Levi, 1972; Basowitz, 1955). In fact, Gersten, Langner, Eisenberg and Orzeck (1974) point out that anxiety is the basic or initial preparation response to environmental changes. In this context, anxiety and stress are linked together by definition, such that stress refers to stimulus-arrangement which to some degree raises the anxiety level of individuals.

The most important role of anxiety is that it serves as a signal of danger to the organism which sets into operation human

resources at all levels of functioning. Briefly defined, anxiety is the conscious awareness of intense dread which is conceptualized as internally derived and not related to external threat (Basowtiz, 1955). To illustrate, when a person perceives a situation as stressful (regardless of any real danger) he/she will experience an increase in the intensity of his/her emotional state and the autonomic nervous system accelerates.

Clinical and research literature (Cattell & Scheier, 1961; Cattell, 1966) has consistently reported two distinct anxiety concepts, "state" or "trait." State anxiety (A-state) is characterized by unpleasant, consciously perceived feelings of tension and apprehension with corresponding activation of the autonomic nervous system. State anxiety, then, refers to "complex emotional reactions that are evoked in individuals who interpret specific situations as personally threatening"(Spielberger, 1972, p. 30). On the other hand, trait anxiety (A-trait) refers to "relatively stable individual differences in anxiety proneness, that is, to differences in the disposition to perceive a wide range of stimulus situations as dangerous or threatening, especially to those involving failure or threat to self-esteem and in the tendency to respond to such threats with A-state reactions" (Spielberger, 1972, p. 39). Furthermore, A-trait reflects individual differences in the duration, intensity, and frequency of A-state reactions.

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Stress Reactions

In studying reactions to stress, an event or situation deemed stressful for one person may not affect another's psychological or physiological systems. McQuade (1972) maintains that different men have different hereditary capacities to withstand stress. There is a wide range of individual differences in response to such situations. To a great extent, an individual's appraisal of threatening elements depends on whether he/she feels control over the situation which is influenced by a succession of past environments, especially the family, and dispositions that have become internalized (Hamburg & Adams, 1967). Psychophysiological reactions to stress can be reduced if a person can maintain a level of "tolerable non-pathogenic stress," which actually contributes to heightened functioning and performance (Pelletier, 1977) by predicting the stressors.

Many of the stressors cited--those favorable and unfavorable--have been identified as psychophysical stressors in the campus community. Students experience high levels of stress and tension in their interactions with the university setting (Bloom, 1975). Snyder and Kahne (1969) report that of 893 students in the Massachusetts Institute of Technology's class of 1965, 209 students were seen in psychiatric service at least once during the four years. Knox (1970) reports that less than 50% of those entering graduate school to pursue a doctorate degree actually persist long enough to graduate. Recently, researchers (Kjerulff & Wiggins, 1976; Janissee & Palyse, 1976) have identified various stressful situations encountered by these students.

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Graduate students must meet the demands of intensive academic activity, competition, establishing inter-personal relationships, frequent time deadlines and establishing new living conditions.

Janisse and Palys (1976) examined the frequency and intensity of anxiety in university students. They found that many situations exist that are stress-inducing for students, with some situations more stressful than others; for example, situations involving ego threats, competition, school, dating. In Kjerulff and Wiggins' (1976) study, graduate students identified two categories of stressful situations. They were situations dealing with inter-personal problems and fate-failure situations defined as those situations clearly not anyone's fault.

In examining the effects of anxiety on learning, empirical evidence points to the fact that the performance of high anxious students is inferior to that of low anxious students on complex or difficult tasks (Spence, 1958; Taylor, 1956). Alper and Haber (1960), in a study on anxiety in an academic situation, imply that measurable anxiety responses, when present, are debilitating to performance. O'Neil, Spielberger and Hansen (1969) investigated performance on a comupter-assisted learning task and changes in state anxiety (A-state) for college students. They found that students with high A-state scores made fewer errors on easy materials and more errors on difficult materials than low A-state subjects. Other negative effects of anxiety on academic performance have been documented (Paul & Eriksen, 1964; Spielberger, 1966; Wine, 1971).

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In light of this, research evidence supports the notion that state anxiety (feelings of apprehension and corresponding arousal of the autonomic nervous system) is more significantly related to learning and performance than trait anxiety (Speilberger, 1966). For example, Meyers and Martin (1974) examined two hypotheses: (a) A-state would have a stronger debilitating effect on concept-learning performance than A-trait and (b) task conditions would affect A-state. Their results were consistent with the hypotheses.

Psychological and Physiological Effects of Stress on Learning and Performance

To determine the extent to which anxiety affects learning and performance, the examination situation should be investigated since it is a common area of academic activity and is a cumulatively taxing source of stress (Mechanic, 1962). The stress lies in the desire to avoid failure. University students and professors report that students experience stress due to test anxiety which alone may lower their performance on tests, and consequently their grade point averages.

In the examination situation, high anxious persons spend task time doing things that are task irrelevant and show a decrement in complicated learning situations. Sarason (1960) in a review of the literature on paper and pencil anxiety scales, identified several studies indicating that high anxious subjects are "more self-deprecatory, more self-preoccupied, and generally less content with themselves than subjects lower in the distribution of anxiety scales" (p. 404). They worry about performance, how well others might excel,

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ruminate over choices open to them, and are repetitive in their attempts to solve the task (Marlett & Watson, 1968; Rapelson, 1957; Morris & Liebert, 1970; Mandler & Sarason, 1970; Mandler & Watson, 1966). Mechanic (1962) states that examinations can also threaten one's self-esteem.

Montague (1953) reported that highly anxious subjects performed better than low-anxious subjects in serial learning of a relatively easy list of nonsense syllables, but performed more poorly than subjects on a more difficult list.

Davidson (1959) in a project concerned with the development of anxiety in children predicted that low anxious children would be described more favorably and with less severe stresses, emotional conflicts and anxieties than highly anxious children. His findings were consistent with his predictions.

Lundberg and Ekman (1970) in an attempt to follow the emotional reactions of a group of subjects in a real-life situation, asked 51 students to report their feelings over a period of time while anticipating in an important examination. The results indicate that as subjective time before the examination decreased, emotional involvement increased.

In an analysis of 110 female undergraduates, Bond (1977) examined academic test performance by test day anxiety, nontest day anxiety, and change in anxiety from a nontest day. An analysis of change in anxiety scores revealed that subjects who exhibited a high increase in anxiety on the test day performed more poorly on the test

than subjects who had either a low increase or a high decrease in anxiety. These data support the theory of drive states suggested by Mandler and Sarason (1952) stating that an increase in anxiety exerts an intervening effect on test performance. The study also suggests that attempts be made to minimize increases and to decrease anxiety level of students on test day.

Only one study was found related directly to graduate-level students. Griffore (1977) studied the relationship between debilitating anxiety and performance on examinations. For the 68 subjects in his research, he found significant correlations to support the notion that debilitating anxiety as measured also operates among professional educators attending graduate school.

Several studies discussed in the literature indicate that high anxiety leads to a breakdown or decline in achievement. Contrary to these clinical observations, however, Schultz and Calvin (1955) report that level of anxiety has no demonstrable effect on academic performance. Barrell (1971) found a weak negative relationship between anxiety and performance on complex tasks.

Marton et al. (1973) investigated the effects of stress-induced instructions on anxiety, learning and test performance. The induced stress had a positive effect on learning, and was significantly related to the level of anxiety in the learning phase. It was further reported that during the performance phase the induced stress had a significant positive effect on anxiety but none on performance.

Additionally the examination situation, representing the stress-eliciting stimulus results in certain physiological stress responses. Syvalahti, Lammintausta and Pekkarinen (1976) studied 131 healthy medical students to determine if the psychic stress of an examination could affect the release of serum growth hormone, serum insulin, and plasma renin activity. For each hormone the level rose significantly by at least 43%. Montgomery (1977) evaluated the effects of performance evaluation anxiety on cardiac response in 48 male undergraduate students. The analysis revealed accelerated changes in cardiac rate sensitive to both anxiety and failure within the evaluation-stress condition.

Similarly, Suggs and Splinter (1966) found that initial rises in heart rate occur prior to activity as a result of reflex activity in the cortex caused by anxiety. Dill (1959) also found an accelerated heart rate in teenage males before testing in a laboratory situation.

Dreyfuss and Czaczkes (1959) clearly demonstrated the stress response to examination situations. Of the 21 students investigated, serum cholesterol levels were higher in 20 students during the examination than they were in a control test taken two days later. There was also evidence of decrease in blood clotting time and a decrease in blood eosinophils. It was suggested that such a combined response could possibly lead to the development of coronary or other thromboses.

Boudewyns (1970) explored the utility of finger temperature (finger blood volume) as a psychophysiological indication of emotional

arousal in university students. As predicted, he found that finger temperature decreased under assumed stressful events. These findings were consistent with other research reports (Plutchik, 1956; Sargent, Walters,& Green, 1973).

It is logical to assume that students seriously suffer from stress associated with academics. Therefore, there is a need for additional research in the area of stress associated with university life, since physical, social, and psychological stressors contribute to academic stress. These stressors may also affect students' academic performance.

In general, recommendations have been made by researchers that could possibly circumvent stress reactions. These recommendations range from avoidance of continual stress to planned relaxation training programs. The focus of this study is on the effects of relaxation training on physiological responses to stress and on intellectual performance. More specifically, a relaxation program will be implemented for graduate students to reduce the stressful effects of taking academic tests.

Value of Relaxation

The preponderance of evidence as to the value of relaxation is positive. Several early studies focused on the prevalence of increased muscular tension and stress and corresponding relaxation treatments (Breese, 1899; Miller, 1926; Fink, 1943). The most extensive work has been done by Edmund Jacobson,who as early as 1912 wrote about stress reduction as a therapy for improving mental health. With the

publication of Progressive Relaxation in 1929, his technique became the prelude for further investigations in the field (Wolpe, 1958; Schultz & Luthe, 1969). Despite the diversity in relaxation procedures, most of the evidence suggests that relaxation is the common denominator and is helpful if not necessary in lowering stress responses (Paul, 1969; Farmer & Wright, 1971; Budzynski & Steyva, 1972; Pelletier, 1977).

If relaxation is helpful and necessary in therapy, it would be of considerable importance to evaluate the relative efficiency of relaxation training methods. It appears that the elicitation of relaxation results in definite physiological consequences (Benson, et al., 1977; Schultz & Luthe, 1969; Wallace & Brown, 1972; Green, Green, & Walters, 1970) as well as self-report data describing peace of mind, feeling at ease, and a sense of well-being associated with relaxation and alleviation of stress responses (Paul & Shannon, 1966; Sherman, 1972; Snider & Oetting, 1966).

Davidson (1978) found that therapeutic relaxation resulted in significant changes in the biobehavioral systems which they engage. For example, he suggested that somatically based techniques resulted in reductions primarily in measures of somatic activation, while cognitively oriented procedures elicit reductions in skin conductance level of subjects. Obrist, Webb, and Sutterer (1969) reported reductions primarily in measures of somatic activation (heart-rate and electromyography). Similarly, Benson, et al. (1974) reported decreased respiratory rate, and pupil constriction. It was suggested that daily

practice of relaxation is of value in situations where chronic stress is present. Reinking and Kohl (1975) examined the effectiveness of four different types of relaxation training including electromographic feedback, Jacobson-Wolpe's progressive relaxation instruction, monetary reward and instruction plus reward. They found that all groups reported increased relaxation. The findings of Schwartz (1974) with regard to the comparability of effects achieved with biofeedback procedures are in agreement with previous studies of Budzynski and Steyva (1969) and Green, Green and Walters (1970) who reported reduction in muscle tension, heart rate and blood pressure.

While much of the research focuses on the effects of relaxation on physiological changes, few studies have been conducted on the effect of relaxation on learning efficiency. There is some evidence, although limited, to support the hypothesis that relaxation can be expected to increase the efficiency of learning and performance by high anxious subjects under stressful conditions.

Steinhaus and Norris (1964) conducted a survey utilizing personal and subjective responses from 166 subjects. These subjects have received instructions in relaxation concerning the value of the training. Respondents reporting improvements in mental concentration were 54%. The investigators suggested that improved relaxation may be more closely related to efficient use of the mind.

Pascal (1949) demonstrated that muscle relaxation improved recall of paired-associates in subjects unselected for anxiety level. Suinn and Richardson (1971) trained clients to react to anxiety with

relaxation. Subjects were treated for mathematics anxiety and compared with untreated, nonanxious control subjects. Their results showed significant reductions, when compared with the control group, in subjective anxiety and higher posttherapy scores on a performance measure involving mathematical computations.

Johnson and Spielberger (1968) studied the effects of a muscle relaxation training program and the passage of time on empirical measures of A-state and A-trait anxiety. They hypothesized that measures of A-state anxiety would decrease following relaxation training and fluctuate over time, while A-trait anxiety would remain stable and unaffected by relaxation. The results indicate that scores on three measures of A-state anxiety declined significantly in response to the training procedures, but relaxation had not influence on A-trait anxiety.

To summarize, the function of relaxation training is to (1) inhibit physiological responses to stress; (2) control subjective reports of dysperia; and (3) reduce physical and mental fatigue, thus permitting greater efficiency.

In looking specifically at the effect of relaxation on academic performance, one can be pessimistic or optimistic in terms of the research. Spielberger, Anton and Bedell (1976) state that behavioral treatment approaches (using some form of relaxation) have consistently failed to bring about improvement in academic achievement and performance on cognitive intellectual tasks. Finger and Galassi (1977) concur on the basis of research literature reviewed that actual improvement in test performance is miniscule.

Contrary to these speculations, Cautela (1969) and Goldfried (1971) argue that relaxation training could be utilized effectively as an active coping skill if clients were taught when and how to relax. This position has been supported by Russell, Miller and June (1975), Suinn and Ricardson (1971), and Zenmore (1975) in the treatment anxiety associated with intellectual performance.

Autogenic Training

Therapeutic applications of deep relaxation procedures have been in existence for some time for the alleviation of stress. Autogenic training, however, has received little attention in this country. It is a comprehensive and successful therapeutic method which involves both the functions of the mind and the body. Because autogenic (self-generating) training involves a self-induced psychophysiological shift to a state which facilitates brain-directed, self-generating and self-regulatory processes of a self-normalizing nature, its effects can be considered as being diametrically opposed to changes brought about by stress (Schultz & Luthe, 1969). In fact, Oscar Vogt first observed from his research on hypnosis as early as 1890 that when patients performed a series of autohypnotic exercises during the day, stressor effects such as tension and anxiety were reduced (Luthe, 1962).

From a technical point of view, autogenic training is "a method of rational physiologic exercises designed to produce a general psychobiologic reorganization in the subject which enables him to manifest all the phenomena otherwise obtainable through hypnosis (Gorton, 1959, p. 31).

The autogenic trainee makes mental contact with various body parts by responding to verbal cues which are called formulas (Morst & Furst, 1979). These include the following: "My right arm is heavy;" "My right arm is warm;" "My heart is beating calmly and regularly;" "My breathing is calm and regular;" My abdomen is warm;" and "My forehead is cool."

Generally, the purpose of autogenic training is to improve functioning and performance by a series of self-directed mental exercises which leads to "increased self-direction of the organism with a strengthening of healthy biologic potentials and a reduction or elimination of malfunction or disease"(Gorton, 1959, p. 31). Gorton (1959) cites eight goals of autogenic training, three of which are directly pertinent to this study:

1. The ability to relax by dissolving psychophysiologic tensions
2. The ability to control physiologic functions that are usually involuntary
3. An increased capacity for voluntary physical and mental performance

The research on autogenic training has followed two trends: research related to theoretical foundations and research related to clinical applications. The research on theory has focused on specific psychophysiologic changes which occur during the practice of autogenic exercises, autogenic methods and specific problems associated with various components of the theory.

Many findings have been reported in the area of clinical application of autogenic training. Luthe (1962) reviewed the research and summarized forty years of clinical experience with autogenic training:

1. Of patients suffering from various psychosomatic illnesses, 60% have been either markedly improved or cured by periods of standard training
2. Behavior and motor disturbances have been treated effectively, for example, in cases of stuttering, phobias and certain states of anxiety in a matter of a few months. The emotional and physiologic tolerance of individuals was increased
3. It was suggested that after autogenic training unconscious material was more readily surfaceable
4. It was reported that intellectual capacity was increased as a result of training
5. Group training is both possible and feasible

Only one study (Snider & Oetting, 1966) employing autogenic training in the treatment of test-anxious subjects was found in the literature. Analysis of repeated measures showed that the treatment decreased test anxiety scores and 78% of the subjects reported high relaxation was achieved along with improved performance. Their results suggest that the majority of their subjects felt more relaxed, less stress prone, and more disciplined in their studies. It should also be noted that the average grade of the group went from C+ at the beginning of training to a B+ at the end of the term.

A type of autogenic training was used as a treatment method in this investigation. It is known as "Open Focus Exercises" and was developed by Fehmi (1975) as a highly specialized relaxation procedure for training people in stress management as well as for personal and transpersonal growth. The procedure enhances attentional flexibility as well as mental and emotional integration. It is suggested that in the development of the use of integrational status of attention as evidenced in Open Focus there is a natural tendency to release repressed energy and material into consciousness and there is a decrease of tension which was a result of habitually functioning in narrow focus (Fehmi, 1975).

Although similar to Autogenic training that concentrates on formuli that instructs the subject to mentally suggest conditions to himself, Open Focus exercises concentrate on objectless stimuli such as space. The exercises consist of a number of questions designed to stimulate imagination of objectless experiences. The subject has to imagine these experiences. For example, the beginning of the series asks, "Can you imagine the space between your eyes?" These questions may be asked by the practitioner or they may be prerecorded.

Rationale for the Present Research

The study has three main elements. The first is based on the idea that stress signals psychophysiological reactions manifested in intense emotional arousal and acceleration of the autonomic nervous system and increased frontalis muscle tension. The second is based on the concept that stress leads to decrements in performance,

particularly in the examination situation. And finally, deep relaxation induced in individuals by an autogenic-type technique reduces stress and increases performance, particularly in the examination situation.

Since stress has been shown to influence performance (i.e., Mandler & Sarason, 1952; Spence & Taylor, 1952; Spielberger, 1966) in numerous situations, it is reasonable that there would be interest in extending the research in this area to graduate-level students. Thus, the primary purpose of this study is to ascertain some of the possible effects of a nine-week relaxation training program utilizing autogenic methods upon the performance of graduate students experiencing stress in a statistics course and in a counseling course. Specifically, the study is designed and was implemented with the expectation that autogenic training would reduce stress and thereby improve academic performance on achievement tests given in the course and course grades of students. It is also expected that autogenic training will decrease certain physiological responses of students.

To summarize, this research is important because precise identification of the outcomes of Open Focus exercises will be presented and the effects of stress reactions on academic performance investigated.

CHAPTER 2

DESIGN AND PROCEDURES

This study has two main purposes. The first was to investigate whether highly stressed graduate-level students could lower their stress level (physiological-arousal) through Open Focus relaxation training as measured by Electromographic (EMG) biofeedback, the State-Trait Anxiety Inventory and the Stress Scale. The second was to determine if the lowering of stress levels significantly increased performance of these students on examinations.

Subjects

The subjects were selected Spring Term, 1978, from graduate courses in the College of Education at Michigan State University. A statistics class and a counseling class were visited in seeking student volunteers. A brief explanation of the nature of the investigation was given. Appendix A provides an illustration of the presentation. Eleven people responded to the presentation and acknowledged an interest in participating.

Selection of the subjects for the study was based on the following screening criteria:

1. Subjects had to score above the fiftieth percentile on the State-Trait Anxiety Inventory (Appendix B) based on the norms for college students. The STAI was used for pre-testing of anxiety levels
2. Subjects had to score a minimum of 150 on the Social Readjustment Rating Scale which would indicate the chance of health change or illness due to stress (Appendix C)
3. Subjects had to sign a consent form (see Appendix D)
4. Subjects had to be available for participation in the study Spring Term, 1978
5. Subjects could not be engaged in any other relaxation program during this time

At the beginning of the baseline phase of the investigation, seven subjects met all of the above criteria.

Description

The seven subjects included four females and three males enrolled in graduate degree programs with ages ranging from 28 to 49. The subjects described themselves as being highly anxious and tense. Three of the seven subjects reported having tried other forms of relaxation in order to feel less stressed. These methods included tranquilizers provided by physicians, yoga and physical exercise. All seven subjects expressed that they had wanted to be involved in a relaxation program for at least a year.

Since the subjects were not drawn at random from a defined population, a summarization of the demographic and personal data is included in Table 2.1.

Experimental Manipulations

The seven subjects selected for treatment were notified and were scheduled for 19 individual training sessions extended over a nine-week period. A schedule outlining the baseline, placebo and treatment phases of the study is provided in Table 2.2. Training time ranged from between 20 and 40 minutes for each session. A small counseling-consultation room in the 250 complex of Erickson Hall, Michigan State University served as the experimental setting where the treatment was administered (see Figure 2.1).

After reporting to the experimental area for the initial baseline, each subject was introduced to the electromyography instrument and an electronic data counter. It was explained to each subject that the function of the equipment was to show how much muscle tension was present. The electromyography and the counter were turned away from the subject to prevent the subject from viewing the monitor.

In addition, the investigator scheduled the remaining 18 sessions for each subject and explained the procedure for the following sessions.

Experimental sessions for each subject were conducted as follows:

Table 2.1. *Personal and Demographic Characteristics*

Characteristics	Subjects						
	1	2	3	4	5	6	7
Sex	Female	Female	Male	Male	Female	Female	Male
Age	49	30	35	30	32	28	40
Marital Status	Married	Single	Married	Married	Divorced	Single	Single
Specialization Area or Major	Counseling	Counseling	Administration & Higher Education	Counseling	Human Ecology	Therapeutic Recreation	Counseling
Course	Stat. Ed. 869	Stat. Ed. 869	Stat. Ed. 869	Ed. 816B	Stat. Ed. 869	ED. 816B	ED. 816B
Degree Program	Ph.D.	Ph.D.	Ph.D.	M.A.	Ph.D.	M.A.	M.A.
Race	Black	White	Black	White	White	White	White

TABLE 2.2.--Research Schedule

Date	Phase	Subject Function	Experimenter Function
April 4-7	Subject Solicitation	1. Complete SRRS 2. Complete State-Trait Inventory (Pre-Test) 3. Complete Consent Forms	1. Presentation on effect of stress on physiological functions and academic performance and how to cope in 869 Statistics course and Counseling course 2. Selection of subjects 3. Arrange appointments for training
April 10-14	Baseline	1. Attend baseline phase to assess physiological responding based on EMG. Three sessions per week for each case. 2. Fill out Stress Scales and return 3. Answer Life History Questionnaire	1. Attach electrodes to frontalis muscles 2. Record EMG microvolt readings for 20 minutes
April 17-21	First Placebo	1. Focus on a revolving disc 2. Fill out Stress Scale and return to experimenter	1. Attach electrodes to frontalis muscles 2. Record EMG microvolt readings
April 24-May 12	First Treatment	1. Listen to Open Focus recordings 2. Listen to tapes at home while recording all practices 3. Complete Stress Scale and return	1. Attach electrodes to frontalis muscles 2. Play cassette recordings 3. Record EMG microvolt readings
May 15-19	Second Placebo	1. Same steps as first placebo	
May 22-June 8	Second Treatment	1. Same steps as first treatment 2. Complete the STAI (Post-test)	

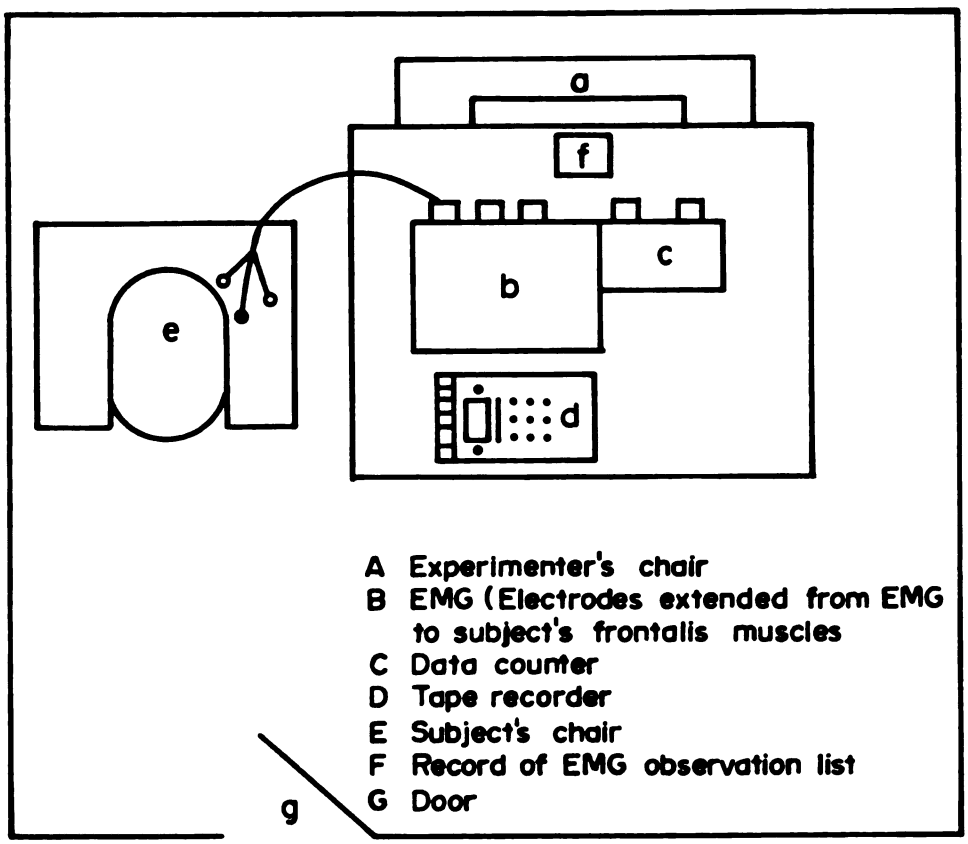

Figure 2.1. Layout of the experimental room during each phase.

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1. Baseline phase. The first three sessions occurred three days a week and lasted approximately 20 minutes. Each subject met with the experimenter to obtain a steady rate of physiological responding based on the electromyograph. The baseline period of data collection allowed subjects to serve as their own control. Electromyograph (EMG) electrodes were attached to the forehead for detecting the actual electrical activity in the frontalis muscles. This site was selected because the frontalis muscles are adequate indicators of tension levels (Danskin & Walters, 1973; Budzynski & Stayva, 1973). Each subject was then asked to relax while sitting in a comfortable chair with his/her eyes closed. Three baseline readings (or data points) of muscle activity were then taken from the meter of the data counter at four-minute, continuous intervals which represented the average microvolt reading. These data points were recorded on a data collection sheet (Appendix E). At the conclusion of each session the electrodes were removed from the forehead. During this phase and each subsequent phase, it was requested that each subject fill out a Stress Scale (Appendix F).

2. Placebo phase. These sessions occurred during the second week on three separate days. EMG electrodes were attached to the forehead. Three four-minute interval EMG readings of average electrical muscle potential were recorded. Each subject was instructed to focus on a revolving disc. This disc was cardboard, 12 inches in diameter with a black and green spiral design. It was driven by a small electric motor at a constant speed of one revolution every two seconds. It was explained that this was a relaxation technique

useful in the reduction of stress. TH EMG electrodes were removed at the conclusion of the sessions.

3. First treatment phase. These sessions involved having the subject listen to a series of Open Focus cassette recordings that were designed to stimulate objectless experience and to broaden attentional focus. The Open Focus exercises contain a series of interrogatory questions beginning with "Can you imagine . . .?" or "Is it possible for you to imagine . . .?" For example, the first question asked is, "Can you imagine the space between your eyes?" In addition, other non-objective questions are asked which refer to other parts of the body. Open Focus instructions were given to each subject at the beginning of this session (Appendix G). A transcript of the tapes appears in Appendix H. There were six sessions extended over a three-week period. The sessions lasted 35 minutes. The average microvolt readings for four-minute intervals were recorded. The electrodes were removed at the conclusion of each session.

4. Second placebo phase. These sessions followed the same procedure as outlined in Phase Two of the project.

5. Second treatment phase. The remaining four sesssions followed the procedure in Phase three of the project.

6. At the conclusions of the second treatment sessions each subject completed both forms of the State-Trait Anxiety Inventory. These posttests were administered by the researcher (Appendix B).

7. On days when subjects were undergoing treatment, they were requested to listen to the Open Focus training tapes at least

once daily except during the placebo phase. The subjects were also asked to keep a log of these home practice sessions and to record the number of practice sessions each day. They were also asked to describe their tension levels before and after practice. These logs were brought to the experimental setting each week (Appendix I).

Additionally, subjects were asked to rate the level or intensity of their stress while in class, out of class, immediately prior to an exam, during an exam and after an exam. These stress scales were also brought to the experimental setting each week.

Determination of the effects of the placebo sessions and treatment sessions on anxiety and tension and performance was ascertained through the use of an intensive design which will be discussed later in this chapter.

Measures

The study employed five dependent measures. First was the State-Trait Anxiety Inventory (Appendix B) used to pre- and post-test anxiety levels. Anxiety was assessed by using the scores obtained on this test. Second, the Social Readjustment Rating Scale was used for screening and to determine if significant life changes had occurred in the subjects that could trigger a high degree of stress. Third, electromyography biofeedback data were collected to obtain baseline and continuous measures of the electrical potential from the frontalis muscles of each subject. Fourth, a self-report stress measure was utilized for subjects to identify their intensity of stress levels during specified times. Finally, a comparison was

made between the percent of correct items on mid-term examinations and final examinations for each subject.

A life history questionnaire was used to secure comprehensive background information for each subject (Appendix J).

State-Trait Anxiety Inventory
Description and Function

Spielberger and Gorsuch and Lushene (1968), the designers of the State-Trait Anxiety Inventory (STAI) conceptualized anxiety on the basis of trait anxiety (A-trait) and state anxiety (A-state). The STAI was designed as separate self-report scales to measure the two anxiety concepts (See Appendix B). The self-report measure may be administered either individually or to groups to determine the anxiety phenomena in "normal" (non-psychiatrically disturbed) adults, juniors and senior high school students and in neurophychiatric and medical patients (Spielberger, Gorsuch, & Lushene, 1968).

The A-trait scale may be used for screening university students for anxiety-proneness and to determine the extent of neurotic anxieties. The A-state scale indicates the level of transitory or free floating anxiety as well as the intensity.

The STAI A - trait scale consist of twenty statements that ask people to respond to each scale item in terms of how they generally feel. If an individual reports that he/she frequently feels tense and anxious and seldom feels relaxed, a high score is recorded. The scores on the A-trait scale reflect stability over time in individual differences of anxiety proneness and are expected to be impervious to

situational stress (Spielberger, 1972). Such questions as, "I feel pleasant," "I feel that difficulties are piling up so that I cannot overcome them," "I am inclined to take things too hard," "I take disappointments so keenly that I can't put them out of my mind," "I become upset and tense when I think about my present concerns," are examples of the items included in the A-trait scale. In response to the questions, a score is derived on the basis of a four-point rating scale: almost, never, sometimes, often, almost always.

The A-state scale is comprised of 20 items that ask people how they feel at a particular time. The scale measures feelings of tension, nervousness, worry, and apprehension. The scale evaluates increasing levels of A-state intensity, where low scores represent states of calmness and serenity, intermediate scores represent moderate levels of anxiety and high scores indicate states of intense anxiety that approach panic. The A-state scale contains questions such as: "I feel secure," "I feel comfortable," "I am presently worrying over possible misfortunes," "I feel high strung." The four categories to which subjects are asked to rate the intensity of their feelings are: not at all, somewhat, moderately, or very much so.

Reliability. Reliability for the A-trait scale scores (Spielberger, et al., 1968) ranged from coefficients .73 to .86 in a test-retest (stability coefficient) of 88 male and 109 female undergraduate college students for a one-hour interval, 20-day interval and 104-day interval between test administration. The reliability coefficients reported for A-state scale scores ranged from .16 to .54

with a median r of .32. Because the A-state scale is designed to be influenced by situational factors, low stability coefficients were anticipated.

Alpha coefficients were computed to determine the internal consistency of the STAI scales (Spielberger, et al., 1968). The reliability coefficients ranged from .83 to .92 for A-state and .86 to .92 for A-trait. The internal consistency for both scales is relatively high.

Validity. The concurrent validity of the A-trait was reported for 126 college females, 80 college males and 66 neuropsychiatric patients. The test designers report correlations with the IPAT Anxiety Scale (Cattell & Scheier, 1963), the Taylor (1953) Manifest Anxiety Scale (TMAS), and the Zuckerman (1960) Adjective Checklist (AACL), general form. The correlations reported for the IPAT were .75 to .77, for the TMAS the coefficients were .79 to .83, and for the ACCL they were .52 t .58. The correlation between the STAI A-trait scale and the TMAS (another measure of trait anxiety) is reasonably high. On the other hand, the AACL is moderately correlated with the STAI.

Estimations of construct validity of the A-state scale are based on a sample of 977 undergraduate college students. The construct validity coefficient was .60 for males and .73 for females.

Social Readjustment Rating Scale
Description and Function

The Social Readjustment Rating Scale (SRRS) was devised by Holmes and Rahe (1970) primarily to "investigate similarities and differences among cultures in terms of life style and life events, and to evaluate the relationship of life change to the occurrence of disease" (Holmes & Masuda, 1973, p. 161). The scale is a paper-and-pencil, self-administered inventory which documents significant life changes that have occurred in a respondent's life (Appendix C). The scale is organized to include areas of dynamic significance in American social structure and includes areas of personal involvement, family, community, social, religious, economic, occupational, residential and health experiences. Individuals are asked to indicate life changes that have occurred during the past two years of their lives. Numerical values are assigned to typical stress related events in people's lives. For example,

Life Event	Numerical Value for Event
Death of a spouse	100
Divorce	73
Marriage	50
Change to different work	36

The instrument consists of 43 such items and a score is derived on the basis of his/her total of the assigned values. Each individual score is obtained by adding up the assigned values of each event that has been checked. A score of 150 roughly indicates a

50-50 probability of illness or health change. Subsequently, a score of over 300 points suggest almost a 90 percent change of health change. Thus, the likelihood of serious health change increases as the score increases.

The conceptual framework of the SRRS is based on the psychobiology research generated by Adolf Meyer.

> Meyer's invention of the "life-chart," a device for organizing the medical data as a dynamic biography, provided a unique method for demonstrating his schema of the relationship of the biological, psychological, and sociological phenomena to the processes of health and disease in man (Holmes & Masuda, 1973, p. 161).

The Meyerian theory emphasizes the importance of such events as entrance into school, changes in living conditions, deaths, births, successes or failures, and other important environmental influences.

Method for scaling the life event items. The scaling method used in the SRRS is based on the magnitude estimation method which is used to measure the perceived amount of change associated with social phenomena. This method arbitrarily assigns a numerical value to an item or stimulus and the subjects rate the other events numerically in proportion to this value (Ruch & Holmes, 1971).

In devising the SRRS, a list of 43 life events was empirically generated from clinical experience. A sample of 394 subjects was asked to judge the amount of social readjustment necessary for each life event. "Social readjustment" refers to the amount and duration of change in one's accustomed pattern of life resulting from various life events. It measures the intensity and length of time necessary

to accommodate to a life event, regardless of the desirability of this event (Holmes & Masuda, 1973, p. 165). One of the life events items (marriage) was arbitrarily assigned a value of 500 and the subjects were asked to rate the remaining items numerically in proportion to this value (Ruch & Holmes, 1971). Subsequently, the items were arranged in rank order of magnitude.

Reliability. In terms of the degree of value consensus concerning the amount of change involved in the life events items (scaling method), essential agreement between discrete groups has been reported (Holmes & Rahe, 1967). Correlation coefficients were revealed for sex, age, class, race, religious preference and level of education. It was reported that all the coefficients were above .90 with the exception of that between whites and blacks which was reported at .82.

In replicating the scaling method, Ruch and Holmes (1971) compared a college population with an average age of 18 to the original sample to further test the degree of value consensus or consistency for each life event. A young sample was chosen to assess if age influenced perceptions of the magnitude of change associated with each life event. A very high correlation coefficient of .97 was found, indicating a high agreement between adult and adolescent samples in relationship to the amount of social readjustment involved in the 43 life events. Similarly, Pasley (1969) studied the intercorrelations between seventh-grade students, college freshmen and the original sample of adults. Intercorrelation agreement was

high with Spearman's rho of .78 indicating that consensus regarding life-change events exists as early as beginning adolescence.

The SRRS was administered on a test-retest schedule with a nine-month interval using 55 subjects to show that consistency of recall is related to the saliency of life events. The following stability coefficients were noted for three representative years--.744 for one year before, .638 for four years before, and .669 for seven years before. The data indicated the consistency to which the amount of life events was recalled (Casey, Masuda, & Holmes, 1967).

Validity. The validity of the SRRS was demonstrated in studies which examined the temporal association of an illness or health change with life-change events. The research findings of Rahe et al. (1964) supported the notion that life events cluster significantly in a two-year period preceding onset of tuberculosis, heart disease, skin disease, hernia and pregnancy.

A number of retrospective studies were reported by Holmes and Masuda (1973) to account for the validity of the SRRS. Rahe et al. (1964), for example, found that as the life change units increased, so did the percentage of illness associated with the life crises. Holmes (1970) further found a positive relationship (.882) to exist between the magnitude of the life crises and major health changes. Rahe and Lind (1971) provide similar data suggesting a positive correlation between mounting life change and sudden cardiac death.

In the area of academic performance which, is more relevant to the research carried out in this study, Carranza (1972) used the SRRS to measure the impact of life changes on high school teacher performance. He found a positive significant correlation between teacher life-change magnitude and teacher absenteeism due to illness or injury and the number of times the teachers changed residence. In summary, it was determined that high incidence of life change is associated with less preferable aspects of teacher performance.

Harris (1972) also used the SRRS to conduct a retrospective study on a group of selected college freshmen. He examined the relationship of life change to academic performance. When data about the effect of life change on grade point average were obtained, it was reported that grade point average was inversely proportional to the amount of life change experienced.

On the basis of prospective studies, inspection of the data indicates a positive correlation between the seriousness of illness and life-change magnitude for the year prior to the onset of disease (Hinkle et al., 1960; Rahe, 1968; Wyler, Masuda & Holmes, 1968, 1970). These findings suggest that the greater the life change or adaptive requirement, the greater the lowering of body resistance and seriousness of the disease. It was also concluded that the health changes encompass a variety of medical and psychiatric diseases.

Biofeedback

Biofeedback, sometimes referred to as sensory feedback, consists of teaching people to be more aware of, and then to control, a broad

spectrum of physiological parameters. Learning to control ongoing physiological processes is achieved through the use of various biofeedback devices that measure muscle tension, heart rate, temperature, or brain waves. According to Danskin and Walters (1973):

> This type of (physiological) information is fed back directly to the individual by visual or auditory electrophysiological devices. With this immediate and objective feedback, a person learns to regulate these normal involuntary processes.

The possible applications of biofeedback include a variety of disorders ranging from hypertension and headache to heartbeat abnormalities, stomach ulcers, Raynaud's disease, and spastic colons (Blanchard & Young, 1974). Other stress related psychosomatic symtoms such as tension, examination anxiety, insomnia and overeating are subject to voluntary self-regulation resulting from biofeedback training. For example, Danskin and Walters (1973) purport that:

> The frontalis (forehead) muscles seems a crucial barometer of tension in many persons, though most are not aware of it until the level of tension is relatively high. Electromyographis feedback training of this muscle usually results in a person's learning to decrease tension voluntarily and lower the tendency to overreact to stress.

Electronic equipment (electroencephalographs, electromyographs, and galvanized skin response is used to monitor a subject's physiological functions and then these functions are fed back to the subject by means of some visual or auditory signal or both. Decision on what type of biofeedback instrumentation to utilize depends on the nature of the internal control desired.

Electromyograph muscle potention data. Since this study is concerned with the effects of relaxation training on examination

anxiety, an electromyographic feedback device was used as a dependent measure to provide objective evidence of relaxation levels.

Elecgromyographic (EMG) feedback consists of recorded patterns of muscle electrical activity. In relationship to relaxation training, the lower the electrical activity, the lower the stress for that muscle group. With deep levels of relaxation any tension is quickly and easily detected on the instrument.

In using the instrument for this study, two electrodes are attached to the skin over the frontalis muscle group with appropriate distance between them. A third electrode, which serves as an electrical reference, is placed on a neutral electrical tissue, i.e., over a bone. The frontalis muscle group was chosen because its tension level is believed to be a good index of general physical and mental activity (Budzynski & Stoyva, 1973). The electrical activity from these muscles is transmitted to the biofeedback device through the electrodes where it is amplified, filtered, and summed over a convenient time period to provide microvolt averages of electrical force in the muscles and then used to activate a visual signal.

The J and J Electromyograph Model 55 was utilized for measuring muscle electrical activity (Appendix K). The J and J digital integrating score keeper LGS-150 was used to record the average microvolts over specified time intervals (Appendix L).

Stress Scale

The stress scale was designed to measure the level of stress. It is a simple verbal scale which demonstrated the intensity of stress ranging from "none" through "mild," "discomforting," "alarming," "distressing," to "acute." This scale is based on the principles developed by Melzack (1971), Mines (1974), and Davidson and McDougall (1969) in which they demonstrated that the intensity of pain could accurately be measured.

The subjects selected completed the charts three days each week throughout the study.

Performance

In discussions by Sarason (1957) and Bond (1977), it is pointed out that students who exhibited a high degree of anxiety performed poorly on examinations. Subsequently, decreasing tension was found to be associated with the elimination of errors and therefore improved performance. It was expected that if the Open Focus relaxation procedure was effective in reducing stress, then an increase in the percentage of correct items answered on a final examination would be found in comparison to the mid-term examination in the same course.

Experimental Design

The intensive design, or N=1 design, is discussed by Hersen and Barlow (1977) as appropriate when investigating particular variables that influence specific behaviors. It is an alternative

approach to comparative group designs in experimental research. This particular design permits the study of an individual's behavior through continuous observation as different treatment techniques are introduced in a systematic fashion. In intensive research, the emphasis is on observing behavioral process on a regular basis so that the process can be analyzed. Such a method as this concentrates on answering specific questions about individual patterns of changing behavior.

While acknowledging the importance of group comparison approaches, the intensive approach can be utilized more efficiently by practicing counselors in determining what is appropriate for his/her client than group designs (Miller & Warner, 1975). Bergin and Garfield (1971) point out that the intensive design meets the need of specificity in research, does not detract from the clinical practice and insures more prompt transfer of findings to practice.

A number of other investigators have cited other clear advantages for the intensive design approach. For example, Barlow, Blanchard, Haynes and Epstein (1977) suggest that such designs are appropriate for answering most research questions regarding clinical significance, variability as a source of data, generality of findings and ethical considerations. Thoresen seems to feel that this type of research focuses directly on specific and effective treatment techniques for individuals (Bridges, 1973). Typically, this design has several other merits over the comparative group approach in the area of applied counseling and psychotherapy research.

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Thoresen and Anton (1972) suggest that group designs generally obscure client change during treatment and that the relationship between change and treatment for each client may vary in fundamentally different ways compared to the average change of a group of subjects. Intensive designs recognize variability, and then use experimental control to examine the variability (Bridge, 1973).

Despite the flexibility and appropriateness of the intensive design for applied counseling and psychotherapy research, a number of criticisms have been identified. The criticisms include suggestions of lack of control and lack of generality.

In response to these criticisms, Thoresen (1972) delineates several major advantages of the intensive design. They include:

1. The specific actions of individuals are the unit of focus, rather than an average comparison between groups.

2. The frequency, magnitude and/or variability of the individual's actions can be examined continuously during each phase and between phases of investigation.

3. The individual subject serves as his own control in that the magnitude and duration of change is compared to his own baseline of actions. Past and individual differences are carefully controlled.

4. Experimental control of variables is greatly facilitated, thereby reducing the need for statistical control through complex inferential statistics.

5. The effects of treatment administered simultaneously on one or more client behaviors can be examined over time for particular individuals by use of the multiple baseline.

6. Causal relationships can be established by replication (reproductability) of specific results by means of certain intervention techniques across individuals. Evidence of generalizations is systematically gathered without recourse to the untenable assumption of random sampling.

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7. The clinician can determine the extent of relevant changes in client action continuously during treatment, if necessary, based on the data provided.

8. An intimate method for controlled inquiry of covert (internal) behavior of individuals is provided. This makes it well suited to humanists.

In summary, the previously cited attributes of the intensive design offer a viable rationale for utility of such a design in this study. It is a scientific, well-controlled and statistically sound design.

In carrying out this study, an intensive design was used for the following reasons: (a) variation in subject responsiveness to relaxation programs is broad; (b) variables which influence the success or failure of the treatment program can be identified for each subject; and (c) the effectiveness of the program can be determined for each subject continuously on a repeated measures basis.

Summary of the Design

This study utilized an intensive case study extension of the basic A-B-A-B experimental design, specifically a single case experimental strategy $A\text{-}A_1^1\text{-}B^1\text{-}A_1^2\text{-}B^2$. The nomenclature should be read as follows:

A represents the baseline phase

A_1^1 the first placebo phase

B^1 the first phase assessing the treatment

A_1^2 the second placebo phase

B^2 the second treatment phase

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The A_1 phase is the intermediary or placebo phase between A (baseline) and B (treatment) and A_2 the placebo phase between B^1 and B^2. These phases control for subject's expectancy of improvement. In this design, the primary emphasis is to determine in the event that administration of the placebo fails to lead to behavioral change (A_1^1 phase of experimentation) over baseline measurement (A), it is possible to ascertain the effects of the treatment in an experimental analysis whereby the treatment is introduced twice and once withdrawn (the B^1-A_1^2-B^2 portion of the study). The design for this study is presented in Table 2.3.

Table 2.3. Intensive Case Study A-A_1-B-A_1-B Design

I (A)	II (A_1^1)	III (B^1)	IV (A_1^2)	V (B^2)
Baseline 1 week	Placebo 1 week	Treatment 3 weeks	Placebo 1 week	Treatment 2 weeks

Hypotheses

The overall purpose of this study was to determine if significant changes in physiological arousal as measured by electromyography will occur in each subject, if state-trait anxiety will be reduced, and if academic performance will be improved. The independent variable in this study was Open Focus relaxation.

The following hypotheses were generated for each individual:

H_1: During the first placebo phase (A_1^1) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_2: During the first treatment phase (B^1) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_3: During the second treatment phase (B^2) muscle tension will be decreased or reduced below the baseline (A) observation level, as indicated by the median slope trend.

H_4: During the first treatment (B') phase muscle tension will be reduced or decreased below the first placebo (A_1^1) phase, as indicated by the median slope trend.

H_5: During the second treatment (B^2) phase muscle tension will be reduced or decreased below the second placebo (A_1^2) phase, as indicated by the median slope trend.

H_6: During the second treatment (B^2) phase muscle tension will be reduced or decreased below all other phases A, A_1', first B' and second A_1^2, as indicated by the median slope trend.

H_7: As a result of relaxation training, post-state and post-trait anxiety scores will be less than pre-state and pre-trait anxiety scores on the State Trait Anxiety Inventory as indicated by the Wilcoxon Signed Rank Test.

H_8: There will be a reduction in tension as measured by the Stress Scale. This reduction will be indicated by the median slope trend

H_9: There will be an increase in the percent of correct items answered on the final examination as compared to the mid-term.

Data Analysis

To determine the effects of relaxation training on stress reduction as measured by the EMG biofeedback and the Stress Scale Self-Report, the split middle method of trend estimation was used for each subject. This technique is useful in describing the rate of behavioral change over time for individual cases. The method

detects linear trends in the data, characterizes present performance, and can be used in making predictions about performances in the future (Hersen & Barlow, 1976).

Median statistics is a test for statistical significance of changes in slope data curves at the point of treatment. A slope of the data in each session was estimated.

The split middle technique employes the use of a chart to graphically represent the rate of behavior. When the data are plotted, an estimate of the slope or "line of progress" is ascertained. The line of progress (referred to as the celeration line if the line is ascending and deceleration, if the line is descending) depicts the direction of behavior change as well as the rate of change. The utility of the celeration line lies in its ability to predict the subject's progress in light of the target behavior. Based on the celeration line, a slope of the data in each phase was estimated. These slopes or "median trends" were then compared.

According to the probability theory (White, 1972), half of the data will fall on one side of the extended trend line and

$$P_X = \binom{N}{X} P^X Q^{N-X}$$

gives the probability for an observed number of data points falling in the experimentally undesirable direction of the median trend. The sessions will not be different in the effects of treatment if the binomial probability equation yields no significant differences between sessions.

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Additionally, the Wilcoxon Signed Rank Test was utilized to compare before and after observations based on the State-Trait Anxiety Inventory on each subject. The Wilcoxon Signed Rank Test is a nonparametric technique. The mechanics of the test include ordering paired differences according to their numerical values without regard to signs, and then the ranks associated with the positive observations are added to form the test statistic. The test statistic is T^+ = Sum of ranks of positive differences D_i (Conover, 1971).

Summary

The major purpose of this study was to determine if relaxation training would decrease stress and increase academic performance in students who were either M.A. degree level or doctoral candidates. Seven subjects, four female and three male, met the selection criteria for inclusion in the study.

The research followed the basic A-B-A-B experimental design as discussed by Thoresen (1972). The basic treatment employed was Open Focus Relaxation therapy, a form of autogenic training. Following the baseline phase and the first treatment phase, a placebo treatment was introduced to control for expectancy of improvement by the subjects.

Physiological data were collected on each individual across each phase of the study. In addition, scores on the anxiety inventory were gathered, stress levels in and out of class were reported and percentages concerning each student's academic performance were

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assessed. Median statistics were used to analyze the hypotheses of the investigation.

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CHAPTER 3

ANALYSIS OF RESULTS

Chapter 3 contains the analysis of the results of the study. Six hypotheses which assessed physiological changes in tension levels for each individual case were examined using White's median slope trend. These hypotheses were:

H_1: During the first placebo phase (A_1^1) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_2: During the first treatment phase (B^1) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_3: During the second treatment phase (B^2) muscle tension will be decreased or reduced below the baseline (A) observation level, as indicated by the median slope trend.

H_4: During the first treatment (B^1) phase muscle tension will be reduced or decreased below the first placebo (A_1^1) phase, as indicated by the median slope trend.

H_5: During the second treatment (B^2) phase muscle tension will be reduced or decreased below the second placebo (A_1^2) phase, as indicated by the median slope trend.

H_6: During the second treatment (B^2) phase muscle tension will be reduced or decreased below all other phases A, A_1^1, first B^1 and second A_1^2, as indicated by median slope trend.

Trend analysis was also used to test the hypothesis measuring the reduction of stress as reported on the Stress Scale. This hypothesis stated that:

H_7: There will be a reduction in tension as measured by the Stress Scale for each individual subject, as indicated by the median slope trend.

An analysis of pre- and post-test observations of the State-Trait Anxiety Inventory was conducted using a nonparametric signed rank test.

H_8: As a result of relaxation training, post-state and post-trait will be less than pre-state and pre-trait anxiety inventory scores, as indicated by the Wilcoxon Signed Rank Test.

Additionally, a comparison is made between the percent of correct items answered on the mid-term and final examinations. This hypothesis stated that:

H_9: There will be an increase in the percent of correct items answered on the final examination as compared to the mid-term.

In order to assess how often subjects listeded to Open Focus tapes, home practice sessions were rated. These mean score ratings of home practice sessions are summarized and reported across the treatment phases.

Individual Cases

Seven subjects were involved in this study. Data were gathered for each subject across each phase of the stress reduction program. A summary description of each subject is presented based on life history questionnaires completed by each subject.

Case 1

This subject was a 49 year-old black female. The nature of tension and anxiety stemmed from maintaining a high degree of

competency in her studies and maintaining a high grade point average. She described the onset of her stress as beginning Fall term, 1978, when she began graduate school. She considered the stress as a part of adjustment in changing her role from professional to student.

She described her childhood as a happy one although she suffered from rheumatic fever at age 8 and then had a recurrence at 17 years of age. She had a tonsillectomy and adenoidectomy at 8 years and a hysterectomy at age 38.

She identified five main fears. They were: (1) failure in studies; (2) maintaining good health so as not to burden anyone; (3) not maintaining an optimistic outlook; (4) becoming a complainer; and (5) having a selfish attitude. She described herself as depressed, anxious, and as having concentration difficulties and memory problems.

To feel more self-confident and to decrease her anxiety was this subject's primary motivation for becoming involved in the program. She was enthusiastic about the treatment package and was very consistent in performing the homework assignments.

Her high and low EMG microvolt readings are presented in Figure 3.1. Trends in slope and level are noted. During Phase I the median trend line is ascending, indicating accelerating electrical activity in the frontalis muscles or increased tension. In each of the subsequent phases, the median trend line is decelerating, indicating that relaxation states are being achieved.

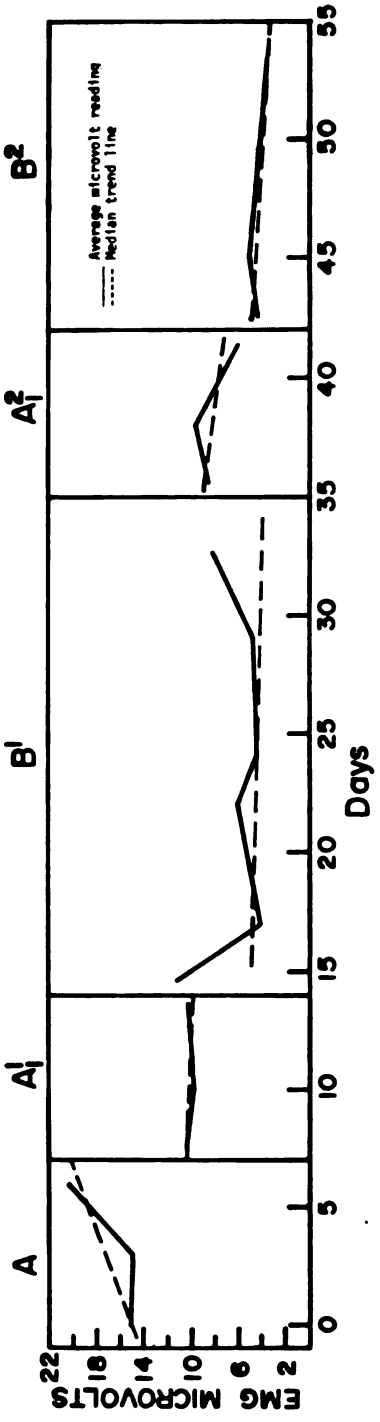

Figure 3.1. The rate of physiological responding based on the electromyograph for Case 1. Representation of the average of the highest and the lowest EMG microvolt reading during each session.

Case 2

This subject was a 30 year old single white female. She reported that when she had many tasks to complete, especially those involving school, she would spend time thinking about what needed to be done and making a list of things to do rather than actually working to complete the tasks. She stated that because she was not academically motivated and productive, she experienced a great deal of anxiety. She felt that such academic pressures as examinations and maintaining high grade point averages were usually upsetting and occasionally had severe triggering tension headaches and backaches. Her physician concurred that the headaches and backaches were brought on by stress since x-rays, blood test, a bone cancer test and a neurological test were all negative.

She had last seen a physician in April, 1978. She received allergy shots every month and was taking an antihistamine. She was most allergic to mold in the air and to dust.

She characterized her childhood as unhappy, particularly at age 8 when her parents were divorced.

She listed her five main fears: (1) having cancer, especially the pain associated with the disease rather than dying; (2) being forced into situations which consistently create tension and unhappiness; (3) taking examinations; (4) fear of being unhappily married as are many people she knows; and (5) being trapped in a job or career that was unfulfilling.

She indicated that she felt tense, depressed especially during finals week, dizziness, stomach trouble, fatigue, anxiety;

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often used aspirin; had allergies and couldn't make decisions, as her major concerns.

The stated reasons for her wanting to reduce stress levels were: (1) to become more academically productive; (2) to reduce tension; and (3) to become more organized and less procrastinating.

Her high EMG microvolt readings are presented in Figure 3.2. Trends in slope and level are noted. During Phase I the median trend line is ascending indicating increased electrical activity in the frontalis muscles. In Phase II the trend line is decelerating and accelerating in each subsequent phase.

Case 3

This subject was a 35 year-old black male, married with two children, and was a full-time doctoral student in Education. He reported that he generally felt tension and anxiety and experienced an inability to relax. One of his major concerns was not being able to successfully complete the requirements for a Ph.D. by the end of the year. He described himself as being anxious, worthwhile, sympathetic, intelligent, attractive, and confident.

During childhood, he experienced the usual childhood illnesses. In adult life he had broken an arm, a finger, and split a foot (all in karate demonstrations). He had last seen a physician in March, 1978, for an overactive thyroid condition but was not taking medication.

He stated that feeling tension and stress was very disturbing to him and interfered with family relationship and his academic life. He reported that he felt under a great deal of pressure from trying

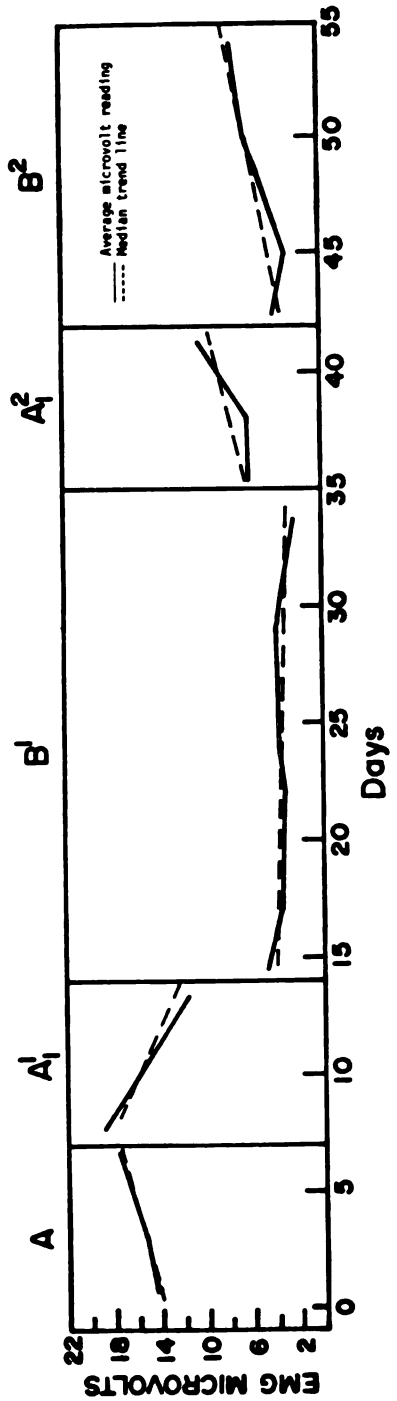

Figure 3.2. The rate of physiological responding based on the electromyograph for Case 2. Representation of the average of the highest and lowest EMG microvolt reading during each session.

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to complete his degree and it didn't take much to upset him. He wanted also to cultivate a better relationship with his family.

He cited two reasons for wanting treatment: (1) to better control mounting levels of tension and (2) to promote a happier relationship with his family.

He had a strong verbal and behavioral commitment to the program. He attended all sessions and practiced listening to tape recordings at home.

His high and low EMG microvolt readings are reported in Figure 3.3. Trends in slope and level are determined. During Phase I, the baseline, the EMG measured low levels of electrical activity in the frontalis muscles. As indicated by the trend line, however, this activity was accelerating. The trend lines further reveal for Phase II the first introduction of the placebo, and Phase III, the first treatment phase, decleration. For Phase IV, the second placebo, the trend line accelerated and then decelerated with the introduction of the second treatment in Phase V.

Case 4

This subject was a 30 year-old married white male with no children. He was a full-time student in the M.A. Counseling Program. Prior to that, he had been a high school teacher for four years. He stated that his tension fluctuated from very calm to extremely severe levels of anxiety. He reported that these extreme tension states occurred during testing periods usually around mid-term and final examinations. He said that two of his major complaints involved an inability to concentrate and failure to organize his activities

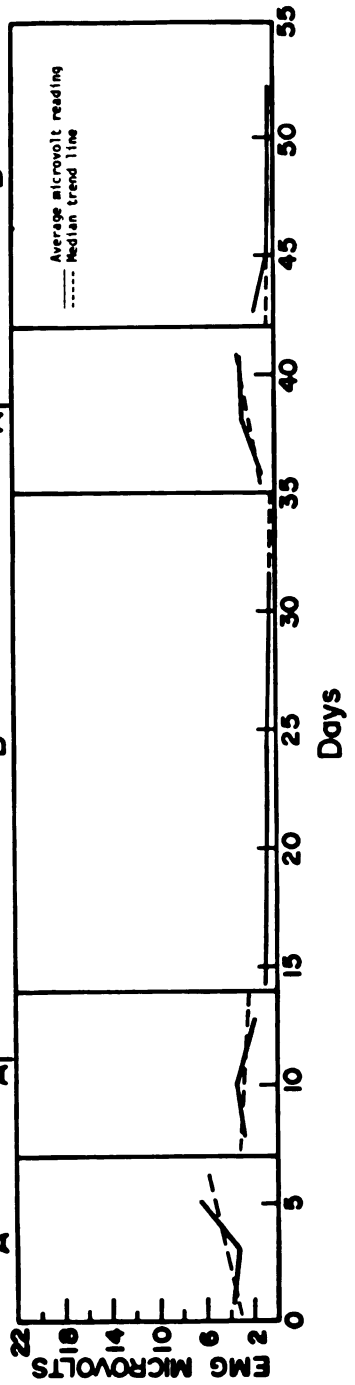

Figure 3.3. The rate of physiological responding based on the electromyograph for Case 3. Representation of the average of the highest and the lowest EMG microvolt reading during each session.

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including his study habits. He described himself as worthwhile, sympathetic, intelligent, attractive, confident and considerate.

His medical history included hepatitis in 1974, bowel disturbances since 1967 (and ongoing), an eye operation and appendectomy in 1975 and tonsillectomy in 1977. He had last seen a physician in March of 1977 and was not currently under medication.

He was cared for by his grandparents between the ages of 2 and 5 since his mother was confined to a mental institution recuperating from an emotional breakdown. Between 9 and 13 he attended a boarding school. As a child, he related that he felt anger toward his mother because she always seemed upset and unhappy. What he wanted from his mother and never got was her understanding and acceptance of his father. As he grew older, he indicated he was able to sort through his relationships with his mother and gain a better understanding of her.

His interests and hobbies included jogging, backpacking, and cross-country skiing.

He cited concentration and organization as present behaviors he wanted to change. He seemed to feel that the relaxation training program would assist him in accomplishing those behavioral goals.

He was enthusiastic about the program and attended all sessions. His high and low EMG microvolt readings are presented in Figure 3.4. During Phase I, the median trend line is ascending, indicating accelerating electrical activity in the frontalis muscles or increased tension. In the remaining phases the median trend lines indicate deceleration or increased relaxation.

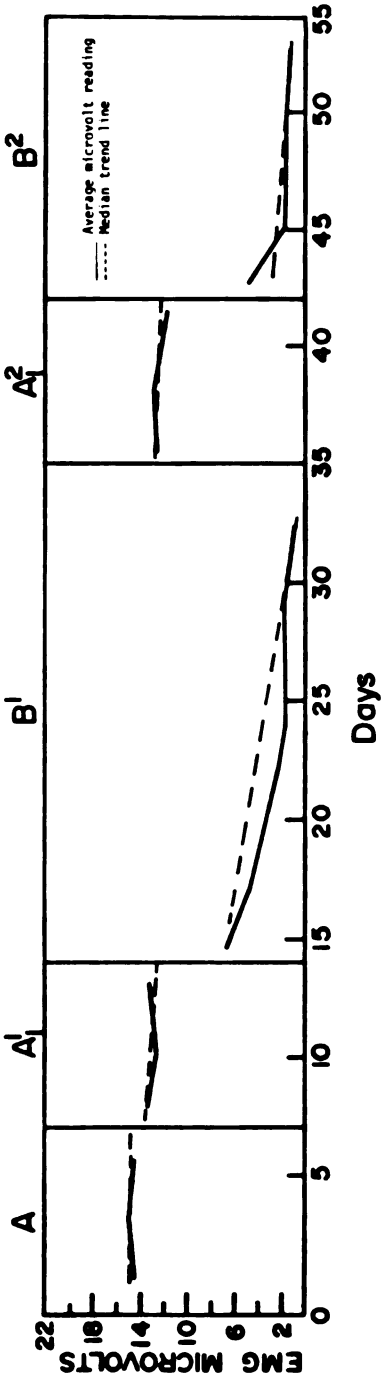

Figure 3.4. The rate of physiological responding based on the electromyograph for Case 4. Representation of the average of the highest and the lowest EMG microvolt reading during each session.

Case 5

This subject was a 32 year-old married white female with two children. She was in a doctoral program in the College of Education.

She indicated that she had experienced extremely severe depression throughout her life and it had increased dramatically over the last eight to nine years. Due to the accelerated tension and stress stemming from her personal and academic life, she had endured painful muscle tension in her neck and head. This had led to the usage of Elavil and Valium. She had previously consulted a psychiatrist (three to six months in 1972), a marriage counselor for a little over a year (1973-1974) and was being treated by a physician throughout the duration of the treatment program. She was not under medication during the study.

In listing her greatest fears, she identified two: (1) failure as being the most alarming; and (2) loneliness. She stated that she was tense, depressed, overly ambitious, unable to have a good time, could not make friends easily and felt panicky. She also indicated that her home conditions were bad, that she had sexual problems, and often entertained suicidal ideas.

Her reasons for participation in the program were: (1) to learn to reduce her feelings of anxiety when required to write term papers or to take an examination; (2) to learn to overcome immobilization due to situational stress; and (3) to find some reason for hope instead of having feelings of hopelessness.

Her microvolt high and low EMG readings are presented in Figure 3.5. Trends in slope are cited. In Phase I, the trend line is

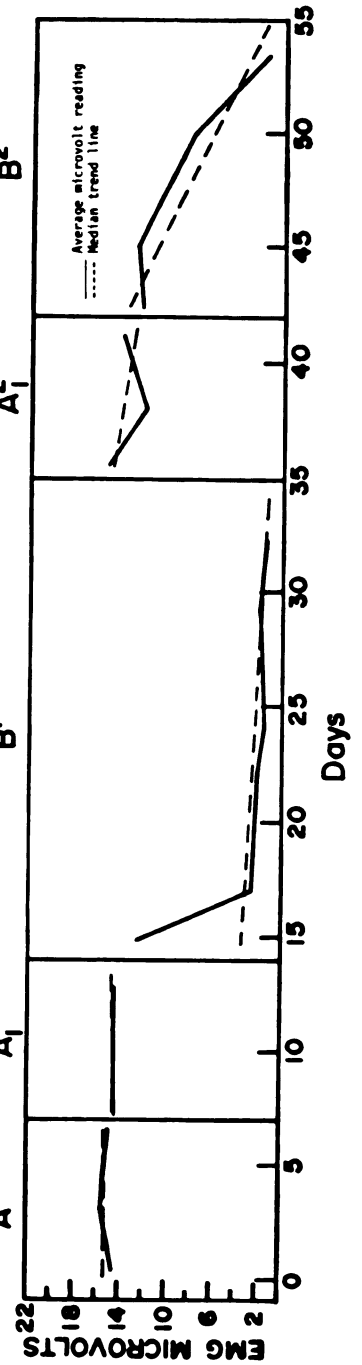

Figure 3.5. The rate of physiological responding based on the electromyograph for Case 5. Representation of the average of the highest and the lowest EMG microvolt reading during each session.

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slightly decelerating. The trend line in Phase II is accelerating and decelerates again in the subsequent Phases III, IV and V. There is a sharp decrease in electrical activity in the frontalis muscles in both treatment phases.

Case 6

This subject was a 28 year-old white single female. She was an M.A. student in therapeutic recreation, having received a B.A. in English literature and Communications. Her interests and hobbies included creative dramatics, theater and water sports. She was spending most of her free time studying and worrying about her proposal and project.

She stated that she often felt tense, depressed, unable to relax, conflict, fatigue and allergetic. Of her fears, she listed anxiety about being evaluated specifically in testing situations as being the most prominent. Other fears included future job opportunities, speaking in front of classrooms and negative criticism.

She reported that her health during childhood and adolescence was good. During young adulthood, however, she suffered several surgical operations: hernia (inguinal and umbilical) at age 24, tumor in breast at age 27, toncillectomy at 25 and appendectomy at 26. Prior to treatment she had been treated for hypertension. The medication prescribed was hygration with a required dosage of 50mg per day. During this study her medication was taken.

The stated reasons for wanting to reduce stress were: (1) to reduce stress levels during threatening situations; (b) to lower

blood pressure; and (c) to feel more comfortable and relaxed when taking examinations and public speaking.

She was highly motivated, attended all sessions and practiced listening to tapes at home at least once per day.

Her weekly high and low EMG recordings are presented in Figure 3.6. The trend lines accelerate during Phases I, II and III. During the two treatments, Phases III and IV, however, the trend lines indicated a decrease in electrical activity and are, therefore, decelerating.

Case 7

This subject was a 40 year-old single white male. He was a second year doctoral student. He stated that the nature of his problem stemmed from experiencing tremendous anxiety when faced with writing term papers or almost any evaluation procedure, especially if he had no control over when or how it was done. He stated that he first became aware of this tension in the second year of his academic career. He estimated the severity of this problem as being extreme and had previously consulted a clinical psychologist regarding this matter.

In terms of personal data, he stated that he had an unhappy childhood characterized by a number of fears and night terrors. His major fears included failure, rejection, night (or darkness) and aloneness. He stated that he suffered from an inability to relax and felt tensed and fatigued. He had headaches often along with bowel disturbances and stomach troubles. He characterized himself as

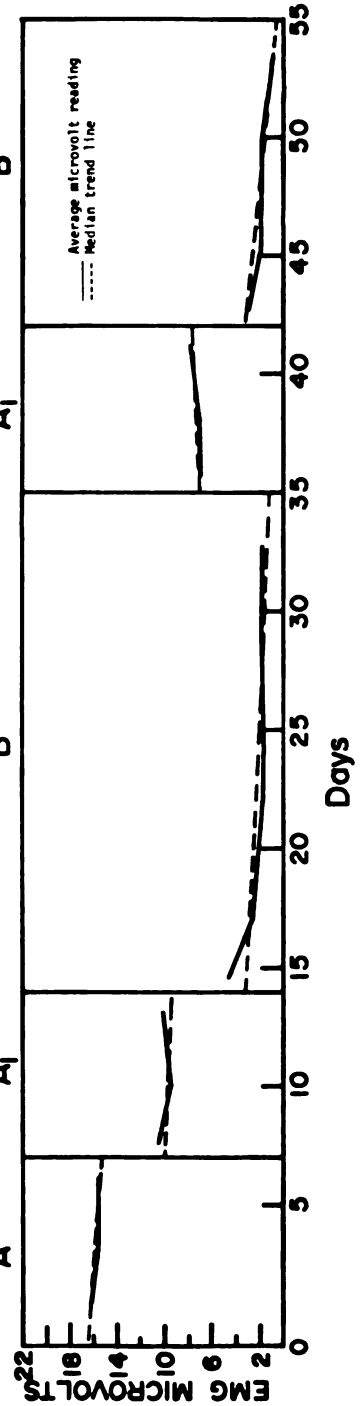

Figure 3.7. The rate of physiological responding based on the electromyograph for Case 7. Representation of the average of highest and lowest EMG data point microvolt reading during each session.

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worthless, inadequate, agitated, unassertive, unattractive, depressed, full of regrets, guilty and sympathetic.

Medically, he reported that he had a relatively healthy childhood, adolescence and adult life. He was not on medication and had not seen a physician since December of 1977.

Considering family data, he described his father as closed and non-communicative and his mother as ambivalent--sometimes friendly, sometimes hostile.

His interests and hobbies were swimming, cycling, jogging, and gardening.

He expressed enthusiasm and interest in the program, but was frequently late in attending the sessions.

His weekly high and low EMG recrodings throughout the phases is demonstrated in Figure 3.7. The trend lines are accelerating for Phases I and II and declerating for the subsequent phases. The electrical activity in the frontalis muscles for Phases III and IV was more reduced than in Phase IV.

Individual Case Hypotheses

For the purpose of data anlaysis in this study, the following hypotheses will be considered along with research data to either support or reject the hypothesis. The data for supporting or rejecting the following three hypotheses are presented in Table 3.1.

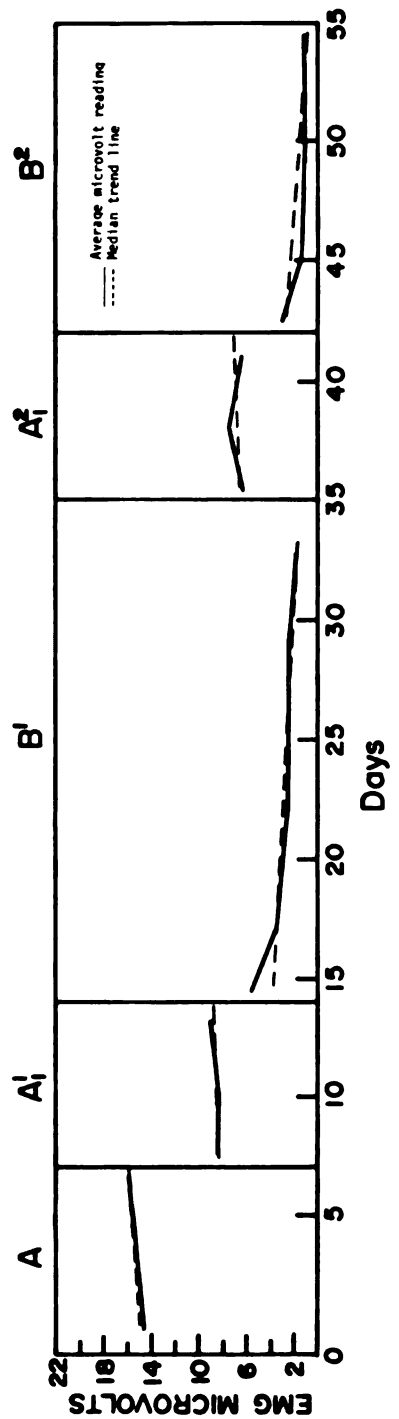

Figure 3.6. The rate of physiological responding based on the electromyograph for Case 6. Representation of the average of the highest and lowest EMG microvolt reading during each session.

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Table 3.1. Median Slope Trend Analysis of Statistical Probabilities of Differences in Muscle Tension Reduction Between Baseline and Treatment Phases (B^1 and B^2) and Baseline and Placebo Phases (A_1^1 and A_1^2) based on EMG

Subjects	Phases			
	$A\text{-}A_1^1$	$A\text{-}B^1$	$A\text{-}A_1^2$	$A\text{-}B^2$
1	.0175[a]	.0000005[a]	.0175[a]	.0003[a]
2	.0702	.0000005[a]	.0175[a]	.0003[a]
3	.0175[a]	.0000005[a]	.0003[a]	.0003[a]
4	.1638	.0000005[a]	.0003[a]	.0003[a]
5	.0117	.0000075[a]	.1400	.0003[a]
6	.0175[a]	.0000005[a]	.0003[a]	.0003[a]
7	.0175[a]	.0000005[a]	.0003[a]	.0003[a]

[a]Denotes statistical significance between phases ($p < .05$).

Hypothesis 1

During the first placebo phase (A_1) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

Hypothesis 2

During the first treatment phase (B) muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

Hypothesis 3

During the second treatment phase (B) muscle tension will be reduced or decreased below the baseline (A) observation level, as indicated by the median slope trend.

The data presented in column 1 of Table 3.1 indicates the statistically significant difference between the baseline (A) phase and the first placebo phase (A_1^1). Hypothesis 1 was accepted for five out of seven subjects as denoted by the letter "a." The data suggest that for these five subjects EMG microvoltage was significantly reduced during the placebo (A_1^1) phase than during the baseline (A) phase.

Column 2 of Table 3.1 is representative of a comparison of tension levels between the baseline (A) phase and the first treatment phase (B^1). For each subject, EMG microvolts significantly lowered ($p < .05$). Therefore, Hypothesis 2 was accepted for all seven subjects.

As demonstrated in column 4, the data present the significant difference between each subject's tension level in the baseline (A) phase and the second treatment (B^2) phase. Each subject's EMG microvolt readings were decreased significantly. Hypothesis 3 was accepted for each of the seven subjects.

Similarly, a comparison was made between Phases A and A_1^2 in which statistical difference was determined in six of the seven cases. The data analyse the comparison in EMG microvoltage between the baseline (A) phase and the return to the second placebo (A_1^2) phase.

The statistical analysis of this table utilized White's (1972) split middle method of trend estimation. The scores cited in Table 3.1 represent probabilities of difference across baseline and all

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other treatment phases. The data for accepting or rejecting Hypotheses 4 and 5 are presented in Table 3.2.

Table 3.2. Probabilities of Differences in EMG Microvoltage between Consecutive Phases for each Subject using Median Slope Trend Analysis

Subjects	Phases			
	I-II (A-A_1^1)	II-III (A_1^1-B^1)	III-IV (B^1-A_1^2)	IV-V (A_1^2-B^2)
1	.0175[a]	.0000685[a]	.0003[a]	.0162[a]
2	.0702[a]	.00000005[a]	.0175[a]	.0003[a]
3	.0175[a]	.0000007[a]	.0175[a]	.0003[a]
4	.1638	.0000005[a]	.0175[a]	.0003[a]
5	.0117[a]	.0000005[a]	.0175[a]	.19
6	.0175[a]	.0000005[a]	.0175[a]	.0003[a]
7	.0175[a]	.0000005[a]	.0175[a]	.0003[a]

[a]Denotes statistical significance between phases ($p < .05$).

Hypothesis 4

During the first treatment (B^1) phase, muscle tension will be reduced or decreased below the first placebo (A_1^1) phase, as indicated by the median slope trend.

Hypothesis 5

During the second treatment (B^2) phase muscle tension will be reduced or decreased below the second placebo (A_1^2) phase, as indicated by the median slope trend.

According to Table 3.2, there was a statistically significant ($p < .05$) reduction in EMG microvoltage as demonstrated between the (A_1^1) and (B^1) phases for all individuals. Therefore, Hypothesis 4, stating that muscle tension during the first treatment phase would be decreased below the first placebo phase, was accepted for all seven subjects.

As shown in the fourth column of Table 3.2, the reduction in EMG microvoltage was statistically significant in all but one case between phases (A_1^2) and (B^2). Hypothesis 5, comparing the second treatment phase to the second placebo phase,was accepted for six out of seven cases.

In summary, Hypothesis 4 was accepted for seven statistically significant outcomes while Hypothesis 5 was accepted for six out of seven statistically significant outcomes. The analysis of this table used the split middle method of trend estimation.

Hypothesis 6

During the second treatment (B^2) phase muscle tension will be reduced or decreased below all other phases A, A_1^1, B^1 and A_1^2.

To evaluate Hypothesis 6, Table 3.3 contains the data necessary to determine the statistical difference between the second return to the treatment phase (B^2) and phases A, A_1^1, B^1 and A_1^2. According to the table, for comparison between A and B^2, there was statistical significance for all seven individual cases. For the A_1^1 and B^2 comparison, six out of the seven were significant. In comparing B^1 and B^2, three out of the seven cases were significant, which

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Table 3.3. Analysis of Statistical Probabilities of Differences in EMG Microvoltage Between Second Treatment Phase and All Other Phases using Median Trend Statistics

Subjects	Phases			
	I-V ($A\text{-}B^2$)	II-V ($A_1{}^1\text{-}B_2$)	III-V ($B^1\text{-}B^2$)	IV-V ($A_1{}^2\text{-}B^2$)
1	.0003[a]	.0003[a]	.054	.0162[a]
2	.0003[a]	.053	.22176	.0003[a]
3	.0003[a]	.016[a]	.053	.0003[a]
4	.0003[a]	.0003[a]	.0002[a]	.0003[a]
5	.0003[a]	.0003[a]	.0002[a]	.19
6	.0003[a]	.0003[a]	.192	.0003[a]
7	.0003[a]	.0003[a]	.0002[a]	.0003[a]

[a]Denoted statistical significance between phases ($p < .05$).

indicated that out of the seven cases three individuals reduced their tension level in the second treatment phase below the level reported in the first treatment phase. Finally, in the $A_1{}^2$ and B^2 comparison, six out of the seven cases were statistically significant. Significance between B^2 and all other phases for each case is denoted by the letter "a."

Hypothesis 7

As a result of relaxation training, post-state and post-trait anxiety scores will be less than pre-state and pre-trait anxiety inventory scores.

For the comparison between pre-state and post-state anxiety as measured by the State form of the State-Trait Anxiety Inventory, the null hypothesis was rejected since T = 0 is less than 4, p = .05 in favor of the alternative. It was, therefore, determined that as a result of relaxation training, post-state anxiety scores were statistically different from pre-state anxiety scores.

In evaluating the pre-trait anxiety and the post-trait anxiety scores, the null hypothesis was accepted since T = 4 is greater than 3, p = .05. It was concluded that trait anxiety was not affected by relaxation training. The scores in Table 3.4 present pre- and post-test scores on the State Trait Anxiety Inventory.

Table 3.4. Pre- and Post-Test State Trait Anxiety Inventory Scores

Subject	Pre-State	Post-State	Pre-Trait	Post-Trait
1	28	22	36	35
2	50	43	51	45
3	56	32	42	40
4	40	37	31	31
5	49	41	61	62
6	50	42	55	51
7	68	48	64	53

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Hypothesis 8

There will be a reduction in tension as measured by the Stress Scale both in class and out of class. This reduction will be indicated by the median slope trend.

The data in Tables 3.5 and 3.6 present the statistically significant ($p < .05$) difference between the baseline Phase A and all other phases--A_1^1, B^1, A_1^2, and B^2 while in class and out of class as measured by the Stress Scale.

Column 1 of Table 3.5 (in class report of stress level) and column 1 of Table 3.6 (out of class comparison of stress levels between phases) assesses the baseline phase to the first presentation of the placebo. It was determined that there was no statistical difference between A and A_1^1 in class or out of class for all seven cases.

As demonstrated in column 2 of both Tables, a comparison is made between the baseline phase (A) and the first treatment phase (B^1). It was found that statistical significance existed for six out of seven cases in class and five out of seven cases out of class. It was concluded that as a result of relaxation training these subjects reported feeling less stressed both in and out of class during the first treatment phase.

Presented in column 3 of Table 3.5 and 3.6 are comparisons between the baseline (A) and the second return to the placebo (A_1^2). There was no statistical difference found between these phases for both in or out of class reports.

Table 3.5. Analysis of Statistical Probabilities of Differences in Stress Level Between Baseline (A) and all Other Phases (A_1^1, B^1, A_1^2, and B^2) While in Class as Measured by the Stress Scale.

Subjects	Phases			
	I-II ($A-A_1^1$)	I-III ($A-B^1$)	I-IV ($A-A_1^2$)	I-V ($A-B^2$)
1	.25	.0078[a]	.125	.03125[a]
2	.25	.0078[a]	.125	.03125[a]
3	.25	.052	.125	.03125[a]
4	.25	.0078[a]	.125	.03125[a]
5	.25	.0078[a]	.125	.156
6	.25	.0078[a]	.125	.03125[a]
7	.25	.0078[a]	.125	.03125[a]

[a]Denotes statistical significance between phases ($p < .05$).

Table 3.6. Analysis of Statistical Probabilities of Differences in Stress Level Between Baseline A and all Other Phases A_1^1, B^1, A_1^2, and B^2 while Out of Class as Measured by the Stress Scale

Subjects	Phases			
	I-II	I-III	I-IV	I-V
1	.5	.0078[a]	.125	.03125[a]
2	.25	.0078[a]	.75	.03125[a]
3	2.0	.0078[a]	.125	.3125
4	.25	.273	.375	.208
5	.25	.1638	.375	.3125
6	.25	.0078[a]	.125	.03125[a]
7	.25	.0078[a]	.125	.03125[a]

[a]Denotes statistical significance between phases ($p < .05$).

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Column 4 provides an analysis of the baseline phase and the second return to the treatment (B^2). It was determined that statistical significance occurred for six out of the seven subjects for in class levels of stress and four out of seven subjects for out of class levels of stress.

Hypothesis 9

There will be an increase in the number of correct items answered on the final examination as compared to the mid-term examination for each individual.

The question posed here is whether or not the subjects, as a result of relaxation training, would improve the number of correct items on final examinations versus mid-term examinations in their respective courses. The percentages to assess that question are presented in Table 3.7. The information provided confirms that seven out of the seven individual cases made improvements. Therefore, Hypothesis 9 was accepted.

In order to assess how well home practice sessions were implemented, self-reports of practices (a record of the number of times each subject listened to the relaxation tapes) were used. The subjects recorded how often they listened to Open Focus tapes during treatments B^1 and B^2. The mean ratings of these home practice reports for each subject are presented in Table 3.8.

Summary

A summary description of each case was presented, along with graphic representations of the subject's physiological response to

Table 3.7. Percentage of Total Correct Items on Mid-term and Final Examination for Each Subject

Subject	Mid-term % Correct Items	Final % Correct Items	% Correct Item Change
1	75	87	12
2	82	89	07
3	79	96	17
4	64	83	19
5	92	98	06
6	86	92	06
7	89	94	05

Table 3.8. Mean Ratings for Each Subject's Home Practice of Tape Recordings in Treatment Phases

	Subjects						
	1	2	3	4	5	6	7
First Treatment Phase	1.17	2.0	1.43	1.05	1.14	.76	1.24
Second Treatment Phase	.64	1.07	1.29	1.00	.50	0	1.43
Grand Mean	.91	1.54	1.36	1.03	.82	.38	1.34

Note. It was suggested that each subject listen to tapes once per day during the treatment phases.

the treatment program. Individual subject hypotheses were considered and a group analysis was made on the pre- and post-test scores of the State-Trait Anxiety Inventory.

The analysis indicated that EMG microvoltage was reduced from the baseline when compared with either the first treatment phase or the second treatment phase. Additionally, it was revealed that performance on academic tests was enhanced. Individual differences, however, did exist.

The mean ratings of home practice sessions were totalled for each individual case for the two treatment Phases B^1 and B^2. The mean scores were used to draw conclusions about the effect of home practice (listening to relaxation tapes) sessions on stress reduction.

Implications of these findings for the treatment of stress and anxiety about performance are discussed in Chapter 4.

CHAPTER 4

SUMMARY

The purpose of this study was to investigate the effects of relaxation training in reducing stress and to increase the academic performance of graduate students. The relaxation program employed in this study was an autogenic training type of treatment called Open Focus that is commercially available. Open Focus is a program where subjects listen to a series of cassette recordings that ask interrogatory questions designed to stimulate objectless experiences and to broaden attentional focus. The treatment, to some extent, is similar to the Autogenic Training methods discussed by Schultz and Luthe (1969). It was hypothesized that if the relaxation procedure was powerful enough, physiologic parameters of tension as measured by an electromyographic (EMG) instrument and subjective feeling of anxiety as measured by the State Trait Anxiety Inventory scores should be reduced for each subject. It was also hypothesized that subjective reports of stress in and out of class should be reduced and that academic improvement would be achieved. The hypotheses presented were consistent with the recent theorizing of Fehmi (1975).

The study was conducted over an eight-week period at Michigan State University in East Lansing, Michigan. Seven graduate students enrolled in the College of Education were included in the study. The

study used an extension of the basic A-B-A-B format (Mersen & Barlow, 1976) intensive design procedure.

The Open Focus relaxation training was taught in two phases. One phase was three weeks in length and the other was two weeks. Other experimental sessions included a baseline phase implemented prior to the relaxation training sessions, and two placebo phases occurred between the relaxation training phases. During the baseline phase, frontalis muscle EMG observations were made for each subject. Subjects also reported subjective levels of stress during this phase of the study and each subsequent phase. In the second phase or the placebo phase each subject was presented a revolving disc and asked to focus on the disc. It was explained that the disc was a mechanism utilized to facilitate relaxation. Subjects listened to Open Focus recordings during the third phase, which was a treatment phase. The fourth phase was a return to the placebo phase where they watched the revolving disc. In the fifth phase subjects again listened to the Open Focus relaxation tapes. Electromyographic responses and subjective self-report data for each subject were collected during each phase of the study.

The criteria measures used in the study to evaluate the effects of Open Focus relaxation training on stress were:

a. Electromyography

b. The State-Trait Anxiety Inventory

c. The Stress Scale

d. Mid-term and Final Examinations

e. Log of Home Practice Sessions

Primarily, two analyses were performed on these data. The first was the median slope trend and was called for by the intensive design used in the study. In carrying out this analysis, specific hypotheses were stated for each individual case.

These hypotheses were:

H_1: During the first placebo phase (A_1^1), muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_2: During the first treatment phase (B^1), muscle tension will be reduced or decreased below the baseline observation level (A) as indicated by the median slope trend.

H_3: During the second treatment phase (B^2) muscle tension will be decreased or reduced below the baseline (A) observation level, as indicated by the median slope trend.

H_4: During the first treatment phase (B^1), muscle tension will be reduced or decreased below the first placebo ($A^1{}_1$) phase, as indicated by the median slope trend.

H_5: During the second treatment phase (B^2) muscle tension will be reduced or decreased below the second placebo phase ($A_1{}^2$).

H_6: During the second treatment phase (B^2), muscle tension will be reduced or decreased below all other phases A, $A_1{}^1$, B^1 and $A_1{}^2$, as indicated by the median slope trend.

H_7: There will be a reduction in tension as measured by the Stress Scale. This reduction will be indicated by the median slope trend.

The second analysis was a non-parametric signed rank test that addressed the following hypothesis:

H_8: As a result of relaxation training, post-state and post-trait will be less than pre-state and pre-trait anxiety inventory scores, as indicated by the Wilcoxon Signed Rank Test.

The analysis compared pre- and post-test observations of the State-Trait Anxiety Inventory.

To study the effects of the treatment procedure on academic performance, a comparison was made between the percentage of correct items answered on the mid-term examination taken by each subject and the percentage of correct items answered on the final examination of the same course. These differences were computed. The hypothesis was:

H_9: There will be an increase in the percent of correct items answered on the final examination as compared to the mid-term.

Another analysis was made of home practice sessions carried out by the subjects of this study. The analysis focused on the number of times the subjects listened to the Open Focus tapes. Mean ratings of home practice sessions were computed for each subject during the two treatment phases.

Discussion

It was hypothesized that Open Focus relaxation training would inhibit tension levels and increase academic performance. Direct assessments were made of physiological parameters and subjective responses to stress. The results of the study indicate that the treatment procedure produced significant decreases in frontalis EMG microvoltage data, as well as subjective reports of stress. The subjects also exhibited significant change as measured by differences in the pre- and post-test scores on the State-Trait Anxiety Inventory. The performance by subjects on the final examination was found to be

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enhanced when comparison of the percentage of correct items answered on a mid-term examination with the percentage of correct items answered on a final examination was made. It would appear, therefore, that Open Focus may be useful for relatively well-functioning graduate students for coping with graduate courses and examinations.

Open Focus Effects on Frontalis EMG

In considering the frontalis EMG data, the results are examined from the graphic representation of the physiological changes for each subject found in Chapter 3. Of interest was Phase I, the baseline session, where six out of the seven students' EMG readings ranged from fourteen to sixteen microvolts. This indicates that before presentation of any treatment, the graduate students' frontalis EMG was high. These findings are consistent with those identified by Griffore (1977), who found that older graduate-level students experienced a high degree of tension triggered by the impact of personal, social, environmental, and academic stressors.

Assessment of the frontalis EMG changes which occurred during each consecutive phase revealed that five out of the seven subjects reduced EMG microvoltage during those phases. This was congruent with the hypotheses. The trend lines of subjects changed from either a horizontal position or an upward slope in the baseline phase to a continual downward slope in the remaining consecutive phases. Two subjects, however, did not show these reductions in EMG mircovoltage output. During the first placebo phase, subject 4 was not

successful in reducing EMG microvoltage and subject 5 was not successful in decreasing EMG microvolts during the second treatment phase. A number of reasons may account for this.

For student 4, lack of concentration was cited as one of his major complaints. Since the placebo phase required concentration on a revolving disc, this phase could have elicited a certain amount of anxiety. The student may have found it more difficult under the conditions of the placebo phase to decrease EMG microvolts, especially since this was the first experimental session.

Student 5 indicated that she was experiencing high levels of anxiety during both the second placebo phase and second treatment phase. She was having a difficult time coping with personal stressors as well as academic ones. She was involved in a separation from her husband who had custody of the children, along with the academic pressures of projects and final exams. These factors seemed to prohibit her from listening to the tape recordings at home. It should be noted that this student's mean rating for home practice was the second lowest. However, as the end of the second treatment approached, her tension level decreased. It appears that the variability in the frontalis EMG during consecutive phases could be attributed to the difficulty of the task during the phase, the current personal-life situations, academic stressors and the number of home practice sessions.

Also of interest is the comparison between the two treatment phases B^1 and B^2. Only three of the students showed significant

differences between Phases III and IV. This seems to indicate that the effects of relaxation tended to peak early for some students and that as time passed, no differences occurred between the two phases. This suggests that there are individual differences in responding to the relaxation training phases.

Open Focus Effects on State-Trait Anxiety

Based on the pre- and post-testing with the State-Trait Anxiety Inventory, there appeared to be a definite effect between the Open Focus training and the state anxiety scores of the subjects. A-state measures for subjects decreased significantly in response to the relaxation training. There was, however, no significant differential relationship between Open Focus training and decreased trait anxiety scores. This evidence seems to suggest that A-state is more likely to be reduced by Open Focus than A-trait. The results lend additional support to the findings of Johnson and Spielberger (1968), showing that measures of A-state declined significantly in response to relaxation training procedures, while A-trait measures were impervious to relaxation training. An important implication of these findings is that Open Focus can be effectively utilized with graduate students in combating high levels of state anxiety. This means that academic performance can be enhanced since analyses of trait anxiety data generally shows that A-trait has no direct effect on performance (King et al., 1976).

The results of these findings that state anxiety was decreased and trait anxiety remained relatively stable are consistent with other

reports in the literature, as state-anxiety has been conceptualized as a transitory condition that varies in intensity from situation to situation, while trait anxiety refers to relatively more stable differences in anxiety proneness (Barsch & Nesselroade, 1973). Further, it was reported (Hodges, 1968) that since A-trait does measure the predisposition to respond, A-state anxiety is heightened in situations involving threats of loss of self-esteem or failure. This study then implies that when graduate students report feelings of stress, they are usually identifying anxiety associated with situations involving social or academic failures or ego-threatening situations.

Effects of Open Focus as Measured by a Stress Scale

During the treatment Phases B^1 and B^2, subjects involved in this study reported their levels of stress during class and outside of class on the Stress Scale. Mixed differences were found in the reduction of subjective feelings of stress. The largest reduction in reported levels of stress was found in B^1 for both in class and out of class time periods. In view of this finding it is possible to examine the effects of home practice sessions on the data. The subjects were required to listen to Open Focus tapes at least once per day during B^1 and B^2 phases. It seems that the application of the Open Focus relaxation tapes and the number of home practice sessions provided the subjects with a self-induced method of either alleviating or reducing anxiety in Phase III. Inspection of

Table 3.8 points to the diligence of subjects listening to tapes during the first treatment. The subjects listened to the tapes fewer times during the second treatment. It appears that when the subjects were capable of self-inducing relaxation then they could also relax in academic situations as well as in other stressful situations.

A point should be made regarding the placebo phase. Stress levels were reported as being high during the two placebo phases A_1^1 and A_1^2. Since the subjects were not required to listen to the Open Focus tapes during these phases, it is likely that their expectations were not as high as they were during the treatment phases. The importance of this, however, does not appear to be very significant as students reduced frontalis EMG and decreased state-anxiety scores on the State-Trait Anxiety Inventory during placebo phases.

Effects of Open Focus on Academic Performance

The effects of the treatment procedure upon academic performance were assessed by comparing the percentage of items passed by subjects on a mid-term examination with the percentage of items passed on a final examination in the same course. The percentage of change was then computed. The results show that an increase in correct responses from the mid-term examination to the final examination did occur for each subject. Thus, the results indicate that Open Focus seemed to be a viable factor in improving examination performance for these subjects.

Many variables such as intelligence, amount of time spent in preparation for examinations, motivation, instructor grading procedures and bias, and difficulty of examinations could not be controlled for in this investigation. However, the findings are consistent with much of the literature that indicates the ability to relax is correlated positively with improved academic performance.

Home Practice Sessions

The last set of data in Chapter 3 contains information regarding each student's mean ratings of home practice sessions. Four of the seven subjects practiced listening to tape recordings at least once per day. From inspection of the data, only subject five, whose practice grand mean was .82, had trouble reducing physiological tension as measured by the EMG and subjective feelings of anxiety. Subject 6, whose grand mean rating was .38, significantly reduced physiological tension and also reported decreased feelings of anxiety. Based on the results of the number of home practice sessions for this study, there appeared to be no definitive effect between number of practices of Open Focus, reduction of tension, and academic performance. It is possible that practicing Open Focus each week in the laboratory was sufficient for some subjects to reduce their stress and they didn't need home practice as much as other subjects. Apparently, the effect of home practice varies with each subject.

Individual Variables

There are many personality types and genetic and environmental factors that influence a particular individual. It has been suggested that individual makeup and the length and type of a relaxation program determine the program's effectiveness. From observing the seven students over the five phases of the study several variables were considered. They include age, sex, race, marital status, degree program and specialization area. Motivation and length of the study were also considered.

With these variables in mind a number of researchers (Morse & Furst, 1979) propose that different relaxers work for different people. Contrary to their research, the age, sex, race, marital status, degree program and specialization differences seemed not to affect the relaxation response as measured in this investigation. As discussed in Chapter 1, people have different mediating factors which affect perceptions of stressful conditions (individual makeup) and individuals vary in their physiological responses to stressors, but the relaxation method employed seemed to be not affected by these variables. In other words, Open Focus technique seems to be effective in initiating and maintaining relaxation in different types of subjects.

Two other factors which influence the effectiveness of a relaxation program are motivation and length of training phases. Motivation is an important variable in a self-directed relaxation program such as this one. All subjects seem to maintain high levels of

motivation as evidenced by their attendance at the experimental sessions, their home practice sessions, and their record keeping. Their motivation seemed to stem from commonly reported feelings of decreased tension and increased sensations of warmth, numbness, floating, tingling, euphoria and various mental images. They also reported better study habits and improvements in interpersonal relationships. These characteristics seemed to have a positive effect on motivation.

The length of the training phases seemed appropriate for all subjects except one. Since people appear to vary in the length of the time needed for learning the relaxation response, this factor should be considered before a relaxation program is implemented. It is also possible that different relaxation training programs would influence individuals differently in terms of the amount of time required to learn how to relax.

Conclusions and Implications

Though these results need replication, Open Focus training as a relaxation technique appears to offer several advantages. The procedure appears to be effective and efficient in the remission of general anxiety and test anxiety as reported by the graduate students in this study. Thus, students can practice Open Focus and increase their sense of well-being, reduce tension and anxiety, and improve academic performance. Open Focus seems to work well with highly anxious students who are confronted with academic problems. It can become an established strategy in their repertoire of responses for

reacting to stressors and may broaden the individual's capacity for problem solving.

This study not only speaks to the use of Open Focus as a procedure for reducing tension, but it also highlights the importance of an automated technique. A relatively large population having experienced similar stress could be treated in a short time, through the use of the relaxation tapes, even where no therapist is physically available.

An intensive design was used in this study. The utilization of such a design lends itself to an investigation of a wide range of individual responses to relaxation training. It is possible through this design to study the ways in which people can use Open Focus to cope with stressful transitory experiences.

Suggestions for Future Research

The benefits derived from Open Focus, as discussed in this study, tended to be in the area of the physiological relaxation response, although significant differences were reported in the subjective areas of individuals coping with stressful situations. The treatment seemed to positively affect cognitive functioning as the students achieved positive gains on their final examinations. Future research will, of course, be needed to determine the degree to which the findings of this study can be generalized. In addition, future research could expand our knowledge in this area by considering the following suggestions for investigating:

1. Replication of this study using a larger number of subjects.

2. A study investigating the effects of Open Focus on other dependent measures such as heart rate, blood pressure, and galvanic skin response.

3. A study using other forms of relaxation meditative therapy, in addition to the Open Focus and comparing the phases in terms of physiological response and academic performance.

4. A study investigating the academic performance of graduate students trained in Open Focus from the beginning of graduate training to completion of their program.

5. A study investigating the effects of Open Focus on subjects enrolled in other academic courses.

APPENDICES

APPENDIX A

PRESENTATION TO ED 869 AND ED 816B

APPENDIX A

PRESENTATION TO ED 869 AND ED 816B

1. Introduction

2. Studying effects of stress in academic environments--

   a. Stress is becoming recognized as one of the major determinants for poor performance, unhappiness, illness, and disease. It is estimated that 60-80% of visits to general practitioners of medicine have problems that are stress related. All of us are faced with stress from a multitude of sources each day. Yet, few of us are adequately prepared to deal with it.

   b. The purpose of this research is to investigate the effects of a stress reduction program on individuals who are experiencing stress in a demanding academic course.

      1. The reason for this presentation tonight is to offer some of you the opportunity to participate in this stress reduction program. The program offers the possibility for you not only to be able to perform at a higher level in your class, but a possible means for reducing stress in other situations

      2. I am looking for volunteers who feel very anxious about their classes and who are willing to participate in an intensive stress reduction program.

         a. Those who are willing, after getting more information, to commit themselves to three sessions per week for about 30 minutes each session for eight weeks should see me for these individual sessions.

         b. Those who are willing to devote 30-45 minutes per day at home practicing the procedures you will be taught and will keep records of daily progress (5 minutes).

c. Those who are also willing for the researcher to collect data about their progress, personal history, tests, so as to measure the effectiveness of treatment.

d. In no way will the treatment be abusive or belittling. Much of the treatment will consist of listening to cassette tapes and following directions given on tape in the privacy of your own home. No identification of you as subjects will be revealed in any report or publication.

e. If desired, your participation may serve as an independent study.

3. Advantages for you.

a. Personal benefits--learn to reduce your stress in many situations, especially academic stress.

b. Those of you who plan to be teachers or plan to be college professors, this is an opportunity to learn a procedure that can be taught to others--your students, family, etc.

c. At the end of the nine weeks, you will have for your own personal use a set of cassette tapes that contains the procedure.

4. For those who are considering to volunteer, please remain after class.

5. Please leave name, address, and telephone number.

Male ____ Female ____ Under Medical Treatment? Yes ____ No ___

Cassette Type Tape Recorder? Yes ____ No ____

5. Explain Individual Design.

a. Open Focus training was developed by Dr. Lester Fehmi of Princeton Medical Center.

b. Learn to reduce effort and tension by focusing on certain internal and external events to the exclusion of other events; to reach a certain state of mental awareness that promotes relaxation at a very deep level--a sense of well-being. Use of visual imagery. The use of a natural process that people can easily learn--through practice. Homostatic response, physical illness, immune system usually works to combat disease. Open Focus lets mind's immunity system

combat stress. Passive mind--no responses going to body that creates internal stress to muscles and organs. Open Focus produces a pleasant state--get acquainted with your bodies--interesting.

c. Those of you under current medical treatment should consult with physician using insulin, thyroxin, or anti-hypertension medicine. Relaxation--mental and physical stress reduction changes dosage requirements

6. Requirements--Commitment. I am not able to provide opportunity to all, but for the most stressed or anxious.

   1. Come to Erickson Hall three times per week for instruction and monitoring--30 minutes each session.

   2. Practice at home with cassettes at least 30 minutes each day.

   3. Monitor with EMG instrument which measures muscle relaxation and is applied to the forehead. First two weeks gather base-line data where you are now--take about 15-20 minutes (three times a week). Next seven weeks--30 minute sessions three times a week. Practice 30 minutes a day at home.

   4. Take some tests tonight so we can assess your level of stress or anxiety.

   5. Fill out a schedule.

APPENDIX B

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 become tense and upset when I think about my present concerns	①	②	③	④

APPENDIX C

SOCIAL READJUSTMENT RATING SCALE

APPENDIX C

SOCIAL READJUSTMENT RATING SCALE

Instructions: Please check off events which have happened to you within the last year and then total up the score by adding up the assigned values of these events.

Events	Value	Events	Value
Death of a spouse	100	Outstanding personal achievement	28
Divorce	73	Spouse begins or stops work	26
Marital separation	65	Start or finish school	26
Jail term	63	Change in living conditions	25
Death of close family member	63	Revisions of personal habits	24
Personal injury or illness	53	Trouble with boss	23
Marriage	50	Change in work hours, conditions	20
Fired from work	47	Change in residence	20
Marital Reconciliation	45	Change in schools	20
Retirement	45	Change in recreational habits	19
Change in family member's health	44	Change in church activities	19
Pregnancy	40	Change in social activities	18
Sex difficulties	39	Mortgage or loan under $10,000	17
Addition to family	39	Change in sleeping habits	16
Business readjustment	39	Change in number of family gatherings	15
Change in financial status	38	Change in eating habits	15
Death of a close friend	37	Vacation	13
Change to different line of work	36	Christmas season	12
Change in number of marital arguments	35	Minor violation of the law	11
Mortgage or loan over $10,000	31		
Foreclosure on mortgage or loan	30		
Change in work responsibilities	29		
Son or daughter leaving home	29		
Trouble with in-laws	29		
Subtotal		Total	

APPENDIX D

CONSENT FORM

APPENDIX D

CONSENT FORM

I, _____ have had the research project entitled "A Study of Academic Stress" conducted by Bob Winborn and Brenda White explained to me to my satisfaction. I understand the experimental design and the requirements of the project. I also understand that any other explanation I desire will be provided me by the researchers and my name will not be mentioned in any way in any publication that might result from the research. I volunarily agree to participate in the project and understand that no research procedures will be abusive to me as a person.

_____

Name

_____

Date

APPENDIX E

DATA COLLECTION SHEET (EMG READINGS)

Na

—

A

A

A

A^1

A_1

A_1

B^1

B^1

B^1

B^1

B^1

B^1

B^1

A_1^2

A_1^2

A_1^2

B^2

B^2

B^2

B^2

APPENDIX E

RECORD OF EMG OBSERVATIONS

Name_____

Date	EMG	EMG	EMG	Note special feelings before and after observation period
A				
A				
A				
A^1				
$A_1{}^1$				
A_1				
B^1				
B^1				
B^1				
B^1				
B^1				
B^1				
$A_1{}^2$				
$A_1{}^2$				
$A_1{}^2$				
B^2				
B^2				
B^2				
B^2				

APPENDIX F

STRESS SCALE

APPENDIX F

STRESS SCALE

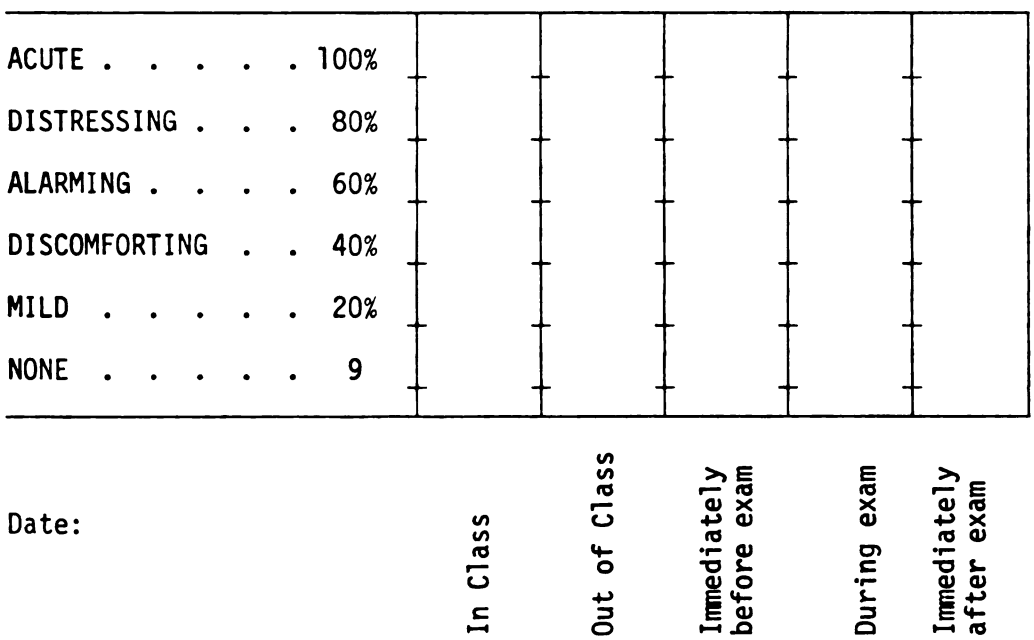
Most people agree that the following five words represent stress of increasing intensity. There are:

0	20%	40%	60%	80%	100%
NONE	MILD	DISCOMFORTING	ALARMING	DISTRESSING	ACUTE

To get a better understanding of the effectiveness of the treatment on reducing stress, I will need to know how your stress (anxiety) varies in intensity during class and examination periods.

How intense is your stress during these times?

To measure your stress, darken in appropriate stress level.



APPENDIX G

OPEN FOCUS INSTRUCTIONS

APPENDIX G

OPEN FOCUS INSTRUCTIONS

This is the date that you start on the Open Focus Training. It may take you some time to achieve the results indicated in the relaxation program (the amount of time varies with each person). DON'T BECOME DISCOURAGED. . . . Keep practicing each day at least once more often if you have the time.

Follow the directions on the tape and let the experience happen. Don't work at following the directions. Take a lazy attitude toward listening and just let the experience happen. Just let go.

This may seem to be a strange procedure to some of you for the reduction of stress. The idea is that when your mind is in Open Focus the mind and body are in an optimum condition to work together in a holistic fashion to reduce stress. Eventually, with practice, Open Focus can become a natural part of your life. The exercises on the tapes will help you to attain Open Focus.

Try to listen to the tapes in a quiet environment that is free of as many distractions as possible. Posture is also important. Sit or lie in a relaxed, comfortable position with legs outstretched and slightly parted, the feet falling loosely outwards, arms loose beside the body or in your lap. If seated, let your head fall in a relaxed position on your chest. Make sure you can breathe easily and freely. Make sure no part of your body distracts you.

One of the most important things about listening to the tapes is your attitude. Just let other things be unimportant and let your entire Being get into the exercises given on the tapes.

Remember that Open Focus can only be learned through practice. Practice but don't become impatient.

APPENDIX H

OPEN FOCUS EXERCISE

OPEN FOCUS EXERCISE

IS IT POSSIBLE FOR YOU TO IMAGINE --- or

CAN YOU IMAGINE ---

--- the space between your eyes

--- the space between your ears

--- the space inside your throat

--- that the space inside your throat expands to fill your whole neck as you inhale

--- the space between your shoulders

--- the space between your hips

--- the space between your thumb and first finger on each hand

--- the space between your first and middle finger on each hand

--- the space between your middle and fourth finger on each hand

--- the space between your fourth and little finger on each hand

--- the space between all your fingers simultaneously

--- that your thumbs are filled with space

--- that your first fingers are filled with space

--- that your middle fingers are filled with space

--- that your fourth fingers are filled with space

--- that your little fingers are filled with space

--- that your hands and fingers are filled with space

--- the region between the tips of your fingers and your wrists is filled with space

--- the region between your wrists and your elbows is filled with space

--- the region between your elbows and shoulders is filled with space

--- the region between your shoulders is filled with space

--- that the space inside your throat is coextensive with the space between your shoulders and in your shoulders and arms, hands, and fingers

--- that the regions inside your shoulders, and the regions between your shoulders, and fingertips are simultaneously filled with space

--- the space between your toes

--- that your toes are filled with space

--- that your feet and toes are filled with space

--- the region between your arches and your ankles is filled with space

--- the region between your ankles and your knees is filled with space

--- the region between your knees and your hips is filled with space

--- that the region between your hips is filled with space

--- your lower abdomen is filled with space

--- your lower back is filled with space

--- your body from the diaphragm down to your feet and toes is filled with space

--- the region between your navel and your backbone is filled with space

--- your stomach is filled with space

--- the region inside your rib cage is filled with space

--- that the region between your ribs is filled with space

--- that the region between your shoulder blades is filled with space

--- that the region between your shoulder blades and your ribs is filled with space

--- the region between your breast bone and your back bone is filled with space

--- the region between your shoulders and your ribs is filled with space

--- your neck is filled with space

--- the region between your shoulder blades and your chin is filled with space

--- the space inside your lungs as you inhale and exhale

--- the space inside your bronchial tubes as you inhale and exhale

--- your whole body, from the chin down, to your feet and toes is filled with space

--- the space inside your throat as you inhale and exhale

--- the space inside your nose as you inhale and exhale

--- the space between the tip of your chin and inside of your throat

--- the distance between the space inside your throat and the space inside your ears

--- the distance between the space inside your throat and the top of your head

--- the distance between the space inside your throat and the space behind your eyes

--- that your jaw is filled with space

--- the space between the tip of your chin and your lower lip

--- that your cheeks and mouth are filled with space

--- that your tongue is filled with space

--- that your teeth and gums are filled with space

--- that your lips are filled with space

--- that space between your upper lip and the base of your nose

--- that the region around your eyes and behind your eyes is filled with space

--- that your eyes are filled with space

--- that your eyelids are filled with space

--- that your nose and sinuses are filled with space

--- the bridge of your nose is filled with space

--- that the region between your eyes and the back of your neck is filled with space

--- the region between the bridge of your nose and the back of your head is filled with space

--- the region between your temples is filled with space

--- that your forehead is filled with space

--- that your brain is filled with space

--- that your spine is filled with space

--- that your whole head is simultaneously filled with space

--- that your whole head and your face are simultaneously filled with space

--- that your whole head, face, and neck are simultaneously filled with space

--- that your whole head, face and neck and your whole body including your hands and feet are simultaneously filled with space

--- that your whole being fills with air when you inhale and your whole being is left filled with space when you exhale

--- At the same time that you are imagining the space inside your whole body, is it possible for you to imagine the space around your body: the space between your fingers and toes, behind your neck and back, the space above your head and beneath your chair, the space in front of you and to your sides

--- that the boundaries between the space inside and the space outside are dissolving and that the space inside and the space outside become one continuous and unified space

--- that this unified space, which is coextensive inside and outside, proceeds in three dimensions, front to back, right to left, and up and down

--- that at the same time you imagine this unified space that you can simultaneously let yourself attend equally to all the sounds that are available to you, the sound of my voice, the sounds issuing from you, and any other sounds that you may be able to hear

--- that these sounds are issuing from and pervaded by unified space

--- that at the same time you are attending the space and the sounds that you can also attend simultaneously to any emotions, tensions, feeling or pains that might also be present

--- that these sensations and perceptions are permeated by space

--- that at the same time that you are aware of the space, the sounds, emotions and other body feelings that you can also be simultaneously aware of any tastes, smells, thoughts and imagery that might be present

--- that all your experience is permeated and pervaded by space

--- that as you continue to practice the Open Focus exercise that you will increase your ability to enter into Open Focus more quickly and more completely and more effortlessly

--- that as you continue to practice this Open Focus exercise your imagery of space will become more vivid and more pervasive

--- that as you continue to practice this Open Focus exercise your ability to imagine space permeating all of your experience will continue to become more vivid and ever-present

--- that as you continue to practice this Open Focus meditation exercise you will relax your mind and body and increase alpha brain waves

--- that as you increase your alpha brain waves your ability to read and take tests will improve

APPENDIX I

HOME PRACTICE LOGS

Record of Home Practice Sessions

Name_____ Week_____

Please bring with you one week from today. This is very important information for the research project. Please remember to practice each day. Practice at least once a day.

Rate 0 - 10 with 10 as high

	# of practices each day	Tension level before practice	Tension level after practice	For each day report any signs of ill health such as headache, cold, etc.
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

Please elaborate here on any special feelings you had before, during, or after practice:

Please elaborate here on any signs of ill health such (for example: morning headache over entire head that lasted for an hour, menstral period began and had cramps all day, stomachache one hour after supper that lasted three hours etc

APPENDIX J

LIFE HISTORY QUESTIONNAIRE

LIFE HISTORY QUESTIONNAIRE*

Purpose of this questionnaire:

The purpose of this questionnaire is to obtain a comprehensive picture of your background. In scientific work, records are necessary, since they permit a more thorough dealing with one's problems. By completing these questions as fully and as accurately as you can, you will facilitate your therapeutic program. You are requested to answer these routine questions in your own time instead of using up your actual consulting time.

It is understandable that you might be concerned about what happens to the information about you because much or all of this information is highly personal. Case records are strictly confidential. No outsider is permitted to see your case record without your written permission.

If you do not desire to answer any questions, merely write "Do not care to answer."

PLEASE WRITE IN INK ONLY.

Date_____

1. General

Name: _____

Address: _____

Telephone numbers: (home) _____ (work) _____

Age: _____ Occupation: _____

By whom were you referred? _____

With whom are you now living? (list people) _____

_____

Do you live in a house, hotel, room, apartment, etc.? _____

Marital status (circle answer): single; engaged; married; remarried;

separated; divorced; widowed; living with intimate partner

If married, husband's (or wife's) name, age, occupation? _____

_____

*Adapted from Arnold Lazarus, Ph.D.,

Religion and Activity:

a) In childhood _____

_____

b) As an adult _____

_____

2. Clinical

a) State in your own words the nature of your main problems and their duration:

b) Give a brief account of the history and development of your complaints (from onset to present):

c) On the scale below please estimate the severity of your problem(s):

mildly upsetting _____

moderately severe _____

very severe _____

extremely severe _____

totally incapacitating _____

d) Whom have you previously consulted about your present problem(s)?

_____

_____

e) Name(s) of physician(s) and phone number(s)

_____

_____

_____

f) When did you last see a physician? Date _____

Reason _____

g) Are you taking any medication? If "yes," what, how much, and with what results?

What? _____

How much? _____

For what? _____

What results? _____

3. Personal Data

a) Date of birth: _____ Place of birth: _____

Time of birth: _____

b) Mother's condition during pregnancy (as far as you know):

c) Check any of the following that applied during your childhood:

___Night terrors	___Bedwetting	___Sleepwalking
___Thumb sucking	___Nail biting	___Stammering
___Fears	___Happy childhood	___Unhappy childhood
___Any others:		

d) Health during childhood?

List illnesses:

e) Health during adolescence?

List illnesses:

f) What is your height? _____ Your weight? _____

g) Any surgical operations? (Please list them and give age at the time

h) Any accidents?

i) List your five main fears:

1.

2.

3.

4.

5.

j) Check any of the following that apply to you:

___headaches	___dizziness	___fainting spells
___palpitations	___stomach trouble	___anxiety
___bowel disturbances	___fatigue	___no appetite
___anger	___take sedatives	___insomnia
___nightmares	___feel panicky	___alcoholism
___feel tense	___conflict	___tremors
___depressed	___suicidal ideas	___take drugs
___unable to relax	___sexual problems	___allergies
___don't like week-ends and vacations	___overambitious	___shy with people
	___inferiority feelings	___can't make decisions
___can't make friends	___memory problems	___home conditions bad
___can't keep a job	___lonely	
___financial problems	___often use aspirin or painkillers	___unable to have a good time
___excessive sweating		
___concentration difficulties	___hypoglycemia (low sugar)	

Others: Please list additional problems or difficulties here.

k) Underline any of the following words which apply to you.

Worthless, useless, a "nobody," "life is empty"

Inadequate, stupid, incompetent, naive, "can't do anything right"

Guilty, evil, morally wrong, horrible thoughts, hostile, full of hate

Anxious, agitated, cowardly, unassertive, panicky, aggressive

Ugly, deformed, unattractive, repulsive

Depressed, lonely, unloved, misunderstood, bored, restless

Confused, unconfident, in conflict, full of regrets

Worthwhile, sympathetic, intelligent, attractive, confident

considerate

Others:

l) Present interests, hobbies, and activities:

m) How is most of your free time occupied?

n) What is the last grade of school that you completed?

o) Scholastic abilities; strengths and weaknesses:

p) Were you ever bullied or severely teased?

q) Do you made friends easily?

Do you keep them?

4. Occupational Data

a) What sort of work are you doing now?

b) Kinds of jobs held in the past?

c) Does your present work satisfy you? (If not, in what ways are you dissatisfied?)

d) What do you earn?

How much does it cost you to live?

e) Ambitions

Past:

Present:

5. Sex Information

a) Parental attitudes toward sex (e.g., was there sex instruction or discussion in the home?)

b)

c)

d)

e)

f)

g)

h)

i)

6. Men

Age

Were

Are

Do y

Do y

7. Marr

How

b) When and how did you derive your first knowledge of sex?

c) When did you first become aware of your own sexual impulses?

d) Were you ever sexually molested as a child?

e) Did you ever experience any anxieties or guilt feelings arising out of sex or masturbation? If "yes" please explain:

f) Any relevant details regarding your first or subsequent sexual experience:

g) Is your present sex life satisfactory? (If not, please explain.)

h) Provide information about any significant heterosexual (and/or homosexual) reactions:

i) Are you sexually inhibited in any way?

6. Menstrual History

Age at first period?

Were you informed or did it come as a shock?

Are you regular? Duration:

Do you have pain? Date of last period:

Do your periods affect your moods?

7. Marital History

How long did you know your marriage partner before engagement?

How long have you been married?

Husband's/Wife's age

Occupation of husband or wife:

a) Personality of husband or wife (in your own words):

b) In what areas is there compatibility?

c) In what areas is there incompatibility?

d) How do you get along with your in-laws? (This includes brothers and sisters-in-law)

How many children have you?

Please list their sex and age(s):

e) Do any of your children present special problems?

f) Any relevant details regarding miscarriages or abortions?

g) Comments about any previous marriage(s) and brief details.

h) Give sex and ages of children by your previous marriage.

i) Give sex and ages of your partner's children by previous marriage:

8. Family Data

a) Father:

Living or deceased?

If deceased, your age at the time of his death?

Cause of death?

If alive, father's present age?

Occupation:

Health:

b) Mother:

Living or deceased?

If deceased, your age at the time of her death?

Cause of death?

If alive, mother's present age?

Occupation:

Health:

c) Siblings:

Number of brothers:

Brothers' ages:

Number of sisters:

Sisters' ages:

d) Give a description of your father's personality and his attitude toward you (past and present):

e) Give a description of your mother's personality and her attitude toward you (past and present):

f) In what ways were you punished as a child?
by your father?

by your mother?

g) Give an impression of your home atmosphere (i.e., the home in which you grew up. Mention state of compatibility between parents and between parents and children).

h) Were you able to confide in one or both your parents?

i) Did one or both your parents understand you?

j) Basically, did you feel loved and respected by your parents?

k) If you have a step-parent, give your age when parent remarried:

l) If you were not brought up by your parents, who did bring you up, and between what years?

m) Has anyone (parents, relatives, friends) ever interfered in your marriage, occupation, etc.?

n) Who are the most important people in your life?

o) Does any member of your family suffer from alcoholism, epilepsy, or anything which can be considered a "mental disorder"?

p) Have you ever lost control (e.g., temper or crying or aggression by hitting)? If so, please describe.

9. Self-Description (Please complete the following)

a. I am a person who

b. All my life

c. Eversince I was a child

d. One of the things I feel proud of is

e. It's hard for me to admit

f. One of the things I can't forgive is

g. One of the things I feel guilty about is

h. If I didn't have to worry about my image

i. One of the ways people hurt me is

j. Mother was always

k. What I wanted from mother and didn't get was

l. Father was always

m. What I wanted from my father and didn't get was

n. My mother wanted me to be more

o. My father wanted me to be more

p. If I weren't afraid to be myself, I might

q. One of the things I'm angry about is

r. What I want and have never received from a woman/man is

s. The bad thing about growing up is

t. One of the ways I could help myself but don't is

10.

b) **What is there about your present <u>behavior</u> that you would like to change?**

c) **What <u>feelings</u> do you wish to alter (e.g., increase or decrease)?**

APPENDIX K

SPECIFICATIONS OF EMG

APPENDIX K

SPECIFICATIONS OF EMG

Technical Specifications of the J & J
EMG Model M-55

Amplifer
Differential type, fully protected

Input noise: 0.2 uV RMS maximum
Common mode rejection greater than 100 db
60 H_2 notch filter, 40 db notch depth
60 H_2 normal mode rejection, 60 dg
Four bandpasses
Ten ranges: 1-1000 uV full scale
Input impedance: 10 megohms

Feedback

Meter: direct reading, uV RMS calibration better than 3%
Outputs: raw EMG, selected band EMG, rectified EMG, audio, meter signal

Controls

Range: 1, 2, 5, 10, 20, 50, 100, 200
500, 1000 uV full scale
Threshold: 0 to full meter scale

Inputs

Electrode test, electrode operate
Electrodes: (3) silver/silver chloride fully shielded, screw-on type

Power

Clinical: (4) size "D" flashlight cells

APPENDIX L

SPECIFICATIONS OF SCORE KEEPER

APPENDIX L

SPECIFICATIONS OF SCORE KEEPER

Technical Specifications of the J & J
LGS-150 Digital Integrating
Score-Keeper

Display

3 1/2 digit LED display, 0.5% accuracy

Count indicator: lights when integrating

Controls

Time Bse: .25s, 25, 4s, 8s, 15, 30s, 1m, 2m, 4m, 8m, 16m, 32m

Range and function: Temperature, threshold, microvolts: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000.

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REFERENCES

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