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TESTING THE EFFECTIVENESS OF A SELF-INSTRUCTIONAL RELAXATION TRAINING PROGRAM

by

Larry Dumka

B.A., University of Manitoba, 1972

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

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TESTING THE EFFECTIVENESS OF A SELF-INSTRUCTIONAL RELAXATION TRAINING PROGRAM

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ABSTRACT

One of the main reasons people may experience inappropriate anxiety reactions is that they have not acquired appropriate strategies for managing environmental stressors. Relaxation training has been found effective in alleviating the frequency, intensity, and duration of inappropriate anxiety reactions. Self-instruction represents a way of administering relaxation training which could increase treatment access and trainee self-control. Accordingly, this study investigated the effectiveness of a self-instructional relaxation training program.

Forty-seven subjects were assigned to either a treatment group, using a self-instructional relaxation training program, or a delayed treatment control group. One-third of the sample were non-students. Dependent measures included self-report measures [Spielberger's State-Trait Anxiety Inventory (STAI) and Cattell's Institute for Personality and Ability Testing-Anxiety Scale (IPAT)] and a psychophysiological stress profile (measuring frontal electromyographic levels (EMG), peripheral skin temperature, and heart rate, under stressor and baseline conditions). For the duration of the five week treatment period subjects also monitored physiological indicators of relaxation (heart rate, respiration rate, and finger temperature) before and after their daily at-home practice sessions.

Analyses of variance for repeated measures were conducted on data from 32 subjects (14 treatment and 18 control; 8 males and 24 females, mean age 30.0 years). Self-report data did not support treatment efficacy. Of the physiological data, EMG data provided support for treatment efficacy. Self-monitoring of physiological indicators of relaxation was shown to be potentially very accurate. Of the self-monitored data, finger temperature data supported treatment efficacy.

Results of the study are discussed in terms of theoretical and practical applications. Suggestions for further research are presented.

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CHAPTER I

THE PROBLEM AND SETTING

Evidence suggests that the incidence of anxiety and other stress related disorders in our society is increasing (Abbondanza, Allen, Hermonmeyer, Hiebert, Pappaport, & Shellonberger, 1978; Behnke & Carlile, 1971; Bowersock, 1974; Lamott, 1975). The result is that more people seem to be dealing less effectively with the stress they encounter. Most of the published data suggests that the main reason most adults experience inappropriate anxiety reactions is that they have not acquired appropriate strategies for managing environmental stressors (Abbondanza et al., 1978; Malmo, 1975; Meichenbaum & Turk, 1976).

A strategy which appears to have wide ranging potential for managing environmental stressors is relaxation training. The goal of relaxation training is to teach people ways of eliciting a relaxation response, that is, a response opposite to their habitual anxiety response. When people relax, their physiological processes tend to function in the opposite direction from when they are feeling anxious (Budzynski, 1973; Malmo, 1975). Relaxation has been found to alleviate the frequency, intensity, and/or duration of a variety of inappropriate anxiety reactions (see reviews by Barrios & Shigetomi, 1979; and King, 1980).

Insofar as relaxation training has been demonstrated to be

effective in alleviating anxiety reactions, a logical question is: "Why haven't more people developed skill at relaxing?" Apart from lack of awareness of this strategy, the issue of treatment access may be a major contributing factor (Lamott, 1975).

Typically, relaxation training requires repeated contact with a counsellor, usually at considerable cost and inconvenience. This requirement may limit access to relaxation training. Competent and credible relaxation counsellors are a relatively scarce resource. In addition, many people are reluctant to seek counsellor intervention because of the presumed stigma. These are factors which may be preventing many people from receiving relaxation training.

An alternative approach, which could circumvent some of the factors preventing people from seeking treatments, would be to use a self-instructional framework to teach relaxation skills. A self-instructional relaxation training program could increase the availability of relaxation training by (a) reducing demand on counsellor time, (b) coincidently reducing the cost and inconvenience of repeated counsellor contact and (c) avoiding much of the stigma that might be attached to consulting a counsellor. The plethora of self-help manuals on the market is an indication that many people who might be reluctant to seek counselling are more willing to obtain and use self-instruction procedures to cope with anxiety related problems.

Self-instruction may have the potential benefit of increasing people's sense of self-control over their relaxation response. For

example, Thomas (1980) found that individuals who were responsible for the management of their learning activities were more likely to see themselves (rather than outside factors) as determining the success of their learning endeavours. This perception of self as the determiner of success or failure may be the single most important variable in maintaining motivation (Maehr, 1976). A self-instructed relaxation training program may combine the benefits of increased self-control, with the increased motivation necessary to sustain the practice of a new skill until it becomes a natural part of a person's skill repertoire.

The Present Study

This research project was designed in response to the issues presented above, that is, in response to: the need to develop more effective training methods for acquiring the relaxation response, the potential benefit of greater access to relaxation training, and the desirability of increased self-control.

The central purpose of this study is to test the efficacy of a self-instructional anxiety reduction procedure. This procedure will be termed the "self-instructional relaxation training program" and is described in a manual entitled Self-Relaxation: Learn It, Use It (Hiebert, 1980).

This study was also designed to rectify two pervasive weaknesses of much research into relaxation. The first weakness is the general lack of physiological data to verify that subjects have actually

learned to relax. Hodges (1976) reports that only 7% of experimental investigations into anxiety used physiological variables as dependent measures. This investigation includes data on physiological reactivity under stressor and baseline conditions. The particular procedure employed to collect the physiological data will be referred to as the "psychophysiological stress profile" or "PSP". The second weakness is the lack (especially in studies of self-instructed treatments) of procedures to monitor the degree to which participants followed the treatment as prescribed (Glasgow & Rosen, 1978). In this study a participant monitoring procedure was used to assess program adherence. Detailed descriptions of the participant monitoring procedures, the PSP, and the self-instructional relaxation training program are presented in Chapter III of this thesis.

This being the first experimental study on the self-instructional relaxation training program, the central purpose was to determine whether a self-instructional format could be used to teach people the relaxation response. That is, the aim was to discover whether the program, when used as instructed, resulted in a significant improvement in participants' ability to reduce their anxiety level. In other words, the central purpose was to determine what effect the treatment had compared to no treatment. Accordingly, no attempt was made to compare the efficacy of the self-instructional relaxation training program with other anxiety reduction procedures or a high expectancy placebo condition.

CHAPTER II

THEORETICAL RATIONALE AND REVIEW OF RELATED LITERATURE

The Construct of Anxiety

> I have constantly tried to single out one end in human actions which all men unanimously hold as good, and which they all seek. I have found only this: the aim of escaping anxiety....Not only have I discussed that all humanity considers this good and desirable, but also that no one is moved to act or speak a single word who does not hope by means of this action or word to release anxiety from his spirit.
>
> Ala Ibu Hazm (Kritzeck, 1956, p. 573)

In A Philosophy of Character and Conduct, written in the eleventh century, Ala Ibu Hazm asserts that anxiety is a universal human experience. It seems that the concepts of anxiety and fear have caught the attention of writers spanning the breadth of recorded history. Cohen (1969) claims that the concept of fear is clearly evident in ancient Egyptian hieroglyphics. In the nineteenth century biologists began to pay more attention to fear and anxiety. Darwin regarded fear as a fundamental adaptive response evolved over countless generations. More recently, May (1950) in his book The Meaning of Anxiety, surveyed the field of literature, music, art, religion, as well as psychology, and found evidence supporting the great if not central significance of the problem of anxiety.

In most theories of psychopathology theorists recognize the

importance of anxiety and fear. Freud (1959), for example, came to view anxiety as the central problem in all neurotic symptom formation. In most models of counselling, counsellors concede that anxiety must be dealt with if treatment is to be successful (Reinking & Kohl, 1975). However, current theoretical perspectives on anxiety and the treatment of anxiety are varied and often discrepant. Lader (1975, p. 6) points out: "Anxiety has variously been described as a mood, a feeling, an emotional response, a symptom, or an illness....". Epstein (1972) likens the present situation to the confusion encountered by the proverbial wise but blind men of Indostan who developed dramatically different conceptions of an elephant because each had touched only certain parts of its exterior anatomy. Since investigators have ascribed diverse meanings to the term anxiety it is sometimes difficult to determine whether anxiety as studied by one author has any relation to what is being studied by another author.

As the purpose of this study is to test the efficacy of a treatment to reduce anxiety, the importance of a clear definition of anxiety is evident.

In reviewing others' attempts to define anxiety (Fischer, 1970; Levitt, 1980; Spielberger, 1975), it is apparent that the task is not easy. No one view appears adequate. Accordingly, the conceptualization of anxiety underlying this study has been derived from several theoretical perspectives. What follows is a brief summary of the contributing features of these perspectives.

Behavioral Components of Anxiety

Behaviorally oriented investigators generally view anxiety as a set of learned responses which occur under certain stimulus conditions.

Earlier theorists such as Hull (1943) and Dollard and Miller (1950) asserted that anxiety was a learned or secondary drive based on the primary drive to avoid pain. Here the concept of drive is that of a force which motivates the organism to behave in a way aimed at reducing the intensity of the drive. Hunger, elimination, and sex are examples of drives. Dollard and Miller (1950) began by postulating the existence of a primary drive to avoid pain. The organism first learns to fear and avoid stimuli that evoke pain at a particular moment. Then, according to Dollard and Miller, this specific fear can become extended or generalized in two ways. The organism might learn to fear not only the specific stimulus but also aspects of the environment associated with the specific stimulus. Another way the fear response might become extended is through stimulus generalization. In stimulus generalization the organism learns to fear objects descriptively similar to the initial specific stimulus. Dollard and Miller's approach suggests that the pervasiveness of anxiety is largely the result of the generalization of specific fear responses.

More recently, behaviorally oriented anxiety theorists have explained the acquisition of the anxiety response from both classical (Pavlovian) and instrumental conditioning perspectives.

Classical conditioning theorists focus on the stimulus properties in the acquisition process. For example, Eysenck (1975) states that anxiety is a classically conditioned fear response that results when neutral stimuli are associated with pain (pain reduction being a primary drive). Wolpe (1958, 1969, 1973) agrees that anxiety is often classically conditioned to environmental stimuli. However, Wolpe emphasizes the behavioral aspects of the anxiety response rather than the drive reduction aspects per se. According to Wolpe (1958), as drive states arise the organism is motivated to act. If the behavior is adaptive the drive state is dissipated. If the behavior is unadaptive the drive state is maintained, the excitement is sustained, and the state is labelled anxiety. Wolpe goes on to say that the resulting sustained level of excitement can become classically conditioned to environmental stimuli. Furthermore, Wolpe (1973) believes that anxiety is usually proprioceptively precipitated by a perceived increase in muscle tension, the muscle tensing also being a result of previous conditioning.

Operant theorists focus not on the stimulus properties in anxiety acquisition but on the avoidance behavior and the consequences of the avoidance behavior. Kimmel (1975), for example, links anxiety to instrumental contingencies aimed at preventing the aversive state. In this view, perceived increases in anxiety often lead to some sort of avoidance behavior. The resulting partial reduction in anxiety reinforces the avoidance behavior. At the same time, however, the

aversive nature of the stimulus is also reinforced. Consequently, the anxiety response is often difficult to extinguish because the person is rarely in a position to experience nonaversive consequences of the anxiety producing situation. From the operant conditioning perspective the stimuli preceding the anxiety response are viewed not as conditioned stimuli but as discriminative stimuli which signal the occurrence of future reinforcement.

Attempts have been made to distinguish between the two constructs anxiety and fear. Kimmel (1975) asserts that it is the duration and persistence of the response which differentiate anxiety from fear. He points out that laboratory conditioned fear responses usually last a short time compared to the unpleasant state of anxiety. Epstein (1972) differentiates fear and anxiety on the basis of response availability. Anxiety is the label given to the condition where the person's response tendencies cannot be expressed either because the threat (stimulus) is unknown or vague, or because an adaptive response (e.g., assertive behavior, avoidance) is not available.

It is easy to see from the foregoing discussion how theoretical discrepancies could arise from inconsistent use of the term anxiety. There is some common ground in the behavioral perspective however. It is generally recognized that anxiety is accompanied by an increase in what has been variously termed drive level, excitement, or tension. These conditions might be included under the more general term "physiological arousal." It is generally recognized that this

increase in arousal level becomes conditioned to environmental stimuli. It is also generally agreed that there is often an important maladaptive behavioral component in the anxiety reaction (e.g., avoidance behavior or performance deficits).

Cognitive Components of Anxiety

Cognitively oriented psychologists tend to recognize the learned behavioral aspects of the anxiety response, but assert that there is an intervening process between the environmental stimulus and the behavioral response. From the cognitive viewpoint (Schachter, 1966; Valins, 1970), behavior is based on perceptions of and cognitions about environmental events, not just the occurrence of these events.

Various evidence is cited to support the view that cognition plays an important intervening role in the anxiety response. For example, many phobic reactions cannot be accounted for by simple Pavlovian conditioning (that is, by contiguous association of physical events). In case histories of many phobics no traumatic precipitating incident can be identified (Marks, 1969). It is also unlikely that the high incidence of snake phobia (Agras, Sylvester, & Oliveau, 1969) is due to traumatic contact with snakes. Accordingly, recent modifications of Pavlovian conditioning theory (e.g., Reiss, 1979; Rizley & Repucci, 1974; Wagner & Rescorla, 1972) have emphasized cognitive information processing and expectancy variables in the acquisition of emotional responses (e.g., anxiety) rather than contiguous association. Also, in the extensive research on modeling and observa-

tional learning (see Rosenthal & Bandura, 1978) investigators have provided evidence for the important role of cognitive processes in the anxiety response. It has been demonstrated, for example, that subjects can acquire anxiety responses when both the unconditioned stimulus and the conditioned stimulus are symbolic (e.g., films of anxiety arousing situations; see Bandura & Barab, 1973).

Although there is growing agreement that cognitive factors play a critical role in anxiety reactions (see review by Spielberger, 1972), there are differing views on how cognitive mediating processes function in relation to autonomic arousal and behavioral responses. What follows is a brief summary of cognitively oriented positions which have contributed to the concept of anxiety underlying this study.

The position of Schachter (1966) and Valins (1970) is that subjectively perceived physiological changes (e.g., increased muscle tension) function as cues which are cognitively processed as emotions (e.g., fear). In this view, if a person is physiologically aroused and unable to identify an eliciting situation, the subject will label the state according to his or her available repertoire of cognitions (Schachter, 1966). It is possible therefore, depending on the person's preception of environmental stimuli, that the same state of physiological arousal could be labelled joy, anger, fear, or whatever.

Ellis' (1962, 1973) position differs from that of Schachter and Valins in that Ellis sees cognitive variables as being more instru-

mental in producing emotional responses. According to Ellis, a person's emotional or behavioral response is a reaction to the person's cognitive appraisal of environmental stimuli, rather than a direct response to the stimuli per se. It is possible, therefore, that substantial discrepancy can exist between a person's subjective cognitive appraisal of a situation as dangerous and the degree of objective danger presented by that same situation. Ellis (1962) asserts that it is inaccurate subjective cognitive appraisals or what he terms irrational beliefs which are primarily responsible for negative emotional states (e.g., anxiety).

The subjective appraisal of a situation as dangerous, whether it in fact is or not, is what Spielberger (1972) terms "threat". This will be the meaning of the term threat when it is used in this thesis.

Meichenbaum (1972, 1975) proposes a conceptualization of anxiety which seems to incorporate aspects of both Schachter's and Ellis' positions. Meichenbaum identifies two principal components of anxiety: emotionality and worry. Emotionality refers to heightened autonomic arousal. Worry is characterized by self-denigrating thoughts and undue concern over performance. According to Meichenbaum, a perceived rise in arousal which is labelled anxiety is often followed by feelings of inadequacy and negative self statements. These negative feelings and self statements, in turn, increase the anxiety response. In this way a feedback loop is established in which physiological arousal and cognition function to amplify the anxiety

response.

Related to Meichenbaum's "worry" component are the variables of predictability and controllability. Bootzin and Max (1980) argue that predictability and controllability of aversive stimuli are cognitive variables which may play an important role in the anxiety response. These authors cite animal studies (Weiss, 1977) which have found that unpredictable and uncontrollable aversive situations result in more severe anxiety reactions than predictable and controllable events. Just as perceived danger (i.e., threat) may be more instrumental in determining anxiety reactions than actual danger, so perceived control may be more instrumental in mitigating the anxiety response than actual control (Rachman, 1978). For example, a person who encounters a difficult situation and thinks: "This is too much; I can't handle it", may likely experience a more severe anxiety reaction that someone who responds by thinking "Well, this may be tough, but I know I can manage it."

In the cognitive positions discussed thus far there is general agreement that cognitive misappraisal is often basic to the anxiety response. This misappraisal could include incorrect perceptions of environmental stimuli, inappropriate labelling of physiological arousal states, maintaining irrational beliefs, and/or having distorted views of personal coping ability. Increasingly, however, anxiety theorists are differentiating between two kinds of appraisal errors which may function in the anxiety response.

Lately, Lazurus and Lorimer (1978) and Coyne and Lazurus (1980) have made a distinction between primary and secondary appraisal. Primary appraisal refers to the cognitive process of evaluating a person's wellbeing regarding an aversive situation. It answers the question: "Am I okay or in trouble?" (Coyne & Lazurus, 1980, p. 151). Secondary appraisal refers to the evaluation of a person's coping strategies, their cost and probabilitity of success. It answers the question: "What can I do about it?" (Coyne & Lazurus, 1980, p. 151). Lazurus (1974) points out that the anxiety response is often anticipatory, that is, it occurs before the aversive event. Anticipatory anxiety can be the result of both primary appraisal, where a person misappraises the consequences of future events and/or secondary appraisal where a person believes that his or her coping resources will taxed or exceeded.

Related to the notions of controllability (Bootzin & Max, 1980) and secondary appraisal (Lazurus & Lorimer, 1978) is Bandura's (1977a) self-efficacy theory. Self-efficacy theory concentrates on the role of efficacy expectations in determining avoidance behavior. According to Bandura, an efficacy expectation is a belief that one can successfully execute the behavior required to produce a desired outcome. Efficacy expectations are derived from four main sources: previous performance feedback, vicarious experience, verbal persuasion, and autonomic arousal. Efficacy expectations determine whether coping strategies will be initiated, how much effort will be expended, how

long coping strategies will be maintained, and how long the aversive situation will be tolerated (Bandura, 1977a). A person who has low or negative efficacy expectations regarding a future event will have an increased likelihood of experiencing heightened autonomic arousal and greater subjective feelings of anxiety when faced with potentially threatening situations. These responses in turn will influence the person's coping, defensive, and avoidance behavior. It would also seem that a person experiencing autonomic arousal in a situation might have decreased efficacy expectations regarding performance in that situation. That is, efficacy expectations and autonomic arousal may function in a mutually accentuating manner.

In examining current cognitive perspectives on anxiety some common points become evident. The positions of Lazurus and Lorimer (1978), Meichenbaum (1972, 1975) and Bandura (1977a) all tend to view simple drive reduction and stimulus/response (what Bandura calls peripherally mediated) paradigms of anxiety reduction as limited. These investigators regard anxiety responses as primarily cognitively (or what Bandura calls centrally) mediated. These positions emphasize what Coyne and Lazurus (1980) term a "transactional" process-oriented approach to analyzing the anxiety response. Integral to this approach is not only how people appraise their ongoing transactions with the environment, but how their coping selects and influences the environment. In all positions outlined above a perceived state of heightened arousal accompanies anxiety. Anxiety results when per-

ception of environmental events and the heightened state of arousal becomes distorted. The anxiety response is usually accentuated by assessments of personal inadequacy and gives rise to maladaptive behavior. Recognition of individual differences tends to figure prominently in the above positions. Although there is much lively discussion on the relationships governing cognitions, emotions, and behavior (e.g., see Bandura, 1977a; Wolpe, 1978), Spielberger (1972) and Dember (1974) assert that there is growing agreement that cognitive factors play a critical role in the arousal and maintenance of emotional states.

Physiological Components of Anxiety

A point common to the discussion of behavioral and cognitive components of anxiety is that the experience of anxiety and physiological arousal are strongly linked (Budzynski, 1973; Germana, 1974). Anxious people have been observed to respond with exaggerated degrees of physiological arousal which are sustained over long periods of time (Budzynski & Peffer, 1980; Malmo, 1970).

Present notions of arousal are varied and somtimes contentious. Arousal here is meant to refer to increases in certain kinds of physiological activity, that is, increased activity of the sympathetic nervous system and in the skeletal muscles. In sympathetic physiological arousal the tendencies are towards increased muscle tension levels, skin conductance, blood pressure, heart rate, respiration rate, pupilary dilation, and peripheral vasoconstriction (Budzynski,

1973; Germana, 1974). Budzynski (1973) also points out that changes in these physiological correlates of anxiety occur more or less automatically, often outside the individual's awareness.

Various theories have been advanced regarding the nature of the relationship between the emotion of anxiety and the accompanying physiological arousal. One aspect of this question is whether emotions can be differentiated on the basis of physiological reactivity. Although there is some tentative evidence that hormonal reaction patterns in aroused states like anxiety and anger may be somewhat different (see review by Martin, 1961), there seems to be more support (see Levitt, 1980) for what has been termed the general arousal theory of emotional activation (Duffy, 1941; Malmo, 1959). In general arousal theory, emotional arousal is physiologically nonspecific or merely general arousal. In this view, the subjective experience of a specific emotion is determined by cognitive labelling. The nature of the labels is largely a function of social learning. The general arousal position is supported by observations of various investigators (e.g., Bootzin & Max, 1980; Gray, 1971; Levitt, 1980) who have found that when physiological correlates alone are considered, no distinction can be made between fear, anxiety, and arousal. Wolpe's (1958) view of the relationship between anxiety and physiological arousal is more extreme than general arousal theory. Wolpe states that anxiety and arousal are the same thing; that muscle tension does not merely accompany anxiety, but that the muscle tension

is the anxiety.

One of the more commonly acknowledged physiological responses in anxiety is increased muscle tension. Malmo (1975) states that over-activation of skeletal musculature is clearly involved in chronic anxiety. Buck (1976) points out that tensing of muscles in areas not directly involved with the task at hand increases with anxiety. Smith (1973) notes that measures of frontal electromyographic (EMG) levels (i.e., measures of muscle tensing as detected by sensors placed on the forehead) correlate highly with scores on Cattell's (1957) IPAT Self-Analysis Form, a subjective anxiety measure.

Available evidence linking sympathetic arousal, and particularly increased muscle tension, to the anxiety response suggests possible treatment alternatives for anxiety reduction. Recalling previous discussion, it seems that the experience of anxiety and the perception of physiological arousal may often function to accentuate each other. Wolpe (1973) has stated that anxiety is usually proprioceptively precipitated by a perceived increase in muscle tension. Meichenbaum has suggested that a perceived rise in arousal which is labelled anxiety is often followed by feelings of inadequacy and negative self-statements which, in turn, increases the anxiety response. To the degree that the experience of anxiety and perception of physiological activity function in a mutually accentuating manner, some means of inhibiting or controlling physiological arousal would seem to be indicated as a potential treatment for anxiety. This inhibiting of

physiological reactivity has been referred to as the intentional cultivation of a low arousal response (Budzynski, 1973; Stoyva & Budzynski, 1975). Considering the evidence linking increased muscle tension to the anxiety response, the use of muscle relaxation is a logical choice as a means of cultivating low arousal and inhibiting the anxiety response.

In this discussion of the physiological components of anxiety, the term arousal was defined and some of the more commonly investigated correlates of arousal were identified. The relationship between arousal and emotion was addressed. Particular emphasis was placed on the role of muscle tension and relaxation in the anxiety response.

Synthesis

The purpose of presenting the various perspectives above has been to outline those positions which have contributed to the conceptualization of anxiety underlying this study. Rather than emphasize differences, the object here will be to identify commonalities. Each perspective has a unique contribution however, and some aspects of these positions are incompatible.

Virtually all positions agree that anxiety is accompanied by physiological arousal. However most theorists would also say that anxiety is more than just physiological arousal. Anxiety is generally experienced as unpleasant and anxiety reduction is generally held to be rewarding. Increases in physiological arousal are followed by

overt and/or covert behavioral responses. The overt anxiety responses are usually maladaptive or inappropriate avoidance patterns. Covert anxiety responses may include inaccurate cognitive appraisal and labelling tendencies, negative self-efficacy expectations, and negative self-statements, which often function to amplify the anxiety response. There is substantial agreement that anxiety often becomes associated with specific environmental events so that certain situations come to elicit an anxiety reaction predictably. Finally, most positions acknowledge variation in response patterns across individuals.

After identifying commonalities among various positions, the task of defining anxiety still remains difficult. Confusion arises from various positions' differential concentration on antecedent environmental conditions, intervening states and traits, and the process of anxiety response. In addition, there is the recent popularization of the term stress which appears to have considerable overlap with the term anxiety. These issues will be addressed before an integrated definition is attempted.

Anxiety state, trait, and process. In an attempt to clarify the situation, Spielberger (1972) has formulated a State-Trait theory of anxiety. In Spielberger's conceptualization, trait anxiety refers to differences between individuals in anxiety proneness. These trait differences appear to be relatively stable over time. State anxiety refers to a transitory emotional state that occurs in response to

environmental events perceived as threatening. These states appear to vary in intensity and fluctuate over time. Although this initial conceptualization of trait and state anxiety has found wide acceptance, Spielberger (1972) found it necessary to add a definition of "anxiety as process" in order to more fully describe the anxiety phenomenon.

Spielberger (1972, p. 484) defines anxiety process as the "sequence of cognitive, affective, and behavioral responses that occur as a reaction to some form of stress." "Stress" here refers to any external stimulus or internal cue (e.g., cognitions, physiological changes) which is perceived as dangerous or threatening.

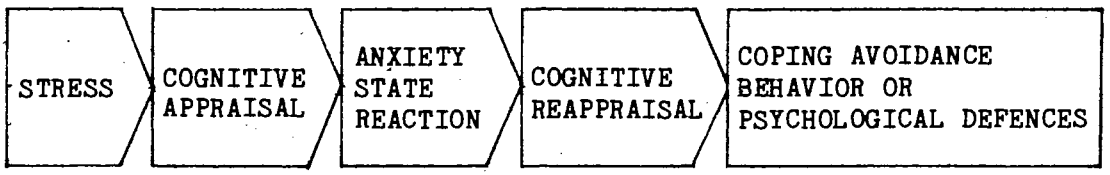

Figure 1. Sequence of events in the anxiety process.

In Spielberger's schema, stress gives rise to an exaggerated cognitive appraisal of danger which results in an anxiety state reaction characterized by unpleasant subjective feelings of tension, apprehension, and arousal of the autonomic nervous system. As elevation in anxiety

state is perceived as unpleasant, the individual then is motivated to engage in cognitive and/or behavioral activities aimed at reducing the intensity of the anxiety state reaction.

The definitions of anxiety proposed by Spielberger (1972) and Coyne and Lazarus (1980) suggest that anxiety is more appropriately viewed as a multidimensional phenomenon; a phenonomenon which cannot be defined adequately within the bounds of a single unitary hypothetical construct. The formulation of terms such as state anxiety, trait anxiety, and anxiety process to describe observed components of the anxiety phenomenon supports this view. Recent contemporary approaches to anxiety (e.g., Davidson & Schwartz, 1976; Rachman & Hodgson, 1974; Lang, 1977) have emphasized the multidimensionality of anxiety and have explained the anxiety reaction in terms of behavioral, cognitive, and physiological component response systems. The differentiation of these component response systems underscores the importance of considering variations in individual response patterns in order to select appropriate anxiety reduction treatments.

The construct of stress. Recent widespread use of the term stress has further complicated the task of defining anxiety. As Spielberger (1972) notes, stress, not unlike anxiety, has been used to describe the stimuli producing the anxiety reaction, the emotional response itself, the motor-behavioral and physiological manifestations of the response, and the entire area of study. Although much common

ground exists between the stress literature and the anxiety literature, delineation of the relationship between these two constructs is beyond the scope of this thesis. In order to avoid confusion, the term stress will not be used henceforth except in the form "stressor" which shall refer to any external stimlus or internal cue which is perceived by the individual as threatening or dangerous.

Definition of Anxiety

The concept of anxiety underlying this study has been influenced by all the considerations above. However the term anxiety, as used in this thesis, most closely resembles Spielberger's (1972) idea of state anxiety. Anxiety in this study refers to an unpleasant interfering emotional state characterized by feelings of tension, apprehension, and nervousness, and accompanied by increased autonomic nervous system activity. Anxiety occurs in response to stressors (as defined above), is cognitively mediated, and fluctuates in intensity over time as a function of those stressors.

This definition is not meant to diminish the importance of other components of the anxiety phenomenon. Rather it is meant to differentiate the construct of anxiety from other identified components in the anxiety process. It is acknowledged that anxiety is usually a response to situations perceived as having an exaggerated degree of threat; that anxiety generally gives rise to maladaptive overt and/or covert behavior which, instead of reducing the level of anxiety, maintains or accentuates it; and that anxiety comes to be linked with

particular environmental stimuli so that these particular stimuli will come to predictably elicit anxiety.

Treatment of Anxiety

The variety evident in theoretical perspectives of anxiety is also evident in treatment approaches purported to reduce anxiety. According to Lazarus (1974, 1975) treatment approaches can be divided into two main categories. In one category are those treatments directed at changing people's relationships to their environments, for example time management (Ferner, 1980) and assertiveness training (Jakubowski & Lange, 1978). In the other category are those treatments aimed at changing people's internal reactions to their environment, for example the use of tranquilizers and drugs, systematic desensitization (Wolpe, 1958) and rational-emotive therapy (Ellis, 1973). Concentrating on strategies aimed at changing people's internal reactions to their environments has certain advantages. In many cases people may have more latitude in changing their internal reactions to their environments than in changing their relationship to their environments. Also strategies aimed at changing internal reactions need not address such a great range of individual differences. Consequently, these strategies are more conducive to group learning and self-instructional approaches.

Progressive relaxation, and more specifically the treatment utilized in this study, falls primarily within the category of

changing people's reactions to their environment. The purpose of this discussion is to provide a context for examining the treatment used in this study. This task will be approached from several angles. First, a brief account of the historical development of relaxation as a treatment for anxiety will be presented. The next section will outline a tentative organizational framework from which to view procedural variations in contemporary self-control approaches to relaxation training. The content of the self-instructional relaxation training program will then be briefly outlined so as to permit a rough positioning of this treatment among other contemporary treatments. Finally, investigations based on programs similar to the self-instructional relaxation training program will be reviewed.

Development of Progressive Relaxation

The development of progressive muscle relaxation training as a treatment for anxiety can be viewed as having progressed through three main phases. It was the pioneering work of Edmund Jacobson (1938) which led to a physiological method of controlling tension and anxiety. Jacobson observed that tensing of muscles occurred in individuals who reported anxiety. He also found that people who relaxed their skeletal musculature, did not exhibit the typical startle response to stimuli such as a sudden noise. Jacobson concluded that muscle relaxation was the physiological opposite of tension and therefore a logical treatment for the overly anxious person. Jacobson observed that individuals could almost eliminate muscle tension by

systematically tensing and relaxing muscle groups and by attending to and discriminating the resulting sensations. His progressive relaxation training involved from one to nine (hour long) sessions training each of fifteen muscle groups for a total of often fifty or more sessions.

Joseph Wolpe's (1958) work in the counterconditioning of fear responses marks the entrance into the second phase of the development of relaxation training as an anxiety reduction procedure. According to Wolpe muscle relaxation and anxiety are reciprocally inhibiting. Thus a person who maintains a state of deep muscle relaxation cannot also feel anxious at the same time. Wolpe's systematic densensitization procedure introduced two developments: a) the use of graduated imagined and real life exposure to the feared stimulus, and b) the abbreviation of relaxation training because of the prohibitive time requirements of Jacobsonian training. Compared to progressive relaxation, which focused on the internal anxiety response, systematic desensitization included more emphasis on the environmental circumstances surrounding anxiety. Research on systematic desensitization burgeoned in the 1960's (see review by Paul, 1969). By the end of the decade some of the limitations of Wolpe's version of systematic desensitization were becoming more clear. For example, the treatment benefit tended to be limited to situations similar to the one which elicited the initial fear reaction (Liberman & Smith, 1972). Also, as systematic desensitization requires that anxiety arousing

cues be specifiable in order to permit hierarchy construction, the procedure tended to be cumbersome or inapplicable to cases of multiple phobias or free-floating anxiety (Barrios & Shigetomi, 1979). Perhaps most significantly, systematic desensitization, as initially advocated by Wolpe, did not emphasize the self-control and prevention potential of the procedure.

The evolution of a third phase in the development of relaxation training is identified by a number of trends of the past decade. The first trend has been towards using measurement of the physiological correlates of relaxation (e.g., measuring changes in muscle tension, peripheral skin temperature, skin conductance, and heart rate levels) to determine the effectiveness of relaxation training. A second trend has been the increase in attention given to cognitive processes in relaxation training programs. A third trend has been the increasing emphasis on the teaching of relaxation as an in vivo coping skill, that is, as a skill which can be used actively to cope with a variety of real life anxiety eliciting situations. Acknowledging that high levels of anxiety can impair performance, practitioners of this type of coping skills training teach clients how to identify indexes of anxiety and how to use relaxation in a self-control framework to reduce their anxiety level. Self-control, according to Bandura's (1977b) definition, refers to people's self-reactive capacities which enable them to exercise control over their own feelings, thoughts, and actions in order to achieve valued goals.

Denny (1980) traces the current emphasis on self-control to two important papers by Cautela (1969) and Goldfried (1971). The eventual effect of these papers was to lay aside mechanistic explanations of systematic desensitization and to prepare the way for cognitive mediational interpretations of this procedure. While Cautela sought to preserve systematic desensitization intact as a self-control procedure, Goldfried went further. Goldfried redefined systematic desensitization as training in self-control and advocated modifications to exploit systematic desensitization's potential as a method for training in self-control. One major change involved altering the treatment rationale so that clients would be told that they would be learning a relaxation skill that they could use to cope actively with anxiety encountered in any setting. Another recommendation was that more attention be given to the relaxation training per se. Rather than having clients terminate an imagined scene as soon as they noticed themselves becoming anxious, Goldfried recommended that clients continue to imagine the scene and attempt to relax away accompanying anxiety, that is, to use relaxation in an active coping manner. Thus in contemporary self-control approaches, there is a tendency to view relaxation training as coping skills training aimed as instructing people in generalizable methods for reducing anxiety.

Contemporary Self-Control Approaches

The purpose of the following discussion is to identify important features of contemporary self-control approaches to relaxation train-

ing. This will be helpful in accomplishing the overall goal of placing the self-instructional relaxation training program tested in this study within a procedural as well as historical context.

Reflecting on the trends of the past decade, a variety of relaxation training programs have been developed in an effort to increase efficiency. These relaxation training programs have included various supplementary procedures. Some of these supplementary procedures have been included to shorten the time required for relaxation induction and to deepen relaxation. Potentially useful examples include breathing exercises (e.g., Deffenbacher & Snyder, 1976), imagery exercises (Samuels & Samuels, 1975), autogenic exercises (Schultz & Luthe, 1959) and biofeedback assisted relaxation (Romano & Cabianca, 1978). Some supplementary procedures have been developed to address cognitive components of anxiety (e.g., Meichenbaum, 1973). Other procedures like differential relaxation (Davison, 1965), cue-controlled relaxation (Russell & Sipich, 1973), and covert modeling (Kazdin, 1973) have been employed to facilitate relaxation induction in stressful settings. When a variety of procedures are available, an attempt is usually made to tailor a program to the client's specific needs (e.g., Deffenbacher & Snyder, 1976).

Programs incorporating one or several of these supplementary procedures usually have different labels and often the correspondence between labels and procedures is not always clear. In an attempt to clarify the present situation Denny (1980) offers a tentative taxonomy

of self-control based relaxation training techniques.

Denny begins by establishing three broad range additive categories of relaxation techniques: (1) applied relaxation techniques, (2) self-control training techniques, and (3) cognitive coping techniques.

Three common characteristics which identify the applied relaxation techniques are: (a) they are introduced with a self-control rationale; (b) they utilize training in the induction of deep relaxation, usually by progressive relaxation but sometimes using variations; and (c) they include specific instructions in how to apply relaxation skills to stressful settings outside treatment. Cue-controlled relaxation (Cautela, 1966; Russell & Sipich, 1973) and Denny's (1974) applied relaxation training are examples of procedures in this first category.

Procedures in the second self-control techniques category share all three of the characteristics of the previous category and add a fourth: guided rehearsal (usually visualization) of coping in anxiety arousing situations which is introduced after relaxation induction training.[1] Examples of procedures in this category are Deffenbacher and Snyder's (1976) relaxation as self-control procedure, Goldfried's

[1]As techniques in all three categories represent self-control approaches Denny's decision to title the second category "self-control training techniques" is unfortunate because it gives rise to possible confusion. The additional differentiating criteria for this second category is the inclusion of coping rehearsal in the relaxation training program. A more appropriate title for this category might be "coping rehearsal techniques."

(1971) self-control desensitization, and Suinn's (1975) anxiety management training.

The cognitive coping techniques category encompasses the four previously mentioned characteristics plus the additional feature termed "cognitive restructuring" in which change efforts are directed at specific negative and counterproductive self-statements which clients emit in certain contexts. Meichenbaum's (1975) stress inoculation training belongs to this general category.

Figure 2 illustrates how these three categories are conceptualized as additive. Moving from Category (1) (applied relaxation techniques) to Category (3) (cognitive coping techniques) relaxation training procedures tend to become procedurally more complex and place increasing emphasis on in vivo application training, guided rehearsal during treatment, and upon cognitive restructuring. Denny's organizational format provides a context for viewing the training content of the self-instructional relaxation training program used in this study as well as a perspective from which to review research on similar treatments.

The Self-Instructional Relaxation Training Program

The purpose of this section is to identify the self-instructional relaxation training program more clearly within the context of contemporary self-control approaches to anxiety management discussed above. To accomplish this goal some description of the self-instructional relaxation training program's content will be necessary.

	Category (1) Applied Relaxation Techniques	Category (2) Self-Control Techniques	Category (3) Cognitive Coping Techniques
Features Emphasized	(a) self-control rationale (b) training in relaxation induction (c) specific application instruction	(a) self-control rationale (b) training in relaxation induction (c) specific application instruction (d) guided rehearsal of application	(a) self-control rationale (b) training in relaxation induction (c) specific application instruction (d) guided rehearsal of application (e) cognitive restructuring

Figure 2. Self-control approaches to relaxation training.

As description of this sort usually appears in a later chapter, the description of content included here is deliberately brief. A more detailed description of program content and procedures is to be found in Chapter III of this thesis.

At the outset it is necessary to distinguish between two components of the self-instructional relaxation training program: (1) the content of the program (in this case, what the trainee does to acquire the relaxation skill); and (2) the method of administering the program (in this case the trainee relies solely on produced materials as the basis of the program and follows the directions included therein). The administration component and the content component will be addressed separately.

Method of administration component. Before going any further it is important to define the term "self-instruction" as it is used to describe the self-instructional relaxation training program's method of administration. Glasgow and Rosen (1978), in a review of self-help behavior therapy manuals, distinguish among three treatment administration conditions based on the degree of the client's reliance upon counsellor contact: self-administered, minimal contact, and counsellor-administered. In a self-administered condition clients rely solely on produced program materials (e.g., written manuals and recorded tapes) and administer the materials without therapist contact. Under this category minimal contact with data-collection

personnel is permissable as long as procedural advice is not given. In a minimal-contact condition there is some contact with a counsellor (e.g., weekly phone calls, weekly meetings). The counsellor offers minimal procedural advice. Clients rely mainly on produced materials. In a counsellor-administered program, clients experience regular contract with a counsellor, in which the counsellor clarifies and elaborates information presented in the produced materials. According to Glasgow and Rosen (1978) these three conditions could also be compared with groups that are called counsellor-directed (where the sole basis of treatment is contact with a counsellor and produced materials are not used), a placebo group, or a no-treatment control.

The self-instructional relaxation training program under study here was developed to be used in circumstances most closely resembling Glasgow and Rosen's (1978) self-administration condition. In this study the program was tested under analagous circumstances. Participants did receive weekly phone calls to allow the experimenter to monitor at home practice sessions and to determine the degree to which the program had been followed as outlined. However, the purpose of these calls was not to provide procedural advice (in the vast majority of these calls such procedural advice was not even sought).

Therefore the term self-instruction as it is applied to the self-instructional relaxation training program refers to a condition in which participants: relied solely on produced materials as the basis for treatment; experienced personal contact with the

experimenter at pretreatment and posttreatment (for purposes of data collection), and received a weekly monitoring telephone call. It is important to reemphasize that the defining criteria for self-instruction is degree of client reliance on therapist contact, a variable outside of Denny's (1980) content focused organizational domain. The reason for this restatement will become more evident in the section where related research is reviewed. Attention will now return to the content component of the self-instructional relaxation training program.

Content component of the training program. Analysing the content of the self-instructional relaxation training program, it would seem to qualify primarily as an applied relaxation technique. In the self-instructional manual relaxation is introduced with a self-control rationale. Participants are directed how to induce and practice daily deep muscle relaxation in a careful step by step manner. In the first week practice involves following the instructions on a prerecorded relaxation tape. The taped instructions include relaxation induction through progressive relaxation, a visualization exercise to deepen relaxation, an open ended visualization instruction to serve as a covert reinforcer, and a breathing cue intended to become conditioned to the relaxed state. During the second and third week trainees practice with a tape on which the progressive relaxation induction has been replaced with an auto-suggestive (i.e., no muscle tensing) induction. In the fourth week, use of the tape is faded out in favour

of practice by recall.

It is clear then that the relaxation induction procedure used by the self-instructional relaxation training program shares common elements with procedures termed cue-controlled relaxation (Cautela, 1966; Russell & Sipich, 1973). As been mentioned, Denny (1980) classifies cue-controlled relaxation as an applied relaxation technique.

After the initial five week training period, participants are directed to choose among several application alternatives described in the self-instructional relaxation training program manual. One of these application alternatives is the use of relaxation in a covert modeling framework. Covert modeling (Kazdin, 1973) is a coping rehearsal procedure which would qualify the self-instructional relaxation training program for membership in Denny's self-control technique category.

However, it is important to note that the dependent measures in this study were administered at the end of the fifth week, before the actual implementation of any application alternatives, and that covert modeling was only one of five application alternatives. Therefore, the self-instructional relaxation training program really seems to straddle both the applied relaxation techniques and the self-control techniques categories. Having concluded this, it is also important to emphasize that the main purpose of this discussion was not to place the self-instructional relaxation training program within the bounds of Denny's tentative and arbitrary framework. Rather, the main pur-

pose was to widen the reader's perspective on the self-instructional relaxation training program by comparing it to other similar treatments. Another allied purpose was to highlight the importance of (and increase the chances of) comparing "apples" with "apples" in reviewing the related research.

Related Research

What follows is a summary of some of the research conducted on procedures resembling the self-instructional relaxation training program most closely. The related research is presented in two sections. In the first section, research relating primarily to relaxation training program content is reviewed. In the second section research which investigated methods of administering relaxation training programs is presented.

Studies relating to relaxation training program content. Studies which have tried to isolate the effect of the progressive relaxation training component of systematic desensitization have yielded mixed results. Some have indicated that relaxation training alone was completely ineffective (Aponte & Aponte, 1971; Cooke, 1968; Davison, 1968). Some have indicated that relaxation training effected significant fear reductions compared to untreated controls (Laxer & Walker, 1970; Trexler & Karst, 1972). While in other instances (Bedell, 1976; Denny, 1974) fear reduction was as great as with systematic desensitization. Denny (1980) notes that such discrepant results might be accounted for by the degree to which the treatment emphasized a self-

control rationale and application training.

Goldfried and Trier (1974) investigated the role of self-control rationales and application training more directly and found that a treatment incorporating these components effected pretest/posttest changes on both behavioral and self-report measures of speech anxiety more consistently than the relaxation only procedure. However differences between the applied relaxation, attention placebo, and relaxation only conditions did not achieve significance.

Cue-controlled relaxation has received a fair amount of research attention. Two studies have investigated the effects of cue-controlled relaxation, systematic desensitization, and no treatment on test anxious students (Russell, Miller, & June, 1975; Russell, Wise, & Statoudakis, 1976). In these studies, cue-controlled relaxation and systematic desensitization were found to be equally effective in reducing self-reports of test anxiety. Using a more sophisticated design, Marchetti, McGlynn, and Patterson (1977) compared cue-controlled relaxation with a placebo condition (intended to control for nonspecific treatment effects) and an untreated control condition. Placebo participants received muscle relaxation training but were told to imagine irrelevant neutral scenes instead of a cue. They also were not given instructions in how to apply relaxation. This study used physiological measures (heart rate and skin conductance) collected during a performance task, as well as self report measures of test and speech anxiety. Cue-controlled relaxation training showed no

significant effects beyond those of the placebo condition or the no treatment control. Marchetti et al. (1977) emphasize that their negative results may be more the result of their choice of training components rather than the dubious value of cue-controlled relaxation.

Applied relaxation training (Denny, 1974), like the self-instructional relaxation training program, places much greater emphasis on a self-control rationale and upon application training than does cue-controlled relaxation training. Chang-Liang and Denny (1976) compared applied relaxation training with systematic desensitization, relaxation alone (intended as an attention placebo condition), and an untreated control condition. Subjects in all three treatment conditions received the same progressive relaxation training. The treatment conditions were found to be equally effective in reducing the trait measure of test anxiety, but applied relaxation training also resulted in significant decreases in the state measure of test anxiety, significant improvement on the performance measure, and significant reductions on two of the three general anxiety measures. On these two latter outcome measures relaxation alone was found to be as effective as systematic desensitization.

Deffenbacher and Shelton (1978) compared anxiety management training (Suinn, 1976), a treatment Denny (1980) classifies as a self-control technique, with systematic desensitization. In this study the results favoured anxiety management training. On most measures, anxiety management training was equivalent to systematic desensitiza-

tion. However, on one measure of targeted anxiety and one measure of non-targeted anxiety, anxiety management training was superior to systematic desensitization. The investigators concluded that anxiety management training could serve both a remedial and a preventive function.

Generally, studies investigating relaxation treatments similar to the self-instructional relaxation training program have found these treatments to be significantly superior to no treatment. Studies comparing various relaxation treatments with systematic desensitization, generally, have found the relaxation treatments and systematic desensitization to be about equally effective. Results from studies utilizing attention placebo groups have been mixed. Generally, relaxation training has not been shown to have greater anxiety reduction than credible placebo conditions (Barrios & Shigetomi, 1979; Grimm, 1980).

A major criticism of research on relaxation treatments is the general lack of physiological dependent measure data. Of 62 relaxation studies reviewed by Barrios and Shigetomi (1979) only 6 monitored the use of physiological variables so as to determine whether subjects actually learned to relax. Results of relaxation studies which have not monitored physiological variables, while indicative of what happens to subjects who participate in relaxation training programs, are not necessarily indicative of what happens to subjects who learn to relax. Accordingly, there is a need for more

studies which assess physiological variables.

Studies relating to methods of administering relaxation training programs. Earlier it was established that the criteria for defining self-instruction was degree of client reliance on counsellor contact. In a self-instructed condition participants rely solely on produced program materials as the basis for treatment and experience only minimal contact with data collection personnel. This was the case with the self-instructional relaxation training program as tested in this study. In reviewing the related research it appears that the term "self-administered" has been used to describe a variety of conditions. When Glasgow and Rosen's (1978) defining criteria are applied, most studies employing so-called "self-administered" conditions actually apppear to have been investigating either minimal contact or counsellor-administered conditions. What follows then is a review of studies which have incorporated varying degrees of self-administered anxiety reduction treatment.

Studies have demonstrated that clients can successfully self-direct systematic desensitization with minimal therapist aid. Baker, Cohen, and Sanders (1973) found an automated desensitization procedure, in which participants listened to a series of tape recorded presentations prepared by the counsellor with the participant's assistance (i.e., under minimal contact conditions), to be as effective as live desensitization. In a study by Phillips, Johnson, and Geyer (1972) treated participants initially met with a counsellor

for one session. Participants then administered treatment under self-administered or minimal-contact conditions. Both treated groups reported significantly more change than untreated controls. Differences between the treated groups were not significant although the self-administered group indicated less improvement than the minimal contact condition.

Rosen, Glasgow, and Berrara (1976), treating snakephobic participants, compared self-administered desensitization, desensitization with minimal counsellor contact, counsellor-directed desensitization, no treatment, and a self-administered placebo condition. These investigators found no significant between group differences on a behavior approach test. On self-report and heart rate measures, combined desensitization groups significantly differed from combined controls. A study by Marshall, Presse, and Andrews (1976), employing a similar design with public speaking anxious subjects, arrived at similar results.

Self-administration appears to have an influence on both maintenance and generalization of treatment effects. The study by Rosen et al. (1976) found, at a two month followup, that self-administered subjects continued to improve after posttesting more than subjects in minimal-contact and counsellor-administered groups. However, Marshall et al. (1977) found that generalization of self-reported improvement was greater among counsellor-directed subjects as compared with self- administered subjects.

A major problem associated with self-administered anxiety reduction treatments is the high rate of participant dropout. A review by Rosen and Glasgow (1978) cite dropout rates often as high as 50%. Marshall et al. (1976) suggest that this problem could be alleviated by even minimal contact with a counsellor, for example a weekly phone call to the client.

The studies described above investigated varying degrees of self-administered systematic desensitization as the anxiety reduction treatment. In reviewing the related research, no similar studies employing self-administered relaxation training were encountered.

Some controlled studies have compared relaxation training administered by tape recording and training administered in person. In both the following studies the experimental procedure followed in the tape recorded relaxation condition would classify the condition, according to Glasgow and Rosen's (1978) criteria, as either counsellor-administered or perhaps even counsellor-directed. In a study by Paul and Trimble (1970) physiological measures indicated that taped administration was significantly inferior to therapist administration, while subjective measures indicated the two treatments were equivalent. A study by Beiman, Israel, and Johnson (1978) also found that live instructions produced superior physiological effects compared to taped instructions, while differences between the two treatments on subjective anxiety only approached significance.

Although both of the above counsellors encouraged subjects to

practice relaxation at home, neither reports whether home practice was conducted by mental recall or by therapist-produced tape recording. Procedural variations between the two studies, regarding varying degrees of therapist contact in the tape recorded conditions, also existed. Thus results of these investigations remain somewhat ambiguous.

Generally, studies investigating varying degrees of self-administered anxiety reduction treatment have provided encouraging results regarding the potential efficacy of these treatments. Under certain conditions it appears that self-administered desensitization can be as effective as counsellor-directed desensitization. The findings regarding treatment maintenance and generalization and client dropout point to the need for further research.

A major criticism of these studies investigating methods of treatment administration is the lack of what Horan (1980) calls independent variable manipulation analysis. The purpose of independent variable manipulation analysis is to assess program adherence, that is, to determine whether subjects did in fact do what they were supposed to be doing. None of the studies cited above report any method for monitoring the degree to which the treatment was implemented as intended and outlined. Clearly there is a need for future studies to incorporate some procedure for determining the degree to which participants actually followed the prescribed treatment.

Summary

The purpose of the preceding discussion was to provide a context for examining the treatment used in the study. This goal was approached from several angles. An historical account traced the evolution of relaxation training from Jacobson's (1938) initial efforts to the genesis of the contemporary emphasis on self-control approaches. A picture of the range and variety of contemporary self-control approaches to anxiety reduction was painted. A way to view this picture was suggested so that comparisons between the self-instructional relaxation training program and similar approaches would be more meaningful. Finally, the related research was reviewed from two perspectives: treatment content and treatment administration.

Two conclusions are drawn from reviewing the related literature. Studies reviewed from a treatment content perspective support the effectiveness of relaxation training which emphasizes a self-control rationale and provides instruction for application of relaxation as a coping skill. Studies reviewed from a treatment administration perspective suggest that under certain conditions self-instructed (i.e., self-administered) relaxation training treatments can be as effective as counsellor-directed treatments. The need for future studies to include assessment of physiological data and program adherence was also highlighted.

The Present Study

The main purpose of this study is to determine whether a

self-instructional format can be used to teach people the relaxation response.

The self-instructional relaxation training program used in the study represents an attempt to develop a more efficient means of acquiring and applying the relaxation response. The program's design includes elements which previous research on counsellor-administered relaxation training programs has indicated are effective, namely a self-control rational, cue conditioning, and application training. The self instructional relaxation training program was chosen as a means of increasing treatment efficiency and accessibility. Insofar as the self-instructional relaxation training program's format represents an increase in accessibility to effective relaxation training, the program's format also represents an increase in efficiency. It is also possible that people who acquire skill at relaxing via a self-instructional format may experience an enhanced sense of "I did it myself", which, in turn, may support continued self-initiated use of the relaxation skill.

In the design of this study an attempt was made to rectify two pervasive shortcomings of much of previous research into relaxation. In this study physiological correlates of relaxation were monitored. Secondly, a method for assessing the degree of program adherence was used.

Hypotheses

The purpose of this initial investigation of the self-

instructional relaxation program was to demonstrate the nature of the effects of this self-administered anxiety reduction treatment. This purpose can be more clearly stated in the form of testable hypotheses:

1) Participants undergoing the self-instructional relaxation training program will demonstrate a lower level of anxiety than the delayed treatment control group from pretreatment to posttreatment as evidenced by score comparisons on paper and pencil self-report measures.

2) Participants undergoing the self-instructional relaxation training program will demonstrate a lower level of physiological arousal than the delayed treatment control group from pretreatment to posttreatment as evidenced by changes in: (a) frontal electromyograph levels (EMG), (b) peripheral skin temperature (PST), and (c) heart rate (HR).

The research design, sampling, assessment, treatment and analysis procedures by which the above hypotheses were tested will be discussed in subsequent chapters of this thesis.

CHAPTER III

DESIGN AND METHODOLOGY

The purpose of this study is to investigate the effectiveness of a self-instructional relaxation training program (Hiebert, 1980). In the previous chapter this purpose was stated in the form of two testable hypotheses. In this chapter the methodology used to test these hypotheses will be described under the following headings: research design, sample, equipment and facilities, dependent measures, and treatment procedures.

Research Design

The research design used in this experimental study was a two-factor, repeated measures design.

Two levels of Factor A (Group) were used. Participants assigned to the treatment group received relaxation training in the form of the self-instructional relaxation training program. Participants assigned to a delayed treatment control group were told it was necessary to obtain a stable indication of their anxiety level before treatment could begin. After being assigned to one of these groups each participant was seen individually by the experimenter on two occasions. On the first occasion, the experimenter administered the pretreatment dependent measures and provided initial instructions. On the second occasion, which was scheduled as near to five weeks later as possible,

the experimenter administered the posttreatment dependent measures. On this second occasion, subjects assigned to the delayed treatment control group were offered treatment (i.e., the self-instructional relaxation training program) so as to conform with ethical guidelines.

The rationale for this research design is based on the view that the treatment used in this study represents a new treatment. When testing the effectiveness of a new treatment, such as a self-instructional relaxation training program, a logical progression of research designs is often employed. Typically, the aim of an initial study of a treatment is to determine what effect the treatment has compared to no treatment. In other words the purpose is to see whether the treatment produces any effect at all. If it is found that the treatment does indeed produce a significant positive effect, then more costly studies, comparing the treatment to other similar treatments, are warranted. This study appears to be the first experimental investigation of the effectiveness of a self-instructional relaxation training program. Being the first study, the central purpose was to determine whether the program, when used as instructed, resulted in a significant improvement in participants' ability to reduce their anxiety level.

Sample

Participants were recruited by means of advertisements in Simon Fraser University campus newspapers, posters displayed in prominent

places on campus, and announcements made by the experimenter to large undergraduate classes. The advertisements, posters, and announcements invited people who wanted to learn how to relax to participate in a research project being conducted in the counselling psychology program of the Faculty of Education. Interested people were directed to call the experimenter at the telephone number provided. Thus, participation in the study could be described as voluntary and self-referred.

The study was conducted simultaneously and in conjunction with another study which had its own design requirements (Cardinal, 1982). Participants were recruited for both studies at the same time. As participants telephoned to register to participate in the study, they were assigned, in an alternating fashion, to either the treatment group or the delayed treatment group or one of two other conditions employed in Cardinal's (1982) study. When an assigned participant dropped out of the study then the next interested person who called was assigned to the group which had experienced the dropout. In this study, pretreatment dependent measures were administered to 47 subjects: 26 subjects were assigned to the treatment group; 21 subjects were assigned to a delayed treatment control group.

Participant attrition occurred in two ways. The first way was by means of subject dropout. Of the 47 participants who were pretested, 36 were posttested (18 treatment, 18 delayed treatment control). This represented a 23.4% dropout rate overall (30.8% for the treatment group, 14.3% for the delayed treatment control group).

The reasons for treatment group dropout included subsequent unwillingness to maintain the time commitment required by the treatment, dissatisfaction with the method of treatment, relationship problems, or disruptions in routine. Delayed treatment group subjects dropped out mainly because learning to relax had become a lower priority compared to when they initially registered.

Another way treatment group attrition occurred was through exclusion of participant data due to insufficient at-home practice. A minimum of 30 at-home practice sessions spread evenly over no less than a 5 week period was established as the criterion level for considering a participant to have implemented the treatment as instructed. Four treatment participants did not meet this criterion level and consequently data collected on these subjects were excluded from analysis. In the end, statistical analysis was conducted on data collected from 14 treatment participants and 18 delayed treatment control participants.

Participants' ages ranged from 20 to 54 with the mean age of 30.0. The somewhat high mean age was due primarily to the significant nonstudent portion of the sample (31.2%). A more detailed demographic breakdown is presented in Table 1.

Table 1

Demographic Data for 32 Participants

Subdivided According to Treatment Condition

Demographic Descriptors		Number of Persons			Summary
Variable	Categorization	Treatment	Control	Total	%
Age	20-24	5	4	9	28.1
	25-29	5	5	10	31.3
	30-39	3	8	11	34.4
	40-49	1	0	1	3.1
	50+	0	1	1	3.1
	Mean	28.1	31.4		
Sex	Male	4	4	8	25.0
	Female	10	14	24	75.0
Occupation	Student	8	14	22	68.8
	S.F.U. Staff	4	3	7	21.9
	Other	2	1	3	9.3
Highest Degree Completed	Grade School	1	0	1	3.1
	High School	7	9	16	50.0
	Community College	3	5	8	25.0
	Bachelor's Degree	2	3	5	15.6
	Master's Degree	1	1	2	6.3
	Doctoral Degree	0	0	0	0.0
Previous Participation in Relaxation Training	Yes	1	5	6	18.7
	No	13	13	26	81.3
Self-assessed anxiety level	Very Anxious				
	4	2	1	3	9.3
	3	2	5	7	21.9
	2	5	8	13	40.6
	1	4	3	7	21.9
	0	1	1	2	6.3
	Not Anxious at all				
	Mean (anxiety level)	2.0	2.1		

Equipment and Facilities

All pretest and posttest sessions were conducted in separate adjoining rooms of a comfortably appointed laboratory. Initially the participant was greeted by the project secretary and seated in one of the rooms containing a chair and a table where the participant read the project information sheet, signed an informed consent form (see Appendix A for copies) and completed pencil and paper dependent measures. After completing these measures the experimenter introduced himself and lead the participant to an adjoining room in order to conduct the psychophysiological stress profile. The participant sat on a comfortable recliner chair which faced a curtained one way mirror. The physiological measurement instruments were housed in a cabinet behind and to the side of the subject. The experimenter sat on a stool adjacent to the subject which allowed the experimenter to face the subject or the instruments as required.

In this study four functions of physiological reactivity were monitored during the stress profile: frontal electromyograph (EMG) activity, galvanic skin resistance (GSR), peripheral skin temperature (PST), and heart rate (HR). Frontal electromyograph levels indicate muscle tension via sensors attached to the forehead (frontalis muscle) just above the eyebrows. Galvanic skin resistance levels indicate changes in the electrical conductivity of the skin surface due to sweat gland activity. Peripheral skin temperature indicates the temperature at the skin surface (in this case, the palmer surface of

the middle finger of the nondominant hand). Heart rate is measured in beats per minute. Typically, when a person is physiologically aroused, EMG levels increase, GSR decreases due to increased sweat gland activity, PST decreases due to decreased blood flow to the periphery of the body, and HR increases.

These four physiological parameters were monitored using a Coulbourn Modular Instrument System. EMG was monitored with a High Gain Bioamplifier/Coupler S75-01 (90-1000 Hz, 30,000 gain). GSR was monitored with the modular unit S71-20 (gain was set at 10 mV/K ohm for maximum sensitivity). PST was measured with module component S71-30 (gain was set at 100 mV/^{o}C for maximum sensitivity). HR was measured with the S71-40 photodensitometric pseudoplethysmometer. Data collection was fully automated, using the Rzz-10, 10 channel microprocessor based printing counter and an NP-7 printer. The specifications of the surface recording electrodes are provided later in the description of the psychophysiological stress profile procedure employed in this study.

Dependent Measures

Three main dependent measures were used in this study: the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch & Lushene, 1970), the IPAT Self-Analaysis Form (IPAT) (Krug, Scheier & Cattell, 1976), and a psychophysiological stress profile (PSP). These measures are discussed in turn below.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) is a 40 item self-evaluation questionnaire designed to measure and distinguish between stable individual differences in anxiety proneness (A-Trait) and transitory anxiety reactiveness (A-State) (Spielberger et al., 1970). There are 20 items that ask subjects to respond according to how they generally feel (A-Trait items), and 20 items that ask subjects to respond according to how they feel right now (A-State items). Test-retest stability coefficients tend to be low for the A-State scale of the STAI (median r = .32) which is expected with a measure designed to reflect situational influences at the time of testing (Spielberger et al., 1970). Test retest stability coefficients for the A-Trait scale of the STAI are reasonably high, ranging from r = .73 to r = .86 (Spielberger et al., 1970). Internal consistency is high ranging from .83 to .92 (Spielberger et al., 1970). Evidence for construct validity of the A-State scale in a normal and exam condition is available for 977 undergraduate college students. Mean scores for state anxiety were "considerably higher in the EXAM condition than in the NORM condition for both males and females" (Spielberger et al., 1970, p. 11). Evidence for the concurrent validity of the A-Trait scale is available for 206 college students and 112 psychiatric patients. Correlation between STAI A-Trait scores and IPAT (Cattell, 1957) scores were moderately high ranging from .75 to .77 (Spielberger et al., 1970). Since it was developed, the STAI has been used

extensively in anxiety research (e.g., D'Augelli, 1974; Leal, Baxter, Martin & Marx, 1981; Martuza, 1974; Spielberger, 1975; Townsend, House & Addario, 1975) and has demonstrated adequate reliability (Kendall, Finch, Auerbach, Hooke & Mikulka, 1976; Spielberger et al., 1970) and validity (Kendall et al., 1976; Martuza, 1974; Spielberger, 1975; Spielberger et al., 1970).

IPAT Self-Analysis Form

The IPAT is a 40 item inventory intended to measure manifest anxiety level, whether it is situationally determined or relatively independent of the immediate influences (Krug, Scheier, & Cattell, 1976). Test-retest reliability coefficients of the IPAT are high, ranging from r = .82 to r = .93, as are the IPAT's internal consistency coefficients, ranging from .78 to .92 (Krug et al., 1976). Evidence for the validity of the IPAT has been derived in three ways. First, using a factorial validity approach with data gathered from 491 college students, 128 neurotic adults, and 113 normal adults, IPAT scores were correlated with a "pure anxiety factor" (derived from 5 independent factorial analyses). Coefficients ranged from .84 to .94 (see Krug et al., 1976 for a summary of the procedures employed). A second approach to establishing validity used data from a total of 156 subjects in four studies. In these studies IPAT scores were correlated with clinically judged anxiety level. When adjusted for the imperfect reliability of clinical judgment, the coefficient was found to be approximately .90 (Krug et al., 1976). Thirdly,

concurrent validity is available for over 2800 subjects (most of whom were undergraduate college students) involved in 16 studies. The average of correlations of the IPAT scale with the Taylor Manifest Anxiety Scale (Taylor, 1953) was found to be .70 and with the Eysenck Personality Inventory N Scale (Eysenck & Eysenck, 1964) to be .79. These represent moderately high correlations. IPAT scores are also reported to correlate highly with physiological measures of anxiety (Cohen, 1965; Smith, 1973).

The Psychophysiological Stress Profile

Rationale and considerations. In the previous chapter it was stated that there is wide support for the notion that anxiety and physiological arousal are strongly linked. Accordingly, the measurement of physiological arousal has logical appeal as a dependent measure of changes in anxiety level. The psychophysiological stress profile employed in this study represents a procedure designed to measure changes in physiological arousal accompanying the anxiety reaction and relaxation.

Recently, investigators have emphasized the necessity of a standardized psychophysiological diagnostic and evaluation procedure (Corson, Schneider, Biondi & Myers, 1980; Fair, 1979). It has also been advocated that psychophysiological assessment procedures should follow an A-B-A or relaxation-stressor-relaxation design (Corson et al., 1980). In such an A-B-A design, the subject typically is seated in a comfortable chair and asked to relax for an initial baseline

period. The participant is subsequently exposed to a moderate stressor, after which the subject is requested to relax again for a poststressor baseline period (Budzynski, 1980; Fair, 1979). Physiological responses are monitored throughout the testing period. The inclusion of stressor and poststressor baseline conditions in psychophysiological assessment is based on the findings of previous research. Light (1981), investigating cardiovascular responses to effortful active coping, found that reactive and non-reactive subjects were indistinguishable during resting (i.e., baseline) conditions. DeGood and Adams (1976) found that treatment groups (i.e., biofeedback training, muscle relaxation, and no feedback groups) were differentiated by posttest comparisons of stressor condition levels. Moreover, the inclusion of a stressor condition has appeal from a clinical viewpoint. Gatchel, Corman, Weis, Smith and Clark (1978), in reference to biofeedback training, point out the central clinical concern is not merely whether subjects can maintain control over physiological responding relative to control groups, but whether they are able to do so under stressor conditions.

There are a number of internal and external factors that can influence the results of a stress profile and therefore merit attention.

Internally, an important factor is the selection of appropriate stimuli for the stressor condition. For experimental purposes, it is preferable to employ stimuli which are standardized across subjects.

Yet, as individuals tend to differ in the intensity and pattern of their physiological responding (Lacey & Lacey, 1958; Knight & Borden, 1979) identification of appropriate stimuli is problematic. The challenge lies in selecting stimuli which are capable of eliciting a significant reactive response in all participants yet do not induce a traumatic experience in more sensitive participants. In this study two cognitive stressors were chosen. The first stressor was a serial sevens task in which subjects were instructed to serially subtract the number seven as fast as possible for three minutes beginning with the number 1000. The second stressor was composed of two reading tasks taken from the Gilmore Oral Reading Test (Gilmore & Gilmore, 1968) (Forms C-9 and C-10 for the pretest; Forms D-9 and D-10 for the posttest). These same two stressors were administered to all subjects (see Appendix B for instructions and data collection forms). Two separate stressor periods were used in order to increase the probability of eliciting a significantly reactive response in subjects and to explore physiological reactivity over time. The choice of cognitive stressors admittedly limits the generalizability of findings about anxiety reactions to anxiety reactions elicited by cognitive stressors.

Externally, there are a number of environmental and personal factors which affect physiological reactivity and therefore affect the reliability of the stress profile. Time of day (Corson et al., 1980), semester (Fisher & Winkel, 1979), season (Waters, Koresko, Rossie &

Hackley, 1979), as well as fatigue (Roessler & Engen, 1977) and caffeine intake (Asterita, Smolnicky & Iatridis, 1981) have all been found to influence physiological reactivity. In this study participants were scheduled for their posttest stress profiles as near as possible to the same time of day as their pretest stress profiles were conducted. All data were collected within the summer semester (i.e., May to August).

Procedure employed in this study. The stress profile employed in this study used an A-B-A design. The procedure followed in administering the psychophysiological stress profile was patterned after Budzynski's (1977, 1978), with the exception that two separate stressor periods were employed rather than one. The sequence of the stress profile was a 12 minute relaxation period; a 3 minute serial sevens task (i.e., the first stressor); a 2 minute relaxation period; a 3 minute reading task (i.e., the second stressor); another 2 minute relaxation period; followed by a final 12 minute relaxation period.

After completing the pencil and paper measures, participants were escorted into an adjoining room containing the physiological recording equipment. Here, participants were shown the monitoring equipment and were given an overview of the stress profile measures. They were told that the study was investigating what happens to people's bodies when they relax and when they engage in different kinds of mental tasks, and in order to determine these differential effects that it was necessary to prepare and connect recording sensors to monitor the

body's functioning. Participants were then seated in a comfortable recliner and the appropriate preparation was begun.

Four channels of physiological data were recorded using a Coulbourn Modular Instrument System. Frontal EMG data was obtained through surface electrodes (two recording electrodes on the forehead one inch above the eyebrows with a ground electrode equidistant between the recording electrodes). Electrode impedences of 30,000 ohms or less were maintained throughout the recording as recommended by the manufacturer. Other measures were via electrodes attached to the participant's nondominant hand. Skin resistance was measured using lead strips wrapped around the medial phalanx of the first and third fingers, with clips attached to the lead strips on the palmar surface of each finger in the manner described by the equipment manufacturer. Peripheral skin temperature was measured with a Yellow Springs series 700 thermilinear temperature probe attached with tape to the distal phalanx of the middle finger of the nondominant hand. Heart rate was measured with a photodensitometric pulse monitor attached to the thumb of the nondominant hand.

After attaching surface electrodes participants were told to relax as much as possible for 12 minutes using whatever strategy they usually used to relax. They were given 30 seconds to get comfortable in the recliner before recording was started. The initial 12 minute baseline relaxation period was followed by the three minute serial sevens task, a 2 minute recovery period, and then the three minute

reading comprehension task. For the reading task, participants were first given one passage to read. When participants completed reading this passage the experimenter then asked them some questions concerning the content of the passage (see Appendix B for copies of data collection sheets). This sequence was then repeated with a different passage. Physiological measurements were only recorded for the first 3 minutes of this stressor period regardless of how much time the two tasks required. The reading comprehension task was followed by another 2 minute recovery period and a final 12 minute poststressor baseline relaxation period.

Physiological recordings of frontal muscle tension, galvanic skin resistance, peripheral skin temperature and heart rate were simultaneously recorded at 3 minute intervals during the two 12 minute relaxation periods (i.e., for a total of 8 data points) and the stressor episodes (2 data points), and at 15 second intervals during the two minute recovery periods (16 data points). Thus, the resulting output yielded a total of 26 data points for each physiological modality.

The posttreatment stress profile followed the same sequence except that alternate forms of the reading task (i.e., the second stressor) were used.

Pre-Training Survey

In addition to the dependent measures discussed above, participants completed a Pre-Training Survey (see Appendix C). The

Pre-Training Survey contained 16 items intended to determine the reasons participants enrolled in the study, past experience with relaxation training, self-assessed anxiety level, selfassessed relaxation skill level, outcome expectancy level and current use of prescribed medications, cigarettes, caffeine, and alcohol.

The problem of controlling for differential treatment credibility and expectancy has been recognized repeatedly in behavior therapy research (Jacobson & Baucom, 1977; Kazdin & Wilcoxin, 1976; Rosenthal & Frank, 1956). Studies have indicated that participants with higher levels of expectancy for treatment success tend to show superior treatment effects compared to participants with lower levels of expectancy. In this study significant differences between the treatment group and control group in outcome expectancy would place severe limitations on conclusions drawn from the data. Hence, one of the purposes of the Pre-Training Survey was to assess potential differences in outcome expectancy between the treatment and control group at pretesting. Five items in the Pre-Training Survey: a self-assessed anxiety level item (question 5), a self-assessed relaxation skill level item (question 7), and three outcome expectancy items (questions 6, 8 and 9) were included to assess expectancy variables. Besides analysing individual items, a total "expectancy score" was derived from these five items. The expectancy score was derived using the following formula [(question 5 - question 6) + (question 8 - question 7) + question 9]. This total expectancy score

was then analysed to determine potential significant differences between the treatment group and control group at pretreatment

Post Five Week Survey

At the time of posttesting all participants completed a Post Five Week Survey in addition to the dependent measures discussed above (see Appendix D). The Post Five Week Survey required participants in the self-instructional group to indicate how closely they had followed the treatment program, their self-assessed anxiety level, the degree to which the treatment program had fulfilled their expectations, what they considered to be the most beneficial aspects of the program, and what changes they would recommend for improving the program. The survey also contained items designed to collect relevant demographic information on participants. The survey for delayed treatment control participants was similar, the only difference being that questions relating to the treatment program were omitted.

Treatment Procedures

In this study participants were alternately assigned to either a self-instructed relaxation training group or a delayed treatment control group.

Self-Instructed Relaxation Training

At the conclusion of the stress profile procedure, participants assigned to the self-instruction condition were given a training manual, Self-Relaxation: Learn It, Use It (Hiebert, 1980), a relaxa-

tion tape for use in home practice, and a relaxation checklist (see Appendix E for copies of protocols and materials) covering the sequence of activities to be completed during the 5 week training period. Each participant was instructed to check off the items as the activities were completed, thus providing a useful indication of the progress that had been made to date. Participants were also requested to record measurements of three indicators of relaxation (i.e., heart rate, respiration rate, and finger temperature) both before and after their daily at home relaxation practice sessions. The self-monitoring of relaxation indicators was employed for two main reasons. One reason was to enhance motivation to complete the program by providing immediate feedback about the physiological effects of practice sessions. Another reason was to provide a concrete method of determining how closely participants had followed the program. Participants were provided with a relaxation monitoring sheet (see Appendix E) for recording data on 7 days of practice and were instructed to submit the monitoring sheet when completed. Participants were also provided with a finger thermometer to measure finger temperature. (The manual contained instructions for taking heart rate, respiration rate, and finger temperature as indices of relaxation.) In addition, a procedure was set up whereby the experimenter contacted participants once per week by telephone to determine their progress through the training program. In the event that procedural issues were raised during the telephone calls,

participants were referred to appropriate sections of the manual which they had been given. In addition, participants were reminded to turn in their completed monitoring sheets at a specified time and prearranged location, and to pick up a new monitoring sheet. A standard format for the telephone contacts was formulated in advance (see Appendix F) and followed by the experimenter when monitoring participants' progress through the 5 week training program. Any person who was found not to be fulfilling the program requirements was dropped from the study. In the monitoring call at the end of the fourth week, participants made an appointment for posttesting.

Delayed Treatment Control

After pretesting, participants assigned to the control group were told that a stable indication of their anxiety level was needed before they began treatment (see Appendix F for protocol followed). Participants were then instructed to return in five weeks for retesting and to begin treatment. Otherwise control participants experienced no therapist contact. After posttesting control participants were offered treatment in the form of the self-instructional relaxation training program. Sixteen out of the 18 control participants accepted the offer. Due to the scope of this particular project and the limitation of project resources no data were collected on control participants.

CHAPTER IV

DATA ANALYSIS AND CONCLUSIONS

This chapter begins with an overview of the statistical procedures used to analyze the data. Following this, the results of research hypotheses listed in Chapter II are discussed. Finally, some analyses of related concerns are presented.

Overview

The data collected in this study were of two main types: pencil and paper self-report measures (i.e., STAI-S, STAI-T, and IPAT) and electronic measures of physiological reactivity (i.e., EMG, GSR, PST, and HR). The self-report data and the physiological data required different statistical analysis procedures. The paper and pencil measures were analyzed using a two-way ANOVAR. The between subjects factor was Group (self-instruction or delayed treatment control) and the within subjects factor was Time (pretreatment or posttreatment). Data on each of the physiological channels monitored were analyzed using a three-way ANOVAR. Details of these three-way analyses will be presented later in the discussion of hypotheses referring to physiological measure data.[1]

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[1] These analyses were conducted using the Statistical Package for the Social Science (SPSS) (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975) except for one problematical analysis involving peripheral skin temperature. In the case of peripheral skin temperature a parallel Biomedical P-Series (BMDP) program (Dixon, Brown, Engelman, Frame, Hill, Jennrich & Toporek, 1981), was used in order to check for accuracy.

Missing Data

In this study missing data occurred in several ways. In one instance a treatment participant neglected to complete the Trait side of the STAI questionnaire. Other sources of missing data were related to the electronic instruments measuring physiological reactivity. The instrument monitoring GSR malfunctioned at various times. Consequently, the GSR data were discarded and not used for hypothesis testing purposes. Also, in a few instances data were discarded because the sensors monitoring physiological data could not be attached in a manner so as to obtain reliable measurements. For example the blood circulation in the thumbs of two treatment participants was such that the photodensitometric pulse monitor could not measure the participants' heart rates accurately. This limitation of the electronic instruments is the reason for the differing cell sizes in Table 2. Regarding the self-monitored physiological data, a Week 5 monitoring sheet was not received from one participant. As far as could be determined, the participant had completed the sheet but had submitted it to the wrong place. This accounts for the smaller cell size indicated in the analysis of variance of self-monitored data.

Hypothesis #1

Participants undergoing the self-instructional relaxation training program will demonstrate a lower level of anxiety than the

delayed treatment control group from pretreatment to posttreatment as evidenced by score comparisons on paper and pencil self-report measures.

Findings: Self-Report Measures

Another way of expressing the above hypothesis is in the form of the question: "Did the groups change differentially across time in favour of lowered anxiety levels for the treatment group?" It is, therefore, the Group by Time interaction which is of primary interest in the data analyses.

The analyses of variance with repeated measures on one factor did not show a significant interaction effect for any of the self-report measures used (see Summary Tables in Appendix G). Also, none of the ANOVAR's indicated a significant Group effect. However, the analyses did show a significant Time effect for the IPAT scores [$F(1,30) = 4.98$, $p < .05$]. That is, the treatment group and the control group both had lower IPAT scores at posttreatment (see Table 2). However, as this Time effect was not accompanied by a significant interaction effect it is evident that the two groups did not change differentially across time.

The main observation that can be made about the above data is that although there was a significant anxiety decrement as indicated by IPAT scores, this decrement cannot be attributed to the self-instructional relaxation program because the control group exhibited a

Table 2

Means and Standard Deviations of STAI-S, STAI-T, IPAT Scores

Dependent Measure	Group	n	Time		Total
			Pretreat	Posttreat	
STAI-S	Treatment	14	38.71 (9.39)	40.79 (9.82)	39.75 (9.49)
	Control	18	39.89 (6.02)	43.78 (9.86)	41.83 (8.27)
	Total		39.38 (7.56)	42.47 (9.80)	
STAI-T	Treatment	13	36.39 (10.36)	36.92 (9.36)	36.65 (9.67)
	Control	18	37.06 (9.46)	38.56 (8.56)	37.81 (8.92)
	Total		36.74 (9.68)	37.87 (8.79)	
IPAT	Treatment	14	34.14 (12.19)	31.57 (12.32)	32.86 (12.10)
	Control	18	36.44 (10.62)	32.33 (9.98)	34.33 (10.38)
	Total		35.44 (11.20)	31.94 (10.88)	

Note. Standard deviations are enclosed in brackets here and in all subsequent tables.

similar decrement. In conclusion, there is no corroboration for Hypothesis #1.

Hypothesis #2

Participants undergoing the self-instructional relaxation training program will demonstrate a lower level of physiological arousal than the delayed treatment control group from pretreatment to posttreatment as evidenced by changes in (a) frontal electromyograph levels (EMG), (b) peripheral skin temperature (PST), and (c) heart rate (HR).

Findings: Physiological Measures

By way of introduction to the following section several points should be noted. First, the data for the physiological channels were analysed using a three factor mixed design analysis of variance with repeated measures on the last two factors. The between subjects factor was Group (self-instruction or delayed treatment control). The two within subjects factors were Time (pretreatment or posttreatment) and Stress Profile Condition [four conditions: 1 - the baseline relaxation period at the beginning of the profile (B1), 2 - the first stressor period (S1) 3 - the second stressor period (S2), and 4 - the final relaxation period (B2)].

The second point relates to the probability levels considered to indicate statistically significant results. In the three-way analyses

of the physiological data the F ratio was considered to be significant at the $p \leq .05$ level. In this study the Scheffé post hoc procedure was used in the multiple comparison of means. A significance level of $p \leq .10$ was chosen for the Scheffé procedure for a number of reasons. First, the Scheffé method is considered to be the most rigorous of commonly used post hoc procedures (Ferguson, 1981) with the greatest potential for committing Type II error. Ferguson (1981) suggests that the establishment of a .10 significance level with the Scheffé method represents a compromise between Type I and Type II errors. Second, at present, conventions have not been established for determining criteria for significant changes in physiological functioning in a procedure such as the stress profile. For example, a significant change in frontal EMG could be considered to be a reduction of 2 microvolts or perhaps a decrement in the deviation from baseline level under stressor presentation (Petersen, 1981). The absence of these kind of critera for measures of change makes the choice of a level of statistical significance particularly difficult. Recognizing that such conventions have not been established and that the stress profile procedure is a recent innovation in the measurement of anxiety (Corson et al., 1980), it seems more appropriate to choose a level of significance which has more power to identify potentially important trends in the large volume of data.

Thirdly, as explanations of the findings from the analyses of the physiological variables are easily subject to confusion, the results

pertaining to each physiological function are dealt with separately. The discussion of each function begins with a listing of the significant results. This listing is then followed by descriptive and interpretive statements about significant main effects. Next, statements regarding significant interactions are made. The summaries of the ANOVAR's for these physiological dependent measures are presented in Appendix H.

Electromyographic levels (EMG). The three-way ANOVAR's of EMG data shows the following significant results:

(a) Main effects:

(1) Stress Profile Condition [$F(3,72) = 3.76$, $p \leq .05$]

(b) Interactions:

(1) Group by Time Interaction [$F(1,24) = 3.92$, $p \leq .06$][2]

(2) Group by Stress Profile Condition [$F(3,72) = 6.61$, $p \leq .01$]

(3) Time by Stress Profile Condition [$F(3,72) = 3.76$, $p \leq .01$]

(4) Group by Time by Stress Profile Condition [$F(3,72) = 2.85$, $p \leq .05$]

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[2]This interaction, although not significant at the conventional $p \leq .05$ level, is being considered a significant result in this case due to the exploratory nature of this study. Insofar as conventions have not been established for psychophysiological measurement and the stress profile represents an innovative procedure, it was felt that erring on the side of Type I error was preferable in this borderline case.

An anxiety reaction typically is accompanied by a rise in EMG levels. The analysis indicates that there were no significant differences evident in the main effects Group and Time. However significant differences were evident in the main effect Stress Profile Condition. This would be expected if the cognitive stressors actually functioned as stressors. In order to detect where the specific charges occurred the Scheffé post hoc procedure was used. Applying the Scheffé least critical difference [$\underline{Sch}(3,72) > 0.42$, $\underline{p} \leq .10$] to the EMG Stress Profile Condition means (see Table 3), it is evident that the cognitive stressors elicited significant increases in EMG levels compared to initial baseline levels. That is, considered overall, the stressors functioned as stressors. Also, the second stressor elicited significantly higher EMG levels than the first stressor.

The Group by Time interaction (see Table 4 and Figure 3) indicates that there was a differential change in EMG levels across time. Applying the Scheffé post hoc procedure [$\underline{Sch}(1,24) > 0.42$, $\underline{p} < .10$] it was found that the treatment group exhibited significantly higher EMG levels than the control group at pretreatment, but not at posttreatment. Perhaps more important, the treatment group showed a decrement in EMG levels from pretreatment to posttreatment, while the control group did not.

The Group by Stress Profile Condition interaction (see Table 3 and Figure 4) indicates that the stressors worked differentially

Table 3

Group x Stress Profile Condition Means and Standard Deviations for EMG, PST, HR

Dependent Measure	Group	n	Pre & Post Stress Profile Cond. B1	S1	S2	B2	Total
EMG	Treatment	12	2.06 (0.48)	3.27 (1.44)	3.79 (1.37)	1.98 (0.67)	2.77[b] (1.32)
	Control	14	2.51 (0.73)	3.03 (0.67)	2.28 (0.84)	2.28 (0.77)	2.54[b] (0.79)
	Total[a]		2.21 (0.64)	2.86 (1.15)	3.38 (1.17)	2.15 (0.71)	2.61 (1.07)
PST	Treatment	14	32.09 (2.75)	31.94 (2.60)	31.58 (2.49)	31.22 (2.60)	31.71[b] (2.60)
	Control	17	33.23 (2.60)	32.96 (2.56)	32.52 (2.60)	32.54 (2.75)	32.81[b] (2.64)
	Total[a]		32.71 (2.71)	32.50 (2.61)	32.09 (2.63))	31.94 2.74)	32.31[c] (2.67)
HR	Treatment	12	66.09 (9.93)	71.99 (12.07)	70.94 (12.41)	63.04 (9.65)	68.02[b] (11.50)
	Control	15	69.85 (8.48)	74.63 (11.57)	72.45 (10.89)	65.60 (9.30)	70.63[b] (10.56)
	Total[a]		68.18 (9.26)	73.46 (11.76)	71.78 (11.50)	64.46 (9.45)	69.47[c] (11.04)

[a]Stress Profile Condition
[b]Group
[c]Grand mean for the dependent measure

Table 4

Group x Time x Condition Means and Standard Deviations for EMG (microvolts)

Time	Group	n	Stress Profile Condition				Total
			B1	S1	S2	B2	
Pre	Treatment	12	2.13 (0.50)	3.75 (1.77)	4.13 (1.64)	1.95 (0.65)	2.99[b] (1.57)
	Control	14	2.25 (0.81)	2.49 (0.68)	3.07 (0.90)	2.28 (0.86)	2.52[b] (0.86)
	Total[a]		2.19 (0.67)	3.07 (1.42)	3.56 (1.38)	2.13 (0.78)	2.74[c] (1.23)
Post	Treatment	12	1.99 (0.48)	2.78 (0.85)	3.44 (0.97)	2.01 (0.71)	2.56[b] (0.97)
	Control	14	2.43 (0.66)	2.54 (0.69)	2.99 (0.81)	2.29 (0.58)	2.56[b] (0.72)
	Total[a]		2.22 (0.61)	2.65 (0.77)	3.20 (0.90)	2.16 (0.64)	2.56[c] (0.84)

[a]Time x Stress Profile Condition
[b]Group x Time
[c]Time

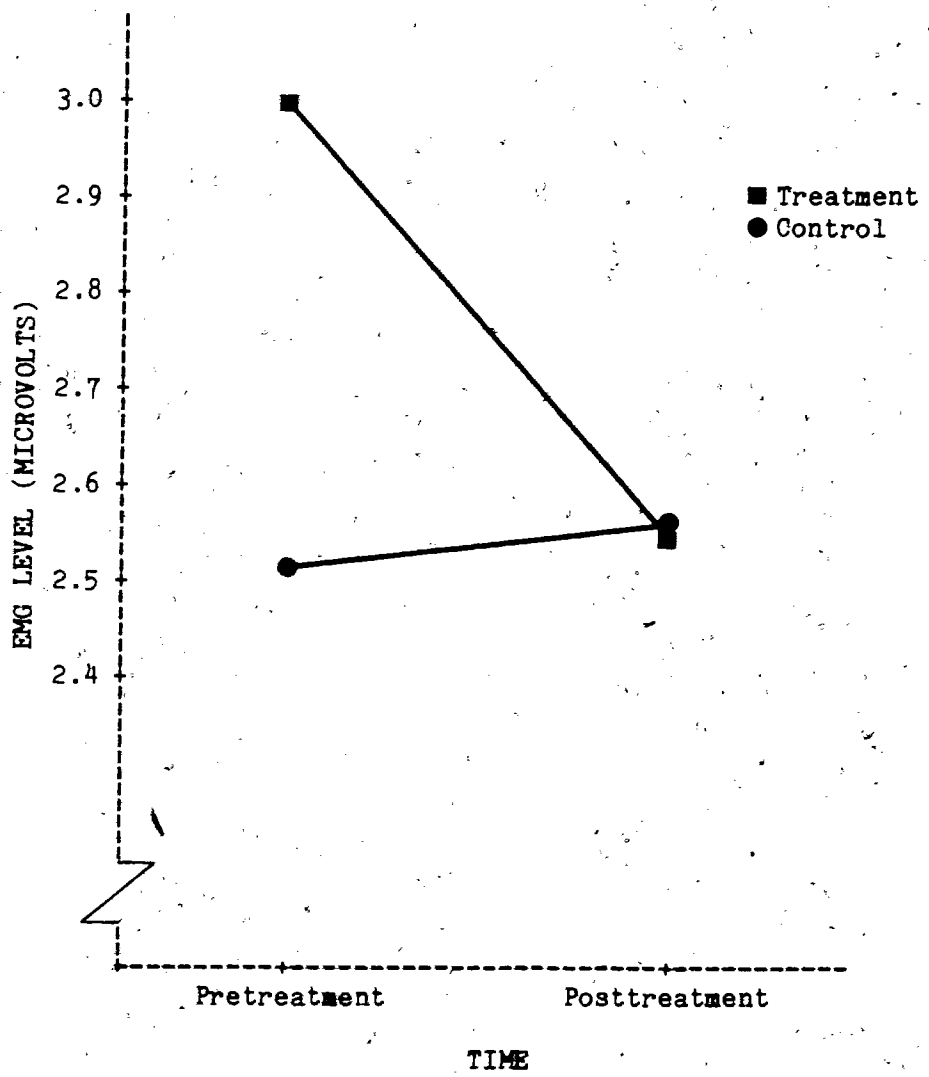

Figure 3. Group by Time interaction, EMG.

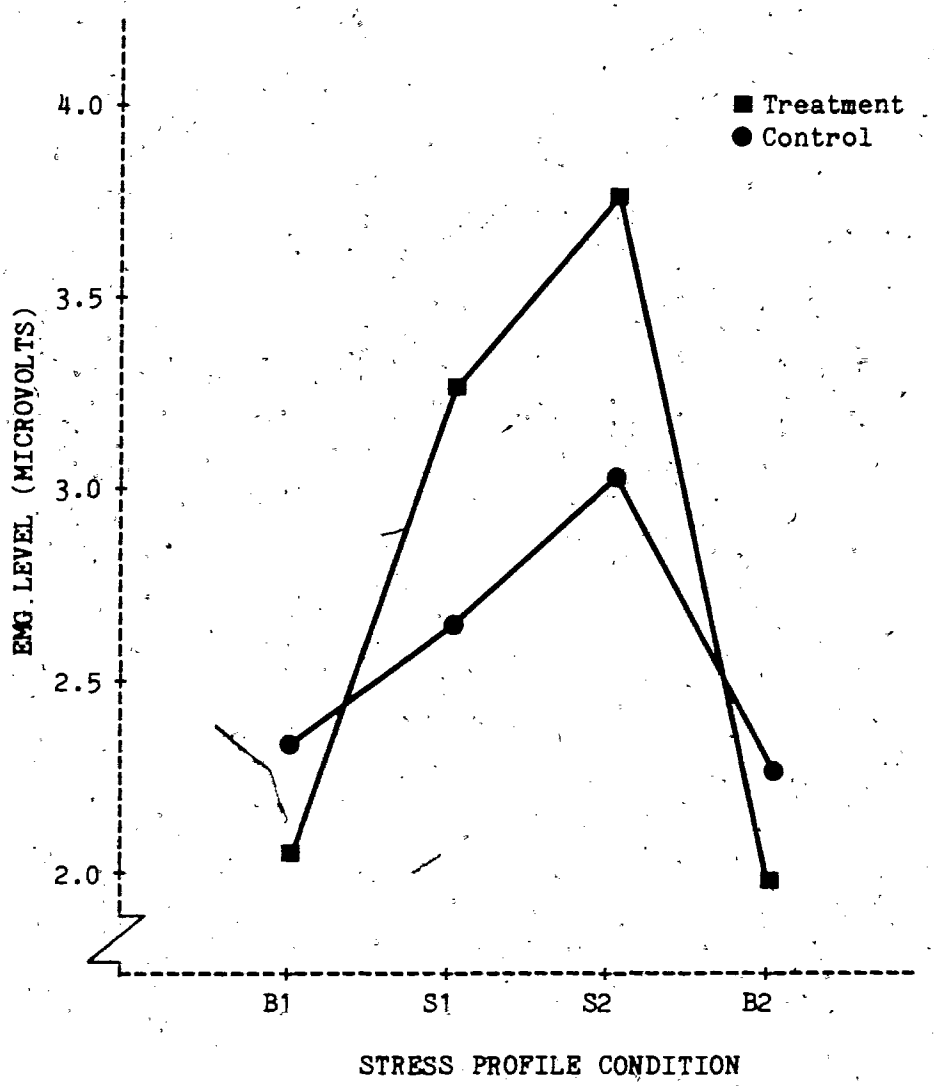

Figure 4. Group by Stress Profile Condition, EMG.

across the two groups. Post hoc analysis revealed that the first stressor functioned as a stressor for the treatment group [Sch(3,72) > 0.62, $p \leq .10$] but not with the control group [Sch(3,72) > 0.58, $p < .10$], whereas the second stressor functioned as a stressor for both groups. Also, the control group reacted to both stressors with EMG levels significantly lower than the treatment group [Sch(3,72) > 0.60, $p \leq .10$].

As the relevant question here concerns whether the groups changed differentially over time, analysis of the Time by Stress Profile Condition interaction (i.e., an analysis collapsed on the Group factor) does not contribute additional valuable information. Discussion will now be turned towards the three factor interaction.

The Scheffé post hoc analysis of the significant Group by Time by Stress Profile Condition interaction supports what has been said previously about the differential effects of the stressors (see Table 4 and Figure 5). However, an additional noteworthy observation is that at posttreatment, the treatment group reacted to the stressors with significantly lower EMG levels than at pretreatment [Sch(3,72) > 0.49, $p < .10$], whereas the control group did not exhibit such decrements.

Conclusions. Results from the analysis of EMG data indicate that the treatment group demonstrated lowered arousal in two ways: (1) a decrement in overall EMG levels from pretreatment to posttreatment and (2) a decrement in reactivity to stressors from pretreatment to

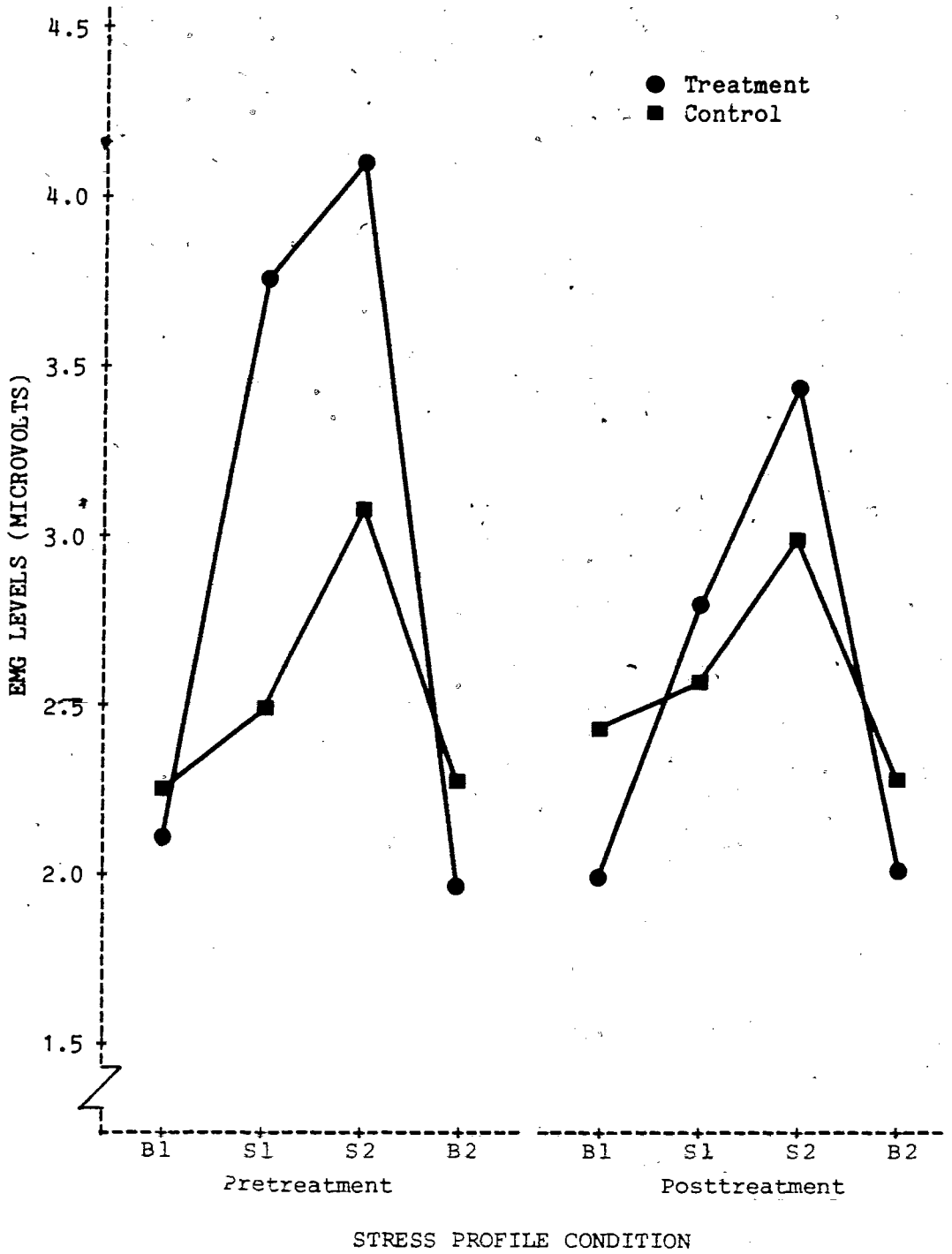

Figure 5. Group by Time by Stress Profile Condition interaction, EMG.

posttreatment. Therefore, in the case of EMG, there is corroboration for Hypothesis #2.

Regarding stressors, the first stressor appears to have functioned as a stressor only with the treatment group, whereas the second stressor appears to have worked for both the treatment and the control group.

Peripheral skin temperature (PST). The three way ANOVAR of PST data shows the following significant results:

(a) Main effects:

(1) Time [$F(1,29) = 8.87$, $p \leq .01$]

(2) Stress Profile Condition [$F(3,87) = 16.48$, $p \leq .01$]

(b) Interactions:

(1) Group by Time [$F(1,29) = 5.39$, $p \leq .05$]

(2) Time by Stress Profile Condition [$F(3,87) = 2.70$, $p \leq .05$]

Typically an anxiety reaction is accompanied by lowering of PST. Analysis of the PST data shows no significant overall Group effect. The analysis does indicate a significant Time effect (i.e., hand warming from pretreatment to posttreatment) (see Table 5).

The accompanying significant Group x Time interaction (see Table 5 and Figure 6) indicates that the two groups warmed differentially across time. A post hoc analysis of Group x Time means was conducted. Surprisingly, it was found that while treatment group PST did not rise from pretreatment to posttreatment, control group PST did rise

Table 5

Group x Time x Condition Means and Standard Deviations for PST (^{o}C)

Time	Group	n	Stress Profile Condition				Total
			B1	S1	S2	B2	
Pre	Treatment	14	32.09 (2.78)	31.91 (2.68)	31.36 (2.52)	30.99 (2.58)	31.59[b] (2.61)
	Control	17	32.39 (2.78)	32.08 (2.62)	31.48 (2.77)	31.42 (2.78)	31.84[b] (2.71)
	Total[a]		32.25 (2.74)	32.01 (2.61)	31.42 (2.62)	31.23 (2.66)	31.73[c] (2.66)
Post	Treatment	14	32.08 (2.81)	31.97 (2.62)	31.80 (2.54)	31.45 (2.68)	31.83[b] (2.61)
	Control	17	34.07 (2.17)	33.83 (2.23)	33.56 (2.24)	33.66 (2.27)	33.78[b] (2.19)
	Total[a]		33:17 (2.67)	32.99 (2.55)	32.76 (2.50)	31.66 (2.67)	32.90[c] (2.57)

[a]Time x Stress Profile Condition
[b]Group x Time
[c]Time

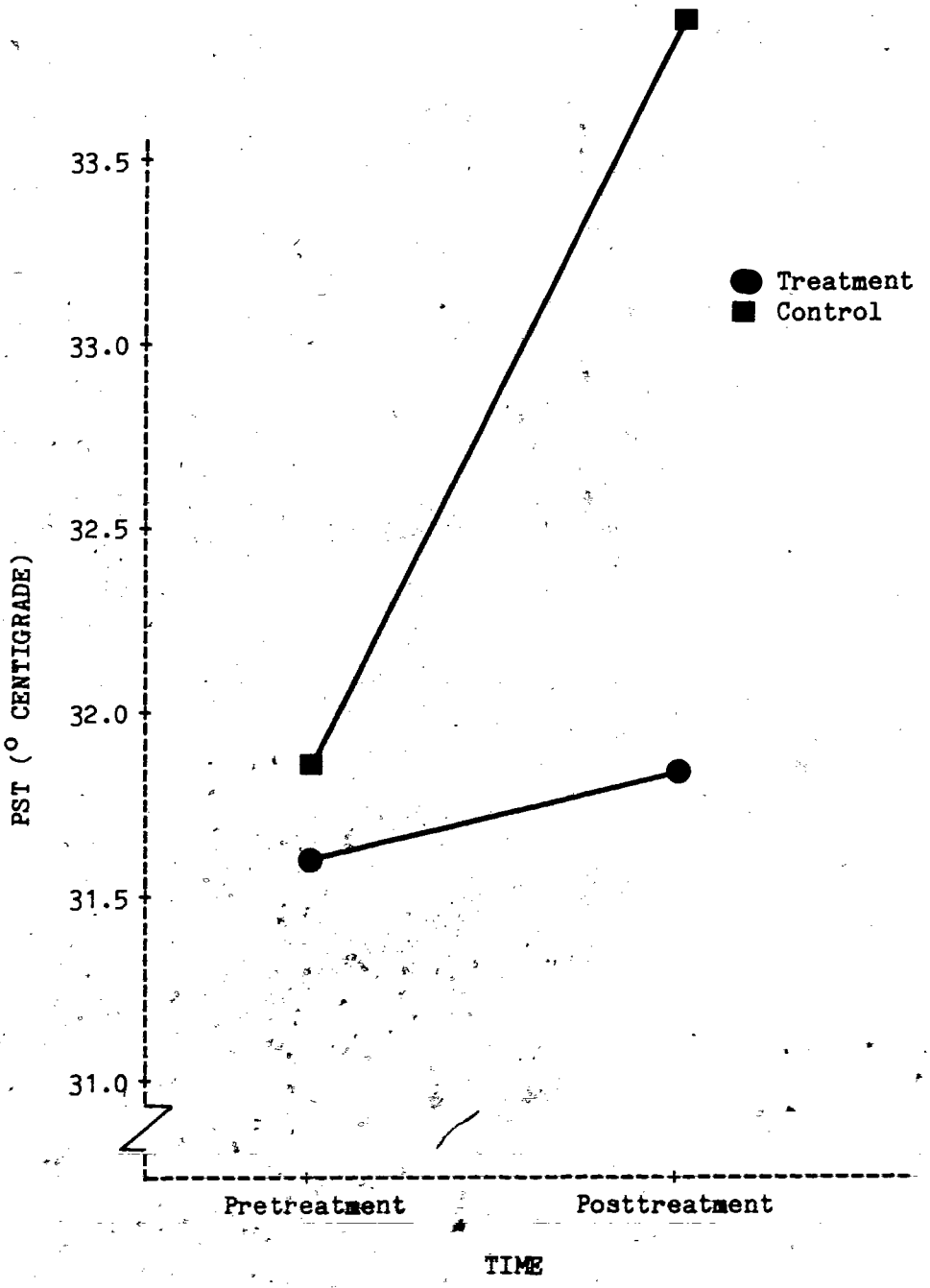

Figure 6. Group by Time interaction, PST.

significantly from pretreatment to posttreatment [Sch(1,29) > 0.83, p < .10].

Regarding the significant main effect Stress Profile Condition, a post hoc analysis of stressor period means (see Table 3) revealed that overall the first stressor did not elicit significant hand cooling, while significant hand cooling did occur during the second stressor period [Sch(3,87) > 0.32, p < .10]. Also, for both groups, PST continued to decrease during the final re-relaxation period rather than rewarm. One implication of these results is that the decrease in PST accompanying the second stressor may have been elicited by the cumulative effect of both stressors rather than by the second stressor alone.

Post hoc analysis of the Time by Stress Profile Condition interaction (see Table 5 and Figure 7) shows that this possible cumulative trend is evident for both groups at pretreatment and posttreatment.

Conclusions. Hypothesis #2 is not corroborated by the analysis of the PST data.

Regarding the stressors, post hoc analysis of the significant Time by Stress Profile Condition interaction indicates that in this case PST reactivity may have been a cumulative response to both stressors.

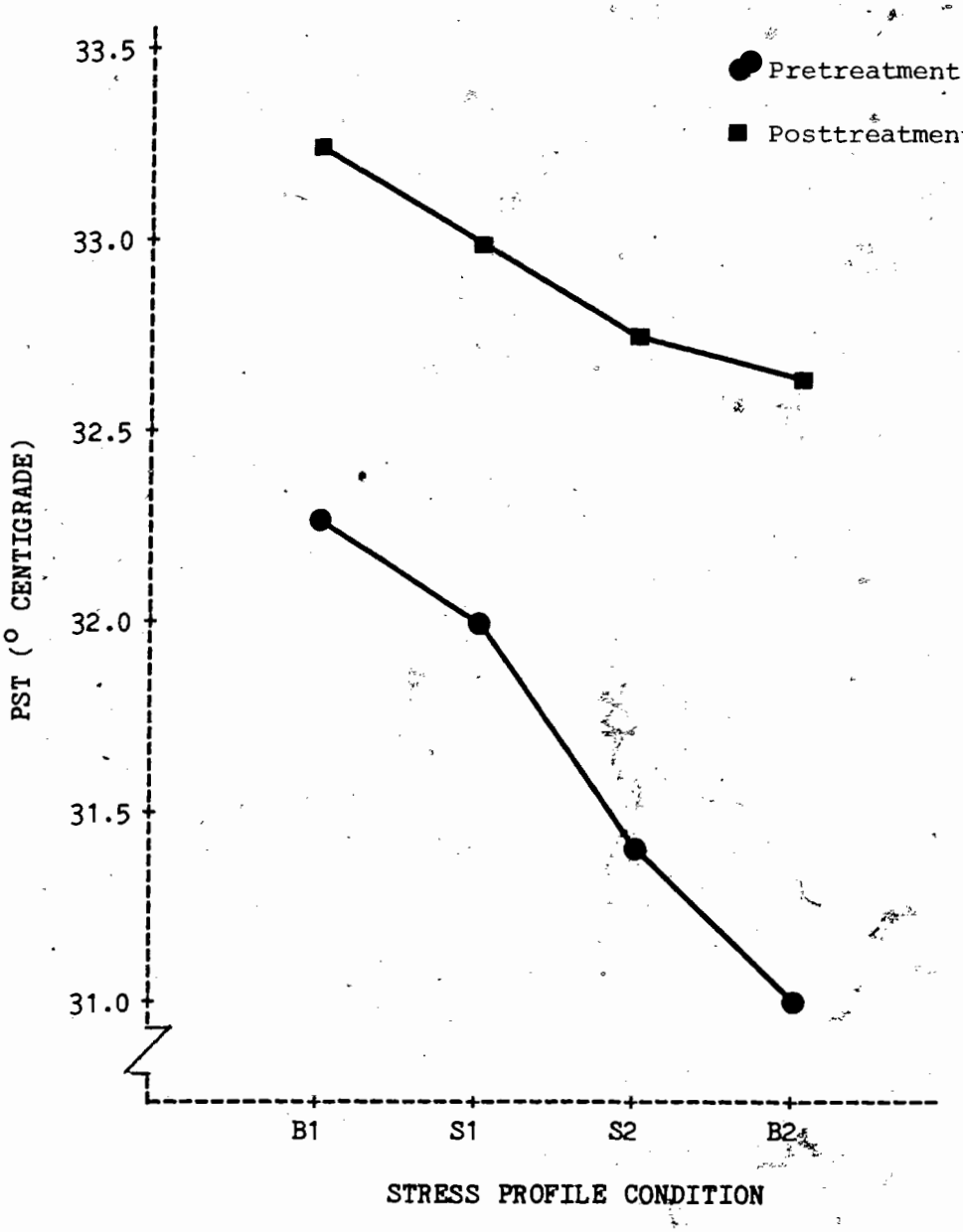

Figure 7. Time by Stress Profile Condition interaction, PST.

Heart rate (HR). The ANOVAR of HR data shows only the following significant result (see Table 6):

(a) Main effect:

(1). Stress Profile Condition [$F(3,75) = 23.84$, $p < .01$]

Inspection of the Stress Profile Condition means (see Table 3) indicates that overall both stressors elicited significant increases in heart rate compared to the initial baseline period [$Sch(3,75) > 2.95$, $p \leq .10$]

Conclusions. The analysis of HR data does not corroborate Hypothesis #2. The analysis does indicate that, overall, both stressors appear to have functioned as stressors.

At this point it would be helpful to summarize the physiological findings. Support for the efficacy of the self-instructional relaxation training program was found in the EMG data but not in the PST or HR data. The stressors functioned effectively in some cases (e.g., with regard to treatment group pretreatment and posttreatment EMG, the second stressor with control group pretreatment and post-treatment EMG, the second stressor with treatment and control group pretreatment PST and generally with HR) but not in other cases (e.g., the first stressor with control group pretreatment and posttreatment PST). Evidence suggests that PST reactivity may have been a response to the cumulative response of both stressors.

Table 6

Group x Time x Condition Means and Standard Deviations for HR (beats/minute)

Time	Group	n	Stress Profile Condition				Total
			B1	S1	S2	B2	
Pre	Treatment	12	66.68 (10.90)	71.39 (12.13)	71.23 (13.25)	62.21 (10.38)	67.88[b] (11.97)
	Control	15	69.05 (9.48)	75.99 (13.68)	71.01 (12.36)	63.51 (10.62)	69.89[b] (12.21)
	Total[a]		68.00 (10.00)	73.94 (12.98)	71.10 (12.51)	62.93 (10.33)	68.94[c] (12.09)
Post	Treatment		65.50 (9.30)	72.59 (12.52)	70.66 (12.09)	63.87 (9.24)	68.15[b] (11.15)
	Control		70.65 (7.60)	73.27 (9.20)	73.90 (9.39)	69.69 (7.54)	71.38[b] (8.64)
	Total[a]		68.36 (8.63)	72.97 (10.62)	72.46 (10.58)	65.99 (8.40)	69.95[c] (9.92)

[a]Time x Stress Profile Condition
[b]Group x Time
[c]Time

Additional Analyses

Pretreatment Group Differences

Data collected in the Pre-Training Survey were analyzed to determine whether there were differences between the treatment group and the control group at pretesting. T-tests for uncorrelated samples were conducted on scores from items intended to determine: self-assessed anxiety level, self-assessed relaxation skill level, outcome expectancy level, and consumption of caffeine, and alcohol. According to these analyses there were no significant differences between the two groups on these demographic variables (see Appendix I).

One pretreatment group difference has already been noted in the analysis of the physiological data. In the case of EMG, the treatment group reacted to the stressors with muscle tension levels significantly higher than the control group.

Self-Monitored Physiological Data

As mentioned in the previous chapter, treatment participants were requested to measure and record three physiological indicators of relaxation (i.e., heart rate, respiration rate, and finger temperature). Participants were instructed to collect these data before and after their daily practice sessions for the duration of the five week training period (see example recording sheet in Appendix E). The main purpose in collecting these self-monitored data was to assess the data's usefulness as a potential dependent measure in research of this nature.

Validity of self-monitored data. To assess the validity of participants' self-monitored data, a comparison test was conducted as part of the post-testing session. Participants were sequentially asked to monitor their heart rates, respiration rates, and finger temperatures, as they normally did before and after their at home practice sessions. As they monitored their heart rate and finger temperatures, these indicators were simultaneously monitored electronically. Visual monitoring of chest movement by the experimenter served as the comparison check for participant-monitored respiration rate. Pearson product-moment correlations between the self-monitored and machine/experimenter monitored data were then calculated. The correlation coefficient for heart rate was $r = .95$; for respiration rate, $r = .97$; and for finger temperature $r = .92$. These high correlation coefficients suggest that participants were capable of monitoring these physiological indicators in a highly reliable fashion.

Analysis. Treatment participants recorded a Prepractice measure, a Postpractice measure, and a difference score for each indicator daily (see Appendix E). The data was analyzed in the following way. First, for each treatment participant, the means of the Prepractice scores for each indicator was calculated for each of the five weeks of the training period. So with heart rate for example, for each participant the mean of the Prepractice heart rate scores for the number of practice sessions in Week 1 was calculated, then Week 2, and

so on. This was done for the Postpractice scores for each indicator as well. Consequently, each participant contributed 5 Prepractice scores (i.e., one mean score for each of the five weeks) and 5 Postpractice scores for each indicator to the final analyses. Finally two factor (within group) ANOVAR's (Prepractice/Postpractice by Time) were conducted for each of the three indicators (see Appendix J for Summaries of these ANOVAR's).

There was no significant Time effect evident in any of the three indicators.

In the case of all three indicators the Prepractice/Postpractice main effect was significant [heart rate : $F(1,12) = 51.96$, $p \leq .001$; respiration rate : $F(1,12) = 29.18$, $p \leq .001$; finger temperature : $F(1,12) = 9.58$, $p \leq .01$]. That is, from Prepractice to Postpractice participants consistently reported significant changes in the magnitude of the measures of heart rate , respiration rate , and finger temperature in the direction of increased relaxation (see Table 7).

However the more important question in this analysis is: "Did the participants' ability to relax (as evidenced by this self-monitored data) increase over time?" Thus it is the Prepractice/Postpractice by Time interaction which is of particular interest here.

Significant Prepractice/Postpractice by Time interactions occurred with respiration rate [$F(4,48) = 2.59$, $p \leq .05$] and with finger temperature [$F(4,48) = 3.65$, $p \leq .01$]. In the case of respiration rate no additional valuable information was derived from

Table 7

Treatmant Group Means and Standard Deviations for Self-Monitored Physiological Indicators Over Five Week Training Period

Indicator	Measure	Week 1	Week 2	Week 3	Week 4	Week 5	Total
Heart Rate (beats/min)	Pre-practice	64.84 (8.99)	66.14 (9.72)	64.31 (9.21)	64.92 (8.03)	65.30 (9.23)	65.10 (8.79)
	Post-practice	60.26 (9.22)	62.14 (9.25)	60.75 (9.21)	61.02 (8.53)	61.85 (8.76)	61.20 (8.74)
	Total	62.55 (9.23)	64.14 (9.52	62.53 (9.205)	62.97 (8.36)	63.57 (8.99)	
Resp. Rate (breaths/min)	Pre-practice	13.30 (2.57)	12.71 (3.39)	12.39 (2.55)	12.50 (2.87)	12.88 (2.99)	12.75 (2.82)
	Post-practice	11.16 (2.43)	10.69 (2.44)	10.70 (2.24)	11.32 (2.70)	10.90 (2.61)	10.95 (2.43)
	Total	12.23 (2.68)	11.70 (3.07)	11.55 (2.50)	11.91 (2.80)	11.89 (2.93)	
Finger Temperature (^{o}F)	Pre-practice	83.87 (7.99)	82.63 (8.42)	81.73 (8.96)	83.58 (7.41)	84.35 (8.23)	83.23 (8.01)
	Post-practice	85.45 (6.70)	85.59 (6.57)	86.16 (7.05)	87.51 (5.72)	87.99 (7.12)	86.54 (6.52)
	Total	84.66 (7.27)	84.11 (7.55)	83.95 (8.22)	85.54 (6.79)	86.17 (7.76)	

Note. n = 13

the Scheffé post hoc analysis [Sch(4,48) > 1.62, $p \leq .10$]. Post hoc analysis of the finger temperature data shows that at Prepractice finger temperatures declined from Week 1 to Week 3 [Sch(4,48) > 1.66, $p \leq .10$] and then increased from Week 3 to Week 5 (see Table 7 and Figure 8). However, Postpractice temperatures show a steady increase over time with significant differences between the Week 1, 2, and 3 means and the Week 4 and 5 means. The difference between the Prepractice and Postpractice temperatures was not significant for Week 1, whereas these differences were significant from Week 2 to 5. Also the numerical magnitude of the differences between Prepractice and Postpractice means shows a steady increase from Week 1 to 3.

In summary, the steady increase in Postpractice temperature and the increase in the magnitude of the differences between Prepractice and Postpractice temperatures suggest that the participants did increase their ability to relax through regular practice.

Intercorrelations Among Dependent Measures

Seven dependent measures were used in this study: three pencil and paper self-report measures (i.e., STAI-S, STAI-T, IPAT) and four psychophysiological stress profile measures (i.e., EMG, GSR, PST, HR) each with four conditions. As was mentioned the GSR data were not used in the analysis. A correlation matrix of dependent measures is presented in Appendix K. Using a probability criterion ($p \leq .05$), it is evident that STAI-S scores correlated highly with all measures of PST. IPAT scores correlated significantly with HR during stressor

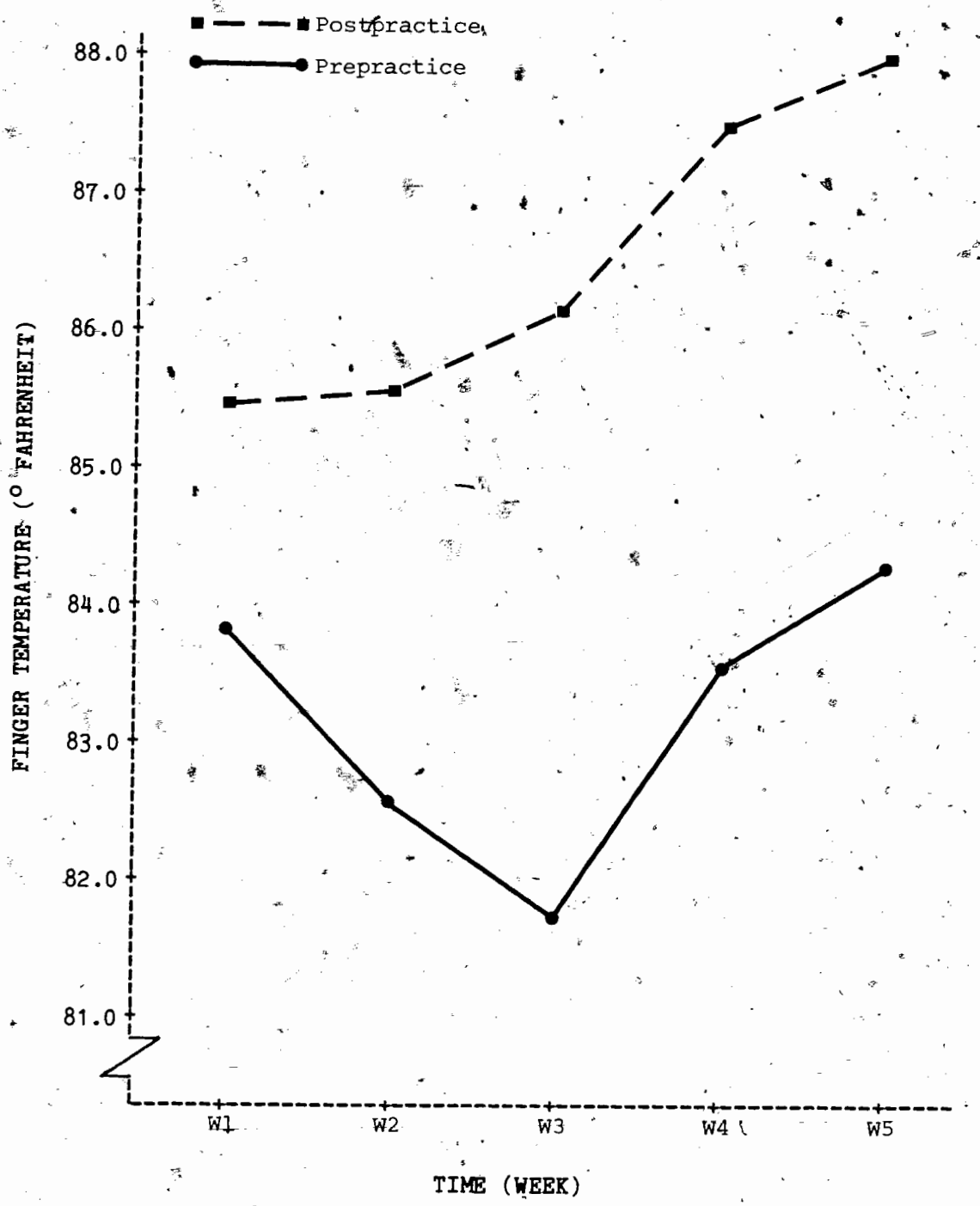

Figure 8. Prepractice/Postpractice by Time (Week), finger temperature.

periods. Also HR and EMG correlated highly during stressor periods.

Demographic Variables

For exploratory purposes, ANOVAR's were conducted to test whether treatment outcome may have been related to the demographic variables age and sex. The results of these analyses indicated that these demographic variables were not significantly related to treatment outcome. However it is difficult to make any conclusions based on these analyses due to the very small cell sizes involved.

Additional Findings

Of interest was the question of whether caffeine consumption and alcohol consumption had changed over the treatment period (see Table 8 for descriptive statistics). Two-way ANOVAR's (Group x Time) were conducted on scores designed to measure these variables. Results of these analyses indicate that there was a significant decrease in caffeine consumption for both groups from pretreatment to posttreatment [$F(1,30) = 13.95$, $p \leq .01$] (see Appendix L for a Summary of this ANOVA).

Summary of Statistical Results

In general the results of this study can be divided into three sections: 1) statements about the treatment, 2) statements about the assessment procedures used, and 3) statements about additional findings.

Findings concerning the treatment will be summarized first.

Table 8

Means and Standard Deviation of Demographic Variables

Variable		n	Means T_1/SD	Means T_2/SD
Caffeine consumption	Treatment	14	1.21/(0.80)	0.86/(0.83)
	Control	18	1.50/(0.71)	1.22/(0.73)
Alcohol consumption (frequency)	Treatment	14	1.50/(0.86)	1.57/(0.94)
	Control	18	2.00/(1.03)	2.11/(1.13)
Alcohol consumption (magnitude)	Treatment	14	0.86/(0.54)	1.22/(0.55)
	Control	18	0.86/(0.54)	1.11/(6.47)

Note. See Pre-Training Survey in Appendix C for magnitude of units of above variables: caffeine consumption - see question 13, alcohol consumption - see questions 14 and 15.

Results of the cognitive (i.e., pencil and paper) measures do not support the efficacy of the self-instructional relaxation training program. Of the physiological functions measured, the EMG data do provide support for treatment efficacy. Considered overall, the greater portion of the data from the seven dependent measures does not corroborate treatment efficacy.

Regarding assessment procedures, it was found that, overall, the correlations between the results of the cognitive dependent measures and the results of the physiological measures were low. Also, correlations between physiological dependent measures generally were low. Analyses of the results of the psychophysiological stress profile indicate that there were no instances in which both cognitive stressors elicited a statistically significant arousal response for both groups at pretreatment. These results raise some questions about the effectiveness of the stressors used in the psychophysiological stress profile procedure.

Several additional findings are of interest. First, no pretreatment differences between groups are indicated by the analysis of Pre-Training Survey and the pencil and paper dependent measure data. However analysis of the psychophysiological stress profile data shows that, at pretreatment, the treatment group reacted to the stressors with muscle tension levels significantly higher than those of the control group. It appears that participants are capable of self-monitoring physiological indicators in a highly accurate manner.

Of the self-monitored data, the finger temperature data provide corroboration for the efficacy of the treatment.

CHAPTER V

DISCUSSION AND IMPLICATIONS

Subjective Reports

The statistical results of this study are summarized in the previous chapter. However, there arises the question of the difference between statistically significant results and subjective reports of change. Stated in other words the question is: "Disregarding statistical results, did people change during the treatment?"

Two questions in the Post Five Week Survey were designed to solicit anecdotal data on clinical change (see Appendix D for a copy of the Post Five Week Survey, questions D.1. and F.5.). In response to these open ended questions three participants reported a decrease in their general level of tension and in their tension in anxiety producing situations. One of these participants, who reported that she was very test anxious, wrote that she "thought that a particular time in July would have been stressful with exams and papers all due at the same time, yet this didn't happen; I sat three exams in one day and didn't experience much tension." Three people reported feelings of increased energy. Four participants said their level of awareness of their body being tense or relaxed was significantly increased. Overall, these self-reported data suggest that clinically significant changes did occur during the course of the training program.

Another relevant question is: "Regardless of statistical results, how beneficial did participants perceive the treatment to be?" Two items in the Post Five Week Survey provide data relevant to this question. Participants were requested to respond to these questions on a five point Likert scale (i.e., marking responses from 0 to 4). The mean of responses to the question "How beneficial was this relaxation program in helping you to reduce your anxiety?" was 2.28. This indicates that, on average, participants felt the treatment had resulted in a moderate degree of change. Likewise, the mean response to the question: "Would you recommend this program to one of your friends?" was 3.36, an even higher figure. This suggests that participants' satisfaction with the degree of change attributed the program was high. The discrepancy between the means of the responses to these two questions may be due to a number of reasons. First, the response scales of these two questions may not be equivalent. Second, participants may not have performed their at home practice sessions as diligently as intended and consequently thought that if they had practiced diligently the program would have benefitted them more. Third, participants may have perceived the treatment period to be short and thought that the program would show even greater benefits as they continued to practice after posttesting.

Overall, the data garnered from the Post Five Week Survey indicate that clinically significant participant change did occur. Moreover, the results from the Post Five Week Survey suggest a higher

degree of participant change than that suggested by the statistical analysis of the dependent measure data.

Discussion of the Results

Before discussing the results it will be helpful to review briefly the rationale and purposes of the study. In Chapter II, two conclusions were drawn from the review of the literature: 1) generally, relaxation training which emphasizes self-control and application training is effective in reducing anxiety; and 2) in some cases, self-instructed treatments could be as effective as counsellor-directed treatments. The main purpose of this study was to determine whether a self-instructional format could be used effectively to administer relaxation training. An attempt was also made to rectify two pervasive shortcomings of previous research. In this study, physiological indicies of relaxation were assessed. Also, a method for determining program adherence was used.

The findings of this study suggest that the self-instructional relaxation training program did result in significant increases in treatment participants' ability to relax. This conclusion is supported by the observed posttreatment decrease in participants' EMG reactivity to stressors, by the progressive increase in participants' ability to warm their hands over the duration of the treatment period (as indicated by participant-monitored finger temperature data), and by data gathered from the Post Five Week Survey. However, the

question remains: "Why didn't the self-instructional relaxation training program demonstrate more consistent success across all the dependent measures?"

The discussion of the results will be presented with this question in mind. Discussion will focus on probable contributing factors related to: a) treatment content, b) the procedures used in administering the treatment, c) the methods used in assessing participant change, and d) the selection of participants.

Treatment Content

In Chapter II, two components of the self-instructional relaxation training program were identified: the content component and the method of administration component. An important question concerning the content component is: "Could treatment content be responsible for the program not showing more successful results?" In addressing this question it is helpful to remember that the content of the self-instructional relaxation training program was intentionally designed to include those components which previous research had demonstrated were effective. In other words a component analysis of the self instructional relaxation training program indicates that the content of the program used in this study is markedly similar to the content of other relaxation training programs which have resulted in statistically significant treatment effects. Thus it does not appear that treatment content is implicated in the lack of more successful

results.

A variable related to treatment content is treatment length. Accordingly, the question relevant to this study is: "Was the program of sufficient length to produce a relaxation training effect?" In this study, the criterion for inclusion in the data analysis was a minimum of 30 practice sessions spread over 35 days. This criterion appears to exceed the number of practice sessions required in most other studies which have demonstrated significant treatment effects (see reviews by Borkovec & Sides, 1979; and King, 1980). Thus it would be difficult to argue that the length of treatment in this study was not long enough for participants to learn how to relax. The conclusion again is that treatment content components are probably not responsible for the lack of more consistent results.

At the same time, research has not yet provided a conclusive answer to the question: "How frequently over how long a period of time does a trainee need to practice relaxation in order to learn how to relax?" Hence, it is recommended that future investigators undertake to compare the effectiveness of various lengths and intensities of relaxation training regimes.

Method of Administration

One objective of this study was to test the self-instructional relaxation training program under conditions which closely approximated those of the program's intended target usage. Problems

which have been associated with this type of self-administered treatment are those of high participant attrition rates and poor program adherence. Glasgow and Rosen (1978) conclude that, on average, 50% of participants in self-help fear reduction programs failed to complete treatment.

In this study two procedures were employed to help maintain program participation: the weekly telephone monitoring call, and the weekly submission of self-monitored physiological data forms. Of the 26 participants who began using the self-instructional relaxation training program, 8 or 30.8% dropped out. This is a substantially lower attrition rate than the typical rate cited by Glasgow and Rosen (1978). This evidence corroborates the effectiveness of these two procedures in maintaining program participation.

Although participants were told that the self-monitoring of physiological data was important for data analysis purposes, another reason for having participants submit data sheets was to assess whether participants did in fact follow home practice instructions. The data sheets provided a picture of individual adherence to the program from week to week. However, the use of the self-monitored data sheets to assess degree of program adherence assumes that participants completed the data sheets reliably and honestly. It is difficult to ascertain whether this assumption is entirely valid. The previous conclusion that treatment content was not implicated in the lack of more significant results does raise suspicion concerning the

diligence with which participants followed home practice instructions. For example, it is possible that participants could have indicated on the data sheets that they had practiced relaxation (by filling in false numbers) when in fact they had not. It is not known whether participants completed the entire relaxation practice sequence or perhaps abbreviated it in some way. There was also no procedure whereby participants could indicate whether cognitive activity (e.g., worry) interfered with the level of relaxation achieved through practice. So even if participants indicated by their completion of the self-monitored physiological data forms, that they had followed home practice instructions, it is possible that the training effect of practice sessions could have been reduced through abbreviation or cognitive interference.

Variability in the 'quality' of the at-home practice is thus suggested as an important factor contributing to the lack of stronger evidence for program efficacy. It is recommended that future researchers endeavor to devise report procedures to control for the possible effects of abbreviation and cognitive interference, and to reduce the likelihood of deception.

Dependent Variable Assessment

In this study an attempt was made to implement recent recommendations (Mahoney, 1978; Barlow & Wolfe, 1981) to conduct assessments of treatment efficacy using measures which access more

than one assessment domain. In addition to pencil and paper self-report measures (i.e., cognitive measures) physiological variables were assessed by means of the psychophysiological stress profile and participant self-monitoring.

Pencil and paper self-report measures. Results of the STAI-S, STAI-T, and IPAT do not indicate that the self-instructional relaxation training program was effective. At the same time, results from these pencil and paper (cognitive) assessment measures did not correlate highly with results from the stress profile (physiological) measures (e.g., with EMG data in which support was found for treatment efficacy). One explanation to account for the results of the cognitive measures and the desynchrony between cognitive and physiological measures relates to the contention that treatments directed at alleviating the cognitive components of the anxiety reaction may produce more variance in cognitive assessment procedures (such as pencil and paper measures of anxiety) whereas physiologically oriented treatments (e.g., deep muscle relaxation training) might produce more variance in physiological measures (Borkovec & Sides, 1979). To the degree that this contention might be valid it is not surprising that the self-instructional relaxation training program (primarily a physiological treatment) did not produce significant variance in the pencil and paper measures.

Psychophysiological stress profile. Of the results obtained from the psychophysiological stress profile, it is the EMG data which

corroborate treatment efficacy. The question arises: "Why didn't the self-instructional relaxation training program demonstrate more consistently significant results across physiological functions monitored?"

The lack of consistent results across physiological functions could be due to a number of factors. The most important of these factors concerns the individual characteristics of participants' physiological responding. One explanation developed to account for inconsistency in physiological responding patterns is "individual response stereotypy". Individual response stereotypy refers to the tendency of an individual to exhibit a consistent but ideosyncratic pattern of autonomic response to stressors. In other words, one person might respond to a range of stressors with increased muscle tension as the dominant reactive physiological modality, while another person might respond to the same range of stressors with increased heart rate as the dominant reactive modality. Evidence for individual response streotypy has come from the work of Lacey and Lacey (1958), Patton (1969) and Knight and Borden (1979).

Individual response stereotypy could account for the lack of consistently significant results obtained by the stress profile procedure in a number of ways. For example, it is possible that the cognitive stressors used in the procedure were not ones which typically elicited significant changes in the monitored physiological functions of the majority of participants. If, by chance,

participants assigned to the treatment group in this study were people who typically did not respond to stressors with muscle tension (EMG) as their dominant physiological reactive modality, then it is understandable that a treatment aimed at training deep muscle relaxation would be less likely to produce significant reductions in EMG reactivity. Another way individual response stereotypy could contribute to nonsignificant results is through participant assignment to treatment groups. For instance, if the treatment group in this study were composed of equal proportions of people who had different dominant reactive modalities (e.g., EMG, PST, HR) then statistically significant pretreatment/post-treatment differences would be less likely to result due to a balancing out of dominant reactive modalities across phyisological modes measured. In the same way, the assignment of varying proportions of participants with different dominant reactive modalities to an experimental group might also contribute to group results that indicate desynchrony among physiological modes monitored.

Therefore, it is recommended that future investigators endeavor to control for the possible effects of individual response stereotypy in a number of ways. These include: (a) determining an individual's responding characteristics before selection as a participant and assignment to group, (b) assigning participants to a treatment group based on participants' dominant reactive physiological modalities, (c) selecting stressors on the basis of the stressor's ability to elicit

significant heightened arousal in the dominant reactive modality, and (d) determining the effectiveness of treatment primarily on the basis of changes in the dominant reactive modality. If implemented in a future study investigating the self-instructional relaxation program, these recomendations would require a prescreening psychophysiological stress profile to be conducted in addition to administering pretreatment and posttreatment dependent measures. It is also suggested that individuals with EMG as their dominant reactive modality be selected for treatment (as the self-instructional relaxation training program is primarily directed at increasing skill at deep muscle relaxation). Admittedly, the resources required to fulfill these requirements using a multigroup comparison design would be substantial.

Another factor affecting the results of the psychophysiological stress profile is the way in which the procedure is scored. In this study the analysis of stress profile data compared the means of treatment and control group EMG levels (in microvolts), peripheral skin temperature (in degrees centigrade) and heart rate (in beats per minute). In evaluating the appropriateness of this scoring and analysis procedure it is helpful to acknowledge two points. First, criteria which indicate significant changes in physiological functioning (in terms of microvolts, degrees centigrade, and beats per minute) have not as yet been established. Second, the range of "normal" responding (in terms of these units) among individuals is

substantial. It would thus seem that a more appropriate way to score the results of the psychophysiological stress profile would be to use an index which compares an individual's physiological responding in the profile's four stimulus conditions to the range of within-individual, within-profile responding, and then determine intergroup differences on the basis of these indices. One index which would compare an individual's physiological responding to itself would be the amount of deviation from baseline during stressor presentation. Another index might be the rate of recovery from stressors. It is thus recommended that future relaxation research using the stress profile devise indices to measure deviation from baseline during stressor presentation and recovery rate and use these indices in making intergroup comparisons.

Self-monitored data. One of the objectives of this investigation was to explore the feasibility of using self-monitored physiological data as a dependent measure in relaxation research. In this study, the use of self-reported, self-monitored data was shown to offer a number of substantial advantages. Foremost is the advantage of providing the investigator with a great many more data points (compared to a pretreatment/posttreatment data collection design) with which to measure participant progress through the course of the treatment period. The prepractice/postpractice recording of self-monitored data also offers the possibility of comparing the effectiveness of individual (or a grouping of individual) practice

sessions. It was the availability of this type of data which permitted the conclusion to be drawn that self-monitored finger temperature data supported the efficacy of the self-instructional relaxation training program. A third and very compelling advantage of self-monitored physiological data concerns expense. In terms of the technological and human resources required, the administration of the psychophysiological stress profile is a very expensive way of collecting dependent measure data on physiological functioning. On the other hand, this study has demonstrated that self-monitored physiological data represents a very economical way to obtain potentially accurate data on physiological functioning. The desirability of gathering data on physiological functioning and the economy of gathering self-monitored physiological data represent arguments in favour of future research utilizing self-monitored physiological data as a dependent measure.

Participant selection. An issue related to participant selection is that of whether the treatment employed in this study was the most appropriate treatment for the participants. To illustrate this issue, a number of participants indicated in the Pre-Training Survey (see Appendix C) that they expected the program to decrease their test anxiety and/or their anxiety associated with writing term papers. While it is possible that this kind of performance anxiety might be a generalized conditioned response to evaluation situations, it is also possible that the anxiety reaction accompanying these tasks might be a

logical consequence of real skill deficiencies in the areas of performance. The treatment employed in this study was not aimed at improving academic skills nor was the sample screened for study skills deficits. To the degree that participants' levels of anxiety were consequences of performance skill deficiencies, the self-instructional relaxation training program would not likely be effective in reducing participants' anxiety levels. This could be one of the reasons for lack of more supportive results especially on the cognitive dependent measures. Therefore it is recommended that future investigations of the program include procedures which are capable of screening out potential participants whose anxiety levels are primarily consequences of factors which are not addressed by the program.

Conclusions and Directions for Future Research

The fundamental question in the assessment of the effectiveness of the self-instructional relaxation training program is whether or not the treatment participants' increased their ability to relax. Although other interpretations are possible, it is concluded here, based on the EMG and the self-monitored physiological data, that the self-instructional relaxation training program did result in significant increases in participants' ability to relax. Factors which may have contributed to the lack of more consistently supportive results have been discussed in detail.

Perhaps the most significant findings of this study relate to the

two secondary objectives of this study, that is: to assess physiological correlates of relaxation and to employ a method for determining program adherence. Experience with the procedures used to achieve these objectives has given rise to a number of important suggestions for future research.

One of the future directions suggested is that of developing the psychophysiological stress profile as a dependent measure. Specific recommendations for using the stress profile to control for the effects of individual response strereotypy and for scoring the stress profile have already been made.

Another direction for future research concerns the use of self-monitored physiological data both as a means of assessing physiological correlates of relaxation and as a means of maintaining program participation in a self-instructed treatment. The results of this study clearly demonstrate the potential advantages of using self-monitored physiological data for these purposes. Research attention now needs to be focused on employing these data as dependent measures and on determining the most appropriate statistical procedures with which to analyse such data.

The third recommendation is for researchers to work towards implementing a criterion research design to measure the effectiveness of relaxation training. To date, studies testing the effectiveness of relaxation training programs have employed fixed time pretreatment/posttreament designs. In these designs, participants' anxiety levels

are assessed at pretreatment, the treatment is administered, and then participants' anxiety levels are assessed after a fixed period. Inferential statistical analysis of the data are conducted and conclusions are made on the basis of these analyses. Results from experiments using this type of design have not contributed substantially to answering a number of basic questions such as: "What is the meaningfulness of a physiological change significant at $p \leq .05$?", "How do we know when a person is relaxed?" and "How long does it take a person to learn how to relax?". An alternative approach would be to employ a criterion level design. In this type of design, participants would be pretested to ascertain the level of their physiological functioning. Participants would then begin treatment and continue to receive treatment until they could demonstrate a pre-established physiological criterion level of relaxation skills. Probably, the main reason why physiological criterion level designs have not been used in testing the effectiveness of relaxation training has been the lack of established physiological criteria to measure relaxation skill. It is suggested here that research aimed at establishing such physiological criteria be considered a priority. Investigation aimed at determining such criteria would not only benefit researchers but would represent a significant contribution to clinical practice. Some of the initial work in establishing physiological criteria for biofeedback training (e.g., Asterita, Smolnicky & Iatridis, 1981; Budzynski, 1973; Corson, Schneider, Biondi

& Meyers, 1980; Petersen, 1981) and the previous discussion on scoring the stress profile might be consulted as starting points. It is the contention of this author that continued concentration on fixed period pretreatment/posttreatment designs will only serve to divert attention and resources away from this important goal.

Mahoney (1978) has asserted that, compared to positive results and successful predictions, negative or ambiguous results and predictive failures have far reaching implications. The findings of this study, although somewhat mixed, do have some far reaching implications for future anxiety/relaxation research. Some of these have been presented. Further work in the directions suggested holds the promise of substantial gains in ability to manage anxiety in the future.

APPENDIX A

PARTICIPANT INFORMATION SHEET

AND

CONSENT FORM

Instructional Psychology Research Group
Faculty of Education
Simon Fraser University
Burnaby, B.C., Canada
V5A 1S6

(604) 291-3395

INFORMATION SHEET

In May, June and July 1981, Dr. Bryan Hiebert in the Counselling Psychology program of the Faculty of Education, will be coordinating a research project. The purpose of the project is to test the effectiveness of various relaxation training procedures.

Those taking part in the study will learn a method for producing deep relaxation at will. Before and after the relaxation training, physiological reactions will be measured and participants will fill out two questionnaires which will measure anxiety. At the start, instruments will measure the participant's hand temperature, muscle tension, heart rate and sweat gland activity, while participants relax and while they perform some mental tasks (reading and arithmetic). Participants will then learn a method of producing deep relaxation by following a relaxation training program; the physiological measures will then be taken again in order to determine how deeply participants have learned to relax.

The whole process will involve two one and one-half hour sessions (to record the physiological measures and fill out the questionnaires), a daily twenty minute practice period for five weeks (which each participant conducts alone at their own convenience), and one contact per week (from 15 minutes to 1 hour) with a project assistant. At the end of the study, participants will have learned a procedure that will help them relax and control stress and anxiety.

The research project has been approved by the University Ethics Committee at Simon Fraser University.

Anyone who wishes more information may telephone Mr. Larry Dumka at 526-7553 or 291-4344 (messages), Jim Cardinal at 291-3389, or Dr. Bryan Hiebert at 291-3389.

Instructional Psychology Research Group
Faculty of Education
Simon Fraser University
Burnaby, B.C., Canada
V5A 1S6

(604) 291-3395

CONSENT FORM

I, _____, have read the accompanying information sheet and agree to take part in the relaxation training research project.

I understand my participation will involve taking a psycho-physiological stress profile, the State-Trait-Anxiety Inventory and the IPAT Self Analysis Form on two occasions. The data from this questionnaire and the physiological measurement sessions will be kept confidential. My responses will be coded on a computer file for the purposes of data analysis and the questionnaire responses will then be destroyed. I understand that I can obtain the results from my own questionnaires and a copy of the final results of the research project by contacting Mr. Larry Dumka or Mr. Jim Cardinal at the above address.

I understand that I am free to decide the degree to which I will follow the training procedures outlined to me.

I understand that I can withdraw from this project at any time I wish.

I understand that if I have any concerns or questions about the project I can telephone Mr. Dumka at 526-7553 or 291-4344 (messages), Jim Cardinal at 291-3395 (messages), or Dr. Bryan Hiebert at 291-3389 (office) or 291-3395 (messages).

_____ _____

Date Signature

APPENDIX B

INSTRUCTIONS FOR SERIAL SEVENS TASK

PRETREATMENT AND POSTTREATMENT DATA COLLECTION FORMS

INSTRUCTIONS FOR SERIAL SEVENS TASK

In a few moments I am going to tell you a number. I want you to subtract 7 from that number, and then subtract 7 from that answer, and then subtract 7 again, and keep on subtracting 7 until I tell you to stop. Do not say your answers out loud. Do all the subtracting silently. After 3 minutes I will tell you to stop and give me the number you have reached. Are you ready? O.K. The number is 1000, go ahead and start subtracting.

PRETREATMENT DATA FORM

Name _____

Date _____

Pretest _____ Posttest _____

1. Answer from serial 7's. _____

2. Form C-9

   a. How is the business world being affected by science and technology? (it is being continuously altered) _____

   b. How will tools of today compare to those of the future? (they will appear quite crude) _____

   c. How has the use of shorthand been affected? (it is used less frequently) _____

   d. What advantage do microfilmed records have over traditional filing systems? (they are less cumbersome than files) _____

   e. What continued effect will machines have on the world of work? (they will increase the accuracy, volume, and speed of work) _____

   Total _____

Form C-10

a. What instrument will revolutionize commerce, business, and education in the future? (the computer) _____

b. Describe one way, mentioned in this paragraph, in which the video-phone will benefit the family. (shopping) _____

c. How will computers improve library facilities? (contents of entire libraries will be stored in world library centers which will be available to everyone) _____

d. Why is it conceivable that the future international language may be English? (approximately 1/5 of the world's population already speak or comprehend English) _____

e. What additional benefit may result from a universal language when it is finally adopted? (it should provide one basis on which world peace can be realized) _____

Total _____

TOTAL _____

PRETREATMENT DATA FORM

Name _____

Date _____

Pretest _____ Posttest _____

1. Answer from serial 7's. _____

2. Form D-9

   a. What profession had the children previously thought of entering? (medicine) _____

   b. What were Bob and his science teacher discussing? (the differences between human beings and animals) _____

   c. What did Bob learn about symbols? (virtually all knowledge is transmitted through symbolic expression) _____

   d. What effect may disturbed emotions have upon the mind's ability to use symbols? (an adverse effect) _____

   e. Name one specialized field mentioned in the paragraph that uses symbols. (mathematics, music, art) _____

   Total _____

Form D-10

a. In what college course will Bob and Jane study in detail about the workings of the human mind? (psychology) _____

b. What factor affects the happiness and equilibrium of every individual and all those in contact with him? (emotional adjustment) _____

c. According to modern psychology, what scientific principle explains all relationships among people-- good or bad? (cause and effect) _____

d. Name another area of study besides psychology in which specialists are studying problems of human relations. (anthropology, sociology, statistics) _____

e. What can we do as individuals to help in the solution of these problems? (we can try conscientiously to understand our own behavior) _____

Total _____

TOTAL _____

APPENDIX C

PRE-TRAINING SURVEY

RELAXATION TRAINING RESEARCH PROGRAM

Pre-Training Survey

NAME _____

1. What prompted you to sign up for the program?

_____

_____

_____

_____

_____

2. Have you ever participated in a relaxation training program before?

a. Yes No

b. If yes, please describe. _____

_____

_____

_____

_____

_____

3. Do you plan to use any other relaxation strategy (e.g., meditation, etc.) besides this program during the next five weeks?

   a. Yes No

   b. If yes, please explain. _____

   _____

   _____

   _____

   _____

   _____

4. With what specific concerns (if any) do you expect this relaxation program to be helpful? _____

   _____

   _____

   _____

   _____

5. Please rate your general overall anxiety level <u>right now</u>.

   Not anxious at all Very anxious

   0 1 2 3 4

6. Please rate what you expect your general overall anxiety level to be <u>after completing the program</u>.

   Not anxious at all Very anxious

   0 1 2 3 4

7. How well are you able to relax at will, now?

Not at all				Very well
0	1	2	3	4

8. How well do you expect to be able to relax after completing this relaxation program?

Not at all				Very well
0	1	2	3	4

9. How beneficial do you expect this relaxation program to be in helping you reduce your anxiety?

Not beneficial at all				Very beneficial
0	1	2	3	4

10. Do you expect to encounter any particularly stressful situations in the next five weeks?

a. Yes No

b. If yes, please explain. _____

_____

_____

_____

_____

_____

11. Are you presently taking any prescribed medications?

a. Yes No

b. If yes, what? _____

_____

CIRCLE THE APPROPRIATE NUMBERS IN ITEMS 12 - 16.

12. How many cigarettes per day do you smoke?

    0. none

    1. less than 6

    2. between 7 and 19

    3. 20 (1 pack) or more

13. How much coffee or tea do you drink each day?

    0. none

    1. 3 cups or less

    2. 4 to 7 cups

    3. 8 or more cups

14. How often do you drink alcoholic beverages?

    0. never

    1. less than once per month

    2. once or twice per week

    3. weekends only

    4. daily or four or more days per week

15. When you do drink, how much do you usually drink?

    0. none

    1. 1 or 2 drinks per occasion

    2. 3 to 4 drinks per occasion

    3. 5 or more drinks

16. What type of alcoholic beverage do you usually drink?

(Circle all appropriate answers.)

1. Beer
2. Wine
3. Liquor

APPENDIX D

POST FIVE WEEK SURVEY

(TREATMENT - FORM A, CONTROL - FORM B)

RELAXATION TRAINING RESEARCH PROGRAM

Post Five Week Survey - Form A

Name _____

A. Please read through the following checklist of relaxation training activities and check off the activities you completed.

RELAXATION TRAINING CHECKLIST

PRETRAINING		Completed (✓)
Day 1	- Read Instruction and Section 1 entitled "What is Relaxation" p. 1-12	_____
Day 2	- Read Section II entitled "Developing Skill at Relaxing" p. 14-22	_____
BEGIN RELAXATION TRAINING		
Week 1	- Practice "Progressive Relaxation"	_____
	- Record data on "Relaxation Monitoring Sheet"	_____
Week 2	- Move to "Autosuggestive Relaxation"	_____
	- Record data on "Relaxation Monitoring Sheet"	_____
Week 3	- Continue with "Autosuggestive Relaxation"	_____
	- Record data on "Relaxation Monitoring Sheet"	_____
Week 4	- Begin to fade out use of relaxation tape	_____
	- Record data on "Relaxation Monitoring Sheet"	_____
Week 5	- Practice relaxation without tape - Record data	_____
	- Begin to strengthen relaxation CUE	_____
	OR	
	- Begin differential relaxation training	_____
	OR	
	- Read section entitled "Using Relaxation" and	_____
	- Decide which use of relaxation is most appropriate for your situation and implement that use	_____

B. On the chart below please check (✓) the days:

1. you went through a relaxation exercise (R) e.g.

	MON
R	✓
D	

2. you collected data (D) on pulse rate, respiration rate and finger temperature, e.g.

	MON
R	
D	✓

Begin on the day on which you first practiced Progressive Relaxation

	MON	TUE	WED	THUR	FRI	SAT	SUN
WEEK 1	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 2	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 3	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 4	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 5	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 6	R	R	R	R	R	R	R
	D	D	D	D	D	D	D
WEEK 7	R	R	R	R	R	R	R
	D	D	D	D	D	D	D

C. 1. In your opinion, how closely did you follow the relaxation training program?

Not at all Very closely

0 1 2 3 4

2. In the first three weeks of the training program, how did you practice home relaxation: a) by listening to the prepared tape or b) did you practice by means of mental recall or c) did you prepare your own relaxation tape?

a) listened to supplied tape

b) used mental recall

c) prepared and listened to my own tape

3. Did you practice with any of the alternate sequences presented at the back of the manual (i.e. Autogenic Relaxation or Guided Imagery)?

a) Yes No

b) If yes, which one(s)? _____

_____

c) Comments? _____

_____

4. Did you use or begin any other relaxation strategy (e.g. meditation, regular exercise, etc.) during the five weeks of this training program?

a) Yes No

b) If yes, please explain (i.e., what strategy was used, how long you've been using it, how often, how long each time and why you used that strategy in addition to, or instead of, the ones outlined in the manual?)

_____

_____

_____

D. 1. With what specific concerns (if any) did this relaxation program help you with?

_____

_____

_____

_____

2. Please rate your general overall anxiety level after completing the program.

Not anxious at all Very anxious

0 1 2 3 4

3. How well are you able to "relax at will" after completing the program?

Not at all Very well

0 1 2 3 4

4. How beneficial was this relaxation program in helping you to reduce your anxiety?

Not beneficial at all Very beneficial

0 1 2 3 4

5. Do you consider the benefit you gained from participating in this relaxation training program to be due to: (please circle the appropriate number along the continuum)

Your efforts — About half and half — The explicitness of the training procedures

0 1 2 3 4

E. 1. Did you encounter any particularly stressful situations during the training program?

a) Yes No

b) If yes, please explain _____

_____

_____

_____

c) Did you try to use your relaxation response in that situation?

Yes No

d) How well did it work?

Not at all Very well

0 1 2 3 4

F. 1. Please indicate the extent to which you feel the manual alone (i.e. without the weekly telephone call) could be used as a completely self-contained program.

Inadequate Very Adequate

0 1 2 3 4

2. Please indicate the extent to which you feel the professionally prepared tapes (i.e. those made available with the manual) are important to the training program (the alternative would be to have no prepared tape and have each person make his/her own tape). Prepared tapes are:

Not important at all Very important

0 1 2 3 4

3. Would you recommend this program to one of your friends?

Never Definitely

0 1 2 3 4

4. If this relaxation training program were to be presented again what suggestions for improvement would you make?

5. What were the most beneficial aspects of the relaxation program?

6. What were the factors involved in your not practicing the relaxation exercises?

7. What were the factors involved in your not gathering the pulse rate, respiration rate, finger temperature data?

G. CIRCLE THE APPROPRIATE NUMBERS IN ITEMS 1 - 5

1. How many cigarettes per day do you smoke?

   0. none

   1. less than 6

   2. between 7 and 19

   3. 20 (1 pack) or more

2. How much coffee or tea do you drink each day?

   0. none

   1. 3 cups or less

   2. 4 to 7 cups

   3. 8 or more cups

3. How often do you drink alcoholic beverages?

   0. never

   1. less than once per month

   2. once or twice per week

   3. weekends only

   4. daily or four or more days per week

4. When you do drink, how much do you usually drink?

   0. not applicable

   1. 1 to 2 drinks per occasion

   2. 3 to 4 drinks per occasion

   3. 5 or more drinks

5. What type of alcoholic beverages do you usually drink? (Circle all appropriate answers.)

   0. not applicable

   1. Beer

   2. Wine

   3. Liquor

H. PERSONAL DATA

1. Age: _____

2. Sex: Female _____ Male _____.

3. Occupation: (Please circle and fill in blank if applicable)

   1. Student 2. a) S.F.U. Staff 3. Other:
   b) Position: _____ _____

4. Circle the number of years of education you have completed:

8 9 10 11 12	13 14 15 16	17 18 19 more
High School	College	Graduate

5. Circle the highest educational degree you have completed:

   a. Grade school

   b. High school

   c. Community College (Associate Diploma)

   d. College (Bachelor's degree)

   e. Master's degree

   f. Doctoral degree

RELAXATION TRAINING RESEARCH PROGRAM

Post Five Week Survey - Form B

Name _____

A. 1. Did you use or begin to use any other relaxation strategy (e.g. meditation, regular exercise, etc.) in the time since you last came in?

a) Yes No

b) if yes, please explain _____

_____

_____

_____

2. Please rate your general overall anxiety level right now.

Not anxious at all very anxious

0 1 2 3 4

3. Did you encounter any particularly stressful situations during the training program?

a) Yes No

b) If yes, please explain _____

_____

_____

_____

4. Did you begin or stop taking any prescribed medication during the training program?

a) Yes No

b) If yes, what? _____

_____

_____

B. CIRCLE THE APPROPRIATE NUMBERS IN ITEMS 1 - 5

1. How many cigarettes per day do you smoke?

   0. none

   1. less than 6

   2. between 7 and 19

   3. 20 (1 pack) or more

2. How much coffee or tea do you drink each day?

   0. none

   1. 3 cups or less

   2. 4 to 7 cups

   3. 8 or more cups

3. How often do you drink alcoholic beverages?

   0. never

   1. less than once per month

   2. once or twice per week

   3. weekends only

   4. daily or four or more days per week

4. When you do drink, how much do you usually drink?

   0. not applicable

   1. 1 to 2 drinks per occasion

   2. 3 to 4 drinks per occasion

   3. 5 or more drinks

5. What type of alcoholic beverages do you usually drink? (Circle all appropriate answers.)

   0. not applicable

   1. Beer

   2. Wine

   3. Liquor

H. PERSONAL DATA

1. Age: _____

2. Sex: Female _____ Male _____

3. Occupation: (Please circle and fill in blank if applicable)

   1. Student 2. a) S.F.U. Staff 3. Other: _____
   b) Position: _____

4. Circle the number of years of education you have completed:

8 9 10 11 12	13 14 15 16	17 18 19 more
High School	College	Graduate

5. Circle the highest educational degree you have completed:

   a. Grade school

   b. High school

   c. Community College (Associate Diploma)

   d. College (Bachelor's degree)

   e. Master's degree

   f. Doctoral degree

APPENDIX E

RELAXATION TRAINING CHECKLIST

PRETREATMENT INSTRUCTIONS FOR SELF-INSTRUCTION PARTICIPANTS

RELAXATION MONITORING SHEET

PROTOCOL FOR MONITORING CALLS

Name _____

RELAXATION TRAINING CHECKLIST

PRETRAINING — Completed ( )

Day 1 - Read Introduction and Section 1 entitled "What is Relaxation" p. 1-12. _____

Day 2 - Read Section II entitled "Developing Skill at Relaxing" p. 14-22. _____

BEGIN RELAXATION TRAINING

Week 1 - Practice "Progressive Relaxation" _____

- Record data on "Relaxation Monitoring Sheet" _____

Week 2 - Move to "Autosuggestive Relaxation" _____

- Record data on "Relaxation Monitoring Sheet" _____

Week 3 - Continue with "Autosuggestive Relaxation" _____

- Record data on "Relaxation Monitoring Sheet" _____

Week 4 - Begin to fade out use of relaxation tape _____

- Record data on "Relaxation Monitoring Sheet" _____

Week 5 - Practice relaxation without tape - Record data _____

- Begin to strengthen relaxation CUE _____

OR

- Begin differential relaxation training _____

OR

- Read section entitled "Using Relaxation" and _____

- Decide which use of relaxation is most appropriate for your situation and implement that use _____

PRETREATMENT INSTRUCTIONS FOR SELF-INSTRUCTION PARTICIPANTS

This manual explains in a brief clear step by step fashion how to proceed through the relaxation training program.

Here is a checklist which outlines what you are to do when.

When you complete each step you can check it off. In this way you can chart your progress through the program.

For example, as you can see the first step on day 1 which is tomorrow is to read the section entitled "What is relaxation."

And when you turn to the table of contents in the manual you find ....

Back to the checklist now. You see in "Week 1" it says "Practice Progressive Relaxation" that means listening to and following the instructions.

On the Progresive Relaxation side of this cassette tape. For weeks 2, 3 and 4 the checklist instructs you to practice "Auto-suggestive Relaxation" which is on the flip side of the cassette.

Do you have access to a cassette tape recorder which you could use daily at home for the next month?

(If yes, that's fine; if no, then instruct the subject to listen to the tape once - at the SFU library - as a model - and then to practice by merely recalling the relaxation sequence to themselves).

Please disregard references in the manual to 'reading scripts' and 'making a tape'. In this program we are supplying you with this pre-recorded tape.

I am also going to ask you to take some data both before and after your practice sessions.

The reason is that most people want some objective measure of how well they're doing at relaxing.

Most people find it easy to take their own heart or pulse rate, their breathing rate and their finger temperature. How to measure these is explained in the manual beginning on page 8. (Flip to page 9 diagram re: pulse rate.)

You will need a thermometer to take your finger temperature so here's one. You can take your finger temperature as indicated in the manual or with this thermometer you can hold it lightly between your thumb and index finger like this.

Here is a data sheet on which to record your measurements for one week. I would like you to bring in your data sheet to the receptionist outside when you've completed it, that would be about next ....., and the receptionist will give you a new sheet. If you come in after hours or if the receptionist is not there, just slip the completed data sheet under the door and take a new one from the envelope tacked up beside the door.

I will call you in two or three days and then once a week thereafter to see how things are going.

Do you have any questions?

There are two benefits to you from participating in the program:

1. you learn to relax more effectively, and

2. you get to keep the materials, the manual, the tape, and the thermometer.

RELAXATION MONITORING SHEET

Week # _____ Name _____

From _____ to _____

DAY	INDICATOR	START	FINISH	DIFFERENCE
1. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
2. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
3. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
4. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
5. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
6. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____
7. _____	pulse rate (per minute)	_____	_____	_____
	breathing rate (per minute)	_____	_____	_____
	finger temperature (degrees)	_____	_____	_____
	_____	_____	_____	_____

PROTOCOL FOR MONITORING CALLS FOR SELF-INSTRUCTED SUBJECTS

'This is _____. I'm with the Relaxation Project at S.F.U.'

First call (Day 2):

'I'm just calling to ask how things are going with the use of the manual.'

'I'm wondering if you finished reading the first 2 sections of the manual.'

If answer is yes.....

'Good, so then you're ready to move on to practicing Progressive Relaxation and begin talking data.'

If answer is no.....

'Has something come up to make you reconsider your willingness to participate in the program, or do you plan on staying with it?'

If answer is 'I want to drop out'

'It would be helpful to us if you could tell us your reasons.'

If answer is 'I want to stay with it'

'Its really important if we're to get valid data that people stick pretty closely to the program. In this case the manual really guides what you're to do.'

'You've told me you want to continue - when do you see yourself getting the reading done..'

'What I'd like to do is phone you then to see if you have any questions...'

(After making follow-up call-ask person to enter date of first practice on their data sheet and delay monitoring calls accordingly.)

Calls #2 & 3.

'I'm just calling to ask how the home practice sessions are going.'

'I'm wondering how the data gathering is going.'

If subject expresses excitement at changes - incorporate and reinforce and say something like, 'so you see how important it is to take the data so you can know how well you're doing.'

'I would like you to turn in your data sheet tomorrow at MPX 7507 and pick up another one' (from Peter -receptionist or alternate arrangement).

Call 4

Add 'You now move to fading out the use of the tape.'

Call 5

Add 'I would like to make an appointment for your post-test.'

'How about...'

Call 6

Add 'We would like you to bring you data sheet with you when you come in for your post-test tomorrow at _____.'

APPENDIX F

PRETREATMENT INSTRUCTIONS FOR CONTROL PARTICIPANTS

PRETREATMENT INSTRUCTIONS FOR CONTROL PARTICIPANTS

As we have said, everybody who participates in this study will learn a relaxation procedure.

I've just finished taking an initial measure of your anxiety level and your physiological reactivity.

What I need is a stable measure of your anxiety level and physiological reactivity over a 5 week period.

What I want you to do is return in 5 weeks time and, we will repeat this procedure and then you will immediately be assigned to a treatment group.

I'd like to make an appointment for you to come in at the same time of day in 5 weeks if that's O.K. with you.

(If the person is not able to make an appointment then, ask the person when we can contact them to make an appointment.)

We'll give you a reminder call about a week ahead of time.

APPENDIX G

SUMMARIES OF ANALYSIS OF VARIANCE

STAI-S, STAI-T, IPAT

Summary of Analysis of Variance STAI-S

Source	SS	df	MS	F	p
Between Subjects					
Group	68.35	1	68.35	0.59	.45
Subjects Within	3502.75	30	116.76		
Within Subjects					
Time	139.84	1	139.84	3.60	.07
Group x Time	13.04	1	13.043	0.34	.57
Subjects Within	1165.38	30	38.85		

Summary of Analysis of Variance STAI-T

Source	SS	df	MS	F	p
Between Subjects					
Group	20.05	1	20.05	0.17	.69
Subjects Within	3484.56	29	120.16		
Within Subjects					
Time	15.69	1	15.69	0.28	.60
Group x Time	3.48	1	3.48	0.06	.81
Subjects Within	1620.80	29	55.89		

Summary of Analysis of Variance IPAT

Source	SS	df	MS	F	p
Between Subjects					
Group	34.33	1	34.33	0.16	.69
Subjects Within	6420.44	30	214.02		
Within Subjects					
Time	181.74	1	181.74	4.98	.03
Group x Time	10.71	1	10.71	0.29	.59
Subjects Within	1094.31	30	36.48		

APPENDIX H

SUMMARIES OF ANALYSES OF VARIANCE

EMG, PST, HR

Summary of Analysis of Variance EMG

Source	SS	df	MS	F	p
Between Subjects					
Group	2.80	1	2.80	0.95	.34
Subjects Within	70.61	24	2.94		
Within Subjects					
Time	2.00	1	2.00	2.66	.12
Group x Time	2.95	1	2.95	3.927	.06
Subjects Within	18.042	24	0.75		
Condition	56.96	3	18.99	26.40	.01
Group x Condition	14.27	3	4.76	6.61	.01
Subjects Within	51.79	72	0.72		
Time x Condition	2.65	3	0.88	3.76	.01
Group x Time x Condition	2.00	3	0.67	2.85	.04
Subjects Within	16.87	72	0.23		

Summary of Analysis of Variance PST

Source	SS	df	MS	F	p
Between Subjects					
Group	74.74	1	74.74	1.78	.19
Subjects Within	1218.69	29	42.02		
Within Subjects					
Time	72.64	1	72.64	8.87	.01
Group x Time	44.15	1	44.15	5.39	.03
Subjects Within	237.38	29	8.19		
Condition	23.51	3	7.84	16.48	.01
Group x Condition	1.26	3	0.42	0.88	.45
Subjects Within	41.37	87	0.48		
Time x Condition	3.00	3	1.00	2.71	.05
Group x Time x Condition	0.00*	3	0.00	0.00	.99
Subjects Within	32.13	87	0.37		

*This number is a result of rounding procedures within the SPSS (Nie et al., 1975) computer analysis program. The SS in this case not in fact 0.00 but a very small number.

Summary of Analysis of Variance HR

Source	SS	df	MS	F	p
Between Subjects					
Group	365.83	1	365.83	0.57	.46
Subjects Within	16054.13	25	642.17		
Within Subjects					
Time	41.67	1	41.67	0.38	.54
Group x Time	20.00	1	20.00	0.18	.67
Subjects Within	2720.56	25	108.82		
Condition	2582.50	3	860.83	23.83	.01
Group x Condition	33.33	3	11.11	0.31	.82
Subjects Within	2708.50	75	36.11		
Time x Condition	98.33	3	32.78	1.73	.17
Group x Time x Condition	118.33	3	39.44	2.08	.11
Subjects Within	1421.50	75	18.95		

APPENDIX I

PRETREATMENT GROUP DIFFERENCES

SUMMARY OF T-TESTS

T-tests Analysis of Pretreatment Variables

Variable	n	$\bar{x}$	SD	df	T	p
Self-assessed anxiety level	14 18	2.00 2.11	1.17 0.96	30	-0.29	.77
Self-assessed relaxation skill level	14 18	1.79 2.00	1.19 1.09	30	-0.53	.60
Outcome expectancy level	14 18	6.21 6.39	1.53 2.40	30	-0.24	.82
Caffeine consumption	14 18	1.21 1.50	0.80 0.71	30	-1.07	.29
Frequency of alcohol consumption	14 18	1.50 2.00	0.80 1.03	30	-1.47	.15
Magnitude of alcohol consumption	14 18	0.86 1.22	0.54 0.55	30	-1.89	.07

APPENDIX J

SUMMARIES OF ANALYSES OF VARIANCE

PARTICIPANT MONITORED PHYSIOLOGICAL DATA

HEART RATE, RESPIRATION RATE, FINGER TEMPERATURE

Summary Analysis of Variance

Self-monitored Heart Rate

Source	SS	df	MS	F	p
Within Subjects					
Time A (Before/ After Practice)	493.95	1	493.95	51.96	.01
Subjects Within	114.06	12	9.51		
Time B (Weeks)	50.12	4	12.53	1.51	.21
Subjects Within	397.56	48	8.23		
Time A x Time B	5.18	4	1.30	0.63	.64
Subjects Within	98.50	48	2.05		

Summary Analysis of Variance

Self-monitored Respiration Rate

Source	SS	df	MS	F	p
Within Subjects					
Time A (Before/ After Practice)	105.75	1	105.75	29.18	.01
Subjects Within	43.49	12	3.62		
Time B (Weeks)	6.87	4	1.71	1.31	.28
Subjects Within	62.65	48	1.31		
Time A x Time B	3.91	4	0.98	2.59	.05
Subjects Within	18.06	48	0.38		

Summary Analysis of Variance

Self-monitored Finger Temperature

Source	SS	df	MS	F	p
Within Subjects					
Time A (Before/ After Practice)	355.88	1	355.88	9.58	.01
Subjects Within	445.69	12	37.14		
Time B (Weeks)	94.25	4	23.56	1.92	.12
Subjects Within	586.81	48	12.12		
Time A x Time B	31.69	4	7.92	3.65	.01
Subjects Within	104.00	48	2.17		

APPENDIX K

PRETREATMENT DEPENDENT MEASURES CORRELATION MATRIX

		STAI-S	STAI-T	IPAT	EMG-B1	EMG-S1	EMG-S2	EMG-B2	TEMP-B1
STAI-T	r =	.12							
	p =	.26							
IPAT	r =	.35	.19						
	p =	.02	.15						
EMB-B1	r =	.09	.03	.19					
	p =	.31	.43	.16					
EMG-S1	r =	.21	.21	.24	.19				
	p =	.13	.13	.09	.15				
EMG-S2	r =	.33	.02	.11	.40	.54			
	p =	.04	.46	.28	.02	.00			
EMG-B2	r =	.13	.08	.15	.85	.15	.33		
	p =	.25	.35	.22	.00	.21	.04		
TEMP-B1	r =	-.29	-.15	.01	-.00	.21	.01	-.02	
	p =	.05	.21	.48	.50	.13	.48	.45	
TEMP-S1	r =	-.28	-.07	.03	.04	.23	.00	-.05	.96
	p =	.05	.35	.43	.42	.11	.49	.41	.00[2]
TEMP-S2	r =	.30	-.04	.04	-.08	.17	-.03	-.14	.89
	p =	.05	.41	.41	.33	.18	.43	.24	.00
TEMP-B2	r =	.37	-.16	-.07	-.08	.07	-.13	-.16	.84
	p =	.02	.20	.32	.34	.35	.24	.19	.00
HR-B1	r =	.09	-.05	.25	.10	.30	.13	.25	.25
	p =	.32	.40	.09	.31	.05	.26	.10	.09
HR-S1	r =	.17	.16	.33	.06	.46	.34	.25	.03
	p =	.20	.22	.05	.38	.01	.04	.11	.45
HR-S2	r =	.15	.16	.43	.03	.46	.32	.02	.10
	p =	.22	.21	.01	.43	.01	.05	.47	.29
HR-B2	r =	-.18	-.13	.05	.20	.31	.18	.26	.36
	p =	.17	.26	.39	.16	.05	.18	.10	.03

[1]Degrees of freedom = 32
[2]P = 0.00 is a result of rounding. It signifies p < .005.

Pretreatment Correlation / Probability[1]

Matrix of Dependent Measures

.33 .04								
.01 .48	-.02 .45							
.00 .49	-.05 .41	.96 .00[2]						
-.03 .43	-.14 .24	.89 .00	.95 .00					
-.13 .24	-.16 .19	.84 .00	.90 .00	.89 .00				
.13 .26	.25 .10	.25 .09	.13 .24	.10 .31	.04 .43			
.34 .04	.25 .11	.03 .45	-.11 .30	-.09 .32	-.15 .23	.84 .00		
.32 .05	.02 .47	.10 .29	.09 .32	.21 .14	-.02 .46	.75 .00	.80 .00	
.18 .18	.26 .10	.36 .03	.31 .05	.22 .12	.21 .14	.68 .00	.51 .00	.50 .00
EMG-S2	EMG-B2	TEMP-B1	TEMP-S1	TEMP-S2	TEMP-B2	HR-B1	HR-S1	HR-S2

APPENDIX L

SUMMARY ANALYSIS OF VARIANCE

CAFFEINE CONSUMPTION

Analysis of Variance Caffeine Consumption

Source	SS	df	MS	F	p
Between Subjects					
Group	1.67	1	1.67	1.90	.18
Subjects Within	26.27	30	0.88		
Within Subjects					
Time	1.59	1	1.59	13.95	.01
Group x Time	0.03	1	0.03	0.21	.64
Subjects Within	3.41	30	0.11		

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