EFFECTS OF SUBJECTS' EXPECTANCY OF EXPERIMENTER'S INVOLVEMENT ON LIVE AND TAPED RELAXATION TRAINING

by

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Progressive or deep muscle relaxation training has become an increasingly popular psychotherapeutic procedure. The usage of relaxation training has increased primarily because of the impressive success of treatment procedures utilizing such training. As the experimental and clinical use of relaxation increased, some of the procedures have been automated in order to facilitate standardization, decrease intrasession variability, and increase the effective use of the therapist's time. Although experimental and clinical studies utilizing automated procedures have been successful, the only research directly investigating the comparability of live and tape instruction procedures has indicated tape relaxation training to be inferior to live relaxation training. The purpose of this study was to investigate the effect of live and taped relaxation training on the reduction of physiological arousal (muscle tension, heart rate) and subjective tension and distress (Anxiety Differential, Subjective Units of Discomfort, Level of Relaxation). It was hypothesized that differences in treatment effect using identical live and tape relaxation training instructions would be a function of the amount of involvement exercised by the experimenter in individualizing the therapeutic procedure.

Sixty students received individual relaxation training during two sessions, one week apart, under one of the following conditions: 1) Live-Involved, 2) Live-Rote, 3) Live-Self Relaxation, 4) Tape-Involved, 5) Tape-Rote, 6) Tape-Self Relaxation. Live and taped relaxation training was conducted under either Involved or Rote conditions. In the Involved condition, the subjects were instructed that they were being monitored both behaviorally and physiologically and that the experimenter would modify the relaxation training instructions to be commensurate with the subject's progress in order to maximize successful results. Subjects in the Rote condition were instructed that they would receive a standard relaxation procedure which could not be modified by the experimenter.

All Experimental groups experienced a significant reduction in muscle tension in both Session 1 and Session 2 in comparison to the Self-relaxation control groups; however, no significant differences were found among the Experimental groups. Both Experimental and Control groups experienced a decrease in subjective arousal as measured by the self-report measures; however, there were no significant differences among the groups. In spite of the efforts to vary the perceived level of involvement of the experimenter, the subjects in the Involved and Rote groups did not differ in their perception of experimenter's involvement.

Both the Live and Tape relaxation groups obtained a significant decrease in EMG in comparison to the Control

groups during both Session 1 and 2, indicating the effectiveness of relaxation training in significantly reducing muscle tension within both the first and second sessions. There was a consistent lack of differences between Live and Tape relaxation procedures for all dependent variables, suggesting that both types of instruction presentation were equally effective. The high rating of experimenter's involvement by the Rote groups suggested that the subject's expectancy is a powerful factor in the relaxation training session, but that the locus of control extended over a broader area rather than being restricted by the experimental instructions.

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INTRODUCTION

During the past decade, progressive or deep muscle relaxation training has become an increasingly popular psychotherapeutic procedure, especially in the area of behavior therapy. Among the procedures which train the client to develop deep states of skeletal-muscular relaxation, Jacobson's (1938) relaxation training has been found to be an effective treatment procedure in combating a wide range of physiological and psychological disorders. Relaxation training has also been an essential component in one of the most widely used types of behavioral therapy, systematic desensitization (Paul, 1969a).

The popularity and increased usage of relaxation training developed because of the impressive successes of treatment procedures and programs utilizing such training. Many disorders which had previously seemed refractory to psychotherapy or which improved only after prolonged periods of treatment, responded quickly and successfully to treatment utilizing relaxation training (Jacobson, 1938; Paul, 1969a). Because of the success enjoyed by these treatment procedures, the effectiveness of the relaxation training itself has generally been assumed. However, in the studies where the effectiveness of relaxation has been investigated, poor assessment procedures have been used (Haynes, Woodward,

Moran, and Alexander, 1974). Research studies investigating the effects of relaxation training on behavioral disorders should be considered as necessary in order to support its continued use as a therapeutic procedure. However, the necessary research evaluating the fundamental components of relaxation training has yet to be conducted.

Relaxation training was taken out of the realm of the occult and given a mantle of scientific and medical respectability largely due to the work of a neurophysiologist, Edmund Jacobson. Both a physician and physiologist, Jacobson first became interested in the area of relaxation through a series of experiments conducted at Harvard in 1908 relating to neuromuscular tension. These early experiments dealt with the nervous start, the neuromuscular excitation occurring in an organism following an unexpected strong stimulus. Jacobson was concerned with human body movement which appeared to be excessive given the intensity of the stimuli. In a series of experiments, Jacobson (1938) found that the start reaction was diminished or absent when subjects were in a state of relaxation. Further research suggested that cognitive processes, such as thoughts and emotions, had a concomitant tension response and that the tension produced by these states could also be diminished or eliminated by the use of relaxation.

Jacobson discovered early in his research that it was often difficult to get subjects to relax deeply. He noted that a subject would often lie quietly on a cot for hours

trying to relax but that this inactivity did not insure relaxation. Jacobson's problems in obtaining optimally relaxed subjects prompted him to develop progressive relaxation, a systematic procedure for training subjects in deep muscle relaxation (Jacobson, 1938). Drawing from his background in physiology, Jacobson postulated that a state of deep muscle relaxation was physiologically incompatible with a state of tension or anxiety. In order for the subject to learn to reach a state of deep muscle relaxation, the subject must be able to differentiate between states of neuromuscular tension and relaxation. Jacobson developed this discrimination in his subjects by having them practice the tensing and relaxing of various muscle groups in the body. First, Jacobson would have his patients tense a particular muscle group tightly for a few seconds, long enough for them to be able to identify where the tension occurred and what it felt like. He would then ask the patient to relax his muscles and to identify the different sensations which occurred during this resting phase. The ability of the patient to identify and locate feelings of tension was what Jacobson called the "cultivating of the muscle sense". Jacobson felt that this was an important aspect in his relaxation procedure, for, unless a patient was able to identify feelings of tension and locate their origin, the patient would not be able to use the relaxation training procedures to counter the tension.

Jacobson's original relaxation training program was a comparatively long process. He stated that patients often required periods of 15 minutes or longer of tension-release exercises for a particular muscle to relax, with some muscle groups having several exercises. Because of the slow progression through the muscle groups, relaxation training often lasted for 6-10 weeks, with 2-4 training sessions per week. Jacobson called his training procedure progressive relaxation because the patients obtained deeper relaxation of muscle groups over time. They also learned to relax principle muscle groups consecutively, and practice strengthened the relaxed state (Jacobson, 1938).

As his research continued, Jacobson's interest in the relaxation response encompassed clinical as well as experimental areas. A physician himself, Jacobson noted that physicians prescribed rest as part of treatment in a multitude of illnesses. As he had noted earlier, the patient may need and desire rest but was often extremely restless and even incapable of obtaining the prescribed rest. Although the importance of rest in convalescence was well known, there was little empirical information about procedures which would induce this needed rest without the use of medication. This concern for the convalescing patient influenced much of Jacobson's later research involved in discerning whether more intense forms of rest were achieved by means of progressive relaxation than those achieved ordinarily by the simple instructions of the physician.

It follows logically that Jacobson became interested in relaxation as a primary treatment procedure in illnesses in which rest was customarily a primary or integral part of treatment. From 1929 to 1938, Jacobson used progressive relaxation as the sole treatment procedure with 105 patients. The 27 classes of disorders treated ranged from traditional psychological areas such as anxiety states and phobias to more medical areas such as coronary disease and Parkinson's disease. Of the 105 patients treated, only eight reported no improvement.

Recent studies have also been reported in which relaxation was successful as an independent treatment procedure. Geer & Katkin (1966), Kahn, Baker & Weiss (1968), and Haynes, et al., (1974) report the success of relaxation training in treating insomnia. Zeisset (1968) used relaxation training in the treatment of interview anxiety experienced by neurotic and psychotic patients. He found that relaxation training plus training in completing applications were as successful as systematic desensitization in reducing interview anxiety.

In the period of 1920 to 1950, considerable research was conducted on variables which influenced the detection and extinction of classically conditioned responses in both animals and humans. In the mid 1940's, Joseph Wolpe began a series of experiments with animals which led him to the conclusion that the most satisfactory way of treating conditioned anxiety was through a gradual counterconditioning

approach. From his research he formulated a counter-conditioning hypothesis, which he termed the "reciprocal inhibition" principle, for eliminating anxiety responses. This principle stated that "if a response antagonistic to anxiety can be made to occur in the presence of anxiety-evoking stimuli so that it is accompanied by a complete or partial suppression of the anxiety responses, the bond between these stimuli and the anxiety responses will be weakened [Wolpe, 1958, p.71]". In developing his procedure, Wolpe chose Jacobson's (1938) progressive relaxation technique as the response which would be incompatible with the conditioned anxiety.

From the reciprocal inhibition principle, Wolpe developed a procedure called systematic desensitization (SD) which he utilized in the treatment of phobias. Systematic desensitization consists of three basic parts: relaxation training, hierarchy construction, and desensitization proper. As will be reviewed later, systematic desensitization has been the subject of substantial research and, as such, has undergone various procedural modifications.

In Wolpe's treatment program, relaxation training is generally an abbreviated form of the Jacobson (1938) relaxation procedure. The goal of relaxation training is to produce a reduced state of physiological arousal, a positive or neutral affective state, and to bring these states under instructional control. The abbreviated relaxation program includes the systematic tensing and releasing of 16 specific muscle groups

in a procedure similar to that of Jacobson. The patient is asked to tense a specified muscle group for a few seconds, identifies what the tension feels like and where it is located, and then releases the muscles while again identifying the sensations occurring during the resting phase. Intermixed with the instructions to tense and release the muscles are suggestions that the patient will feel sensations of warmth, heaviness, and relaxation in the muscles and throughout the body. The amount of time spent on relaxing any particular muscle group depends on the difficulty the patient has in achieving relaxation in that muscle group, for the general procedure calls for one muscle group to be completely relaxed before progressing to the next group. Wolpe (1958) presents a sequential order for relaxation of specific muscle groups; however, both he and other therapists (Bernstein & Borlovec, 1973) suggest that the sequence of muscle groups relaxed is not important as long as there is a sequential order in which one muscle group is relaxed before progressing to the next group. Wolpe (1966) suggested that his abbreviated Jacobson relaxation procedure could be completed in the course of six interviews, with the patient practicing at home for two 15-minute periods a day.

Anxiety hierarchies are constructed by the therapist and the patient based on the patient's report of the eliciting stimuli. The hierarchy itself is a list of the entire range of anxiety eliciting stimuli ordered on a scale from

the weakest to the strongest. The items in the hierarchies are specific and concrete, and progress along a scale of a just noticeable increase in anxiety arousal potential from one item to the next. The hierarchy usually includes from 10 to 100 items, depending upon the severity of the anxiety and the complexity of the anxiety eliciting stimuli.

Systematic desensitization generally begins after the hierarchy has been constructed and the patient has been trained in progressive relaxation. By the time SD is begun, the patient should be capable of achieving relaxation reasonably quickly by suggestions without having to go through the tension-release cycles. The therapist begins by having the patient relax and then gives him instructions that he will be asked to imagine a series of scenes as vividly as possible. The patient is also instructed to signal the therapist by a prearranged signal if he experiences any anxiety while imagining the scene. After the instructions, the patient is presented the first scene. Each scene is presented verbally by the therapist in as much detail as possible with presentation duration approximately 20 seconds. At the end of a scene presentation, the patient is asked to stop thinking about the scene and to relax, this relaxation phase also lasting approximately 20 seconds. Each scene is usually presented twice, and if no anxiety has been elicited, the next scene is presented. If the patient signals that he is experiencing anxiety during the presentation of a scene, the therapist terminates the scene immediately, and the patient is asked to

relax deeply. The anxiety eliciting scene may then be presented again without certain specific stimulus cues, or the preceeding scene may be presented again. The anxiety eliciting scene is presented with gradually increasing detail until it can be imagined twice without eliciting anxiety.

Systematic desensitization has been the subject of one of the most intensive and rigorous scientific investigations of any psychotherapeutic procedure. Paul (1969b) states that SD is the first treatment procedure to withstand such a rigorous evaluation, and supports his assertion by a detailed review of 75 studies in which nearly 1000 patients were treated by 90 therapists. Although 55 of these studies were uncontrolled and their designs incapable of evaluating a cause and effect hypothesis, only four of the studies produced negative results. The remaining 20 studies had considerably more sophisticated designs and control procedures. Paul concluded that "the findings were overwhelmingly positive, and for the first time in the history of psychological treatments, a specific therapeutic package reliably produced benefits for clients across a broad range of distressing problems in which anxiety was of fundamental importance [p.159]".

The massive amount of research which tended to support the effectiveness and usefulness of SD was influenced by the recent focus of research on the effectiveness and contributions of the components of SD, i.e., relaxation, graded exposure

to aversive stimuli, and temporal contiguity of stimulus events. Of particular interest has been the research conducted on the role of relaxation in SD. Lomont & Edwards (1967) investigated the role of relaxation in systematic desensitization while at the same time examining the hypotheses that extinction of classically conditioned responses, rather than reciprocal inhibition by relaxation, accounted for the efficacy of SD. Snake phobic females were placed into two treatment groups, one using SD and the other a procedure as similar as possible to SD except that relaxation was omitted. If fear reduction by SD is actually a function of extinction, wherein the conditioned stimulus is presented without the accompanying unconditioned stimulus, then the SD procedure without the relaxation component should be as effective as the SD with the relaxation training in producing a reduction in fear. The results of the study indicated that the SD group showed a significantly or nearly significantly greater fear reduction on 3 of 5 dependent measures, whereas the extinction group did not appear to show a reduction in fear to any appreciable extent. Although the results of this study are suggestive of the role of relaxation in SD, the lack of experimental control prevents any substantial support for its hypothesis.

More sophisticated designs were employed by Kondas (1967) and Davidson (1968) in studies similar to that of Lomont and Edwards. Kondas assigned test anxious students to one of four experimental groups: 1) systematic desensitization,

2) relaxation alone, 3) hierarchy presentation without relaxation, 4) no treatment control. Subjects receiving SD evidenced the greatest decrease in anxiety as measured by the Fear Survey Schedule.

Davidson designed his study as a direct test of the hypothesis that SD involves a genuine counterconditioning process. Subjects were matched on the basis of strength of snake avoidance behavior and were assigned to one of four experimental conditions. The first group was assigned to a traditional SD program in which a series of aversive stimuli were contiguously paired in imagination with deep muscle relaxation. The second group was assigned to a "pseudodesensitization" condition in which snake-irrelevant stimuli were paired contiguously with deep muscle relaxation. This pseudodesensitization group controlled for the effects of relaxation and subject expectation. A third group received exposure to graded aversive stimuli without relaxation and thus controlled for the effects of extinction. The fourth group was a no-treatment control group which only participated in the pre- and post-treatment assessment of snake avoidance. Subjects in the pseudodesensitization and exposure groups were yoked to subjects in the desensitization group whose progress determined the number of treatment sessions, the length of the sessions, and the number and duration of each imagined scene. The results of the study showed that only the subjects receiving SD displayed a significant reduction

in snake avoidance behavior, thus strongly supporting the hypothesis of counterconditioning by systematic desensitization.

These studies (Lomont & Edwards, 1967; Kondas, 1967; Davidson, 1968) in supporting the hypothesis of reciprocal inhibition, also support the efficacy of relaxation as an antagonistic response to anxiety. Other researchers, however, have questioned the utility of relaxation in the SD procedure.

In a theoretical evaluation of relaxation and its role in SD, Rachman (1968) argues that muscular relaxation may not be an "essential ingredient" in the SD package. His argument centers around studies in which therapy has been successful with patients who received only perfunctory training in relaxation procedures, as few as one training session before the commencement of SD (Cooke, 1966), or in which the therapist or experimenter was inexperienced. He also points out the success of in-vivo desensitization where the subject is presented graded live exposure to the anxiety eliciting stimulus or stimulus complex, without being in a state of deep muscle relaxation. Rachman also argues that relaxation is not the only possible response antagonistic with anxiety, and therefore, any response which is antagonistic to anxiety will satisfy the conditions stated in the reciprocal inhibition principle and can be used in place of relaxation. Although certain of his arguments are theoretically sound, Rachman presents no experimental research of his own or others which directly tests his hypotheses. Twice he circumvents his own

argument by stating that relaxation appears to facilitate treatment and that muscular relaxation may be mental relaxation which in turn may be necessary. Rachman presents his ambivalent position by saying "it would be unwise to abandon the use of muscular relaxation prematurely [p.164]".

Wilkins (1971; 1972) also questions the necessity of relaxation in SD. Although using Rachman's (1968) position as the basis of his argument, Wilkins reinterprets Davidson's (1968) study by stating that the successful reduction in fear was due to the subjects' self-control of exposure to feared stimuli rather than the reciprocal inhibition of anxiety. Wilkins presents a testable hypothesis but provides no empirical evidence of confirmation.

In summary, the majority of the literature addressing itself to the question of the necessity of relaxation in SD supports the hypothesis that relaxation is an integral and necessary part of treatment by systematic desensitization. Those studies questioning the efficacy or necessity of relaxation in SD have been theoretical in nature, offering no direct test of their hypotheses. Therefore, the strongest arguments support the role of relaxation in SD.

Historically, as the effectiveness of SD as a treatment procedure drew stronger support in the literature, variations and modifications in procedures began to appear. One variation which has occurred frequently has been the automation of some or all of the SD procedure. Interest in the

automation of the SD procedure has been influenced by both clinical and experimental considerations. From an experimental point of view, increased automation of a procedure generally reduces the number of uncontrolled, extraneous variables which enter into a research design. For example, by automating relaxation instructions, the experimenter can control for many intrasession variables such as speed and duration of presentation, voice inflection and tone, word slurring, and accidental deviation from specified procedures. Clinically, the use of automated procedures is attractive because it increases the effective utilization of therapist time as well as decreases therapist involvement in procedures which may become boring and repetitious.

The most widespread use of automation has occurred with the use of taped or recorded relaxation instructions (Migler & Wolpe, 1967; Davidson, 1968; Folkins, Evans, Opton & Lazarus, 1968; Folkins, Lawson & Opton, 1968; Garlington & Colter, 1968; Goldberg & D'Zurilla, 1968; Kahn & Baker, 1968; Barlow, Leitenberg, Agras & Wincze, 1969; Colter & Garlington, 1969; Donner & Guerney, 1969; Ihli & Garlington, 1969; Leitenberg, Agras, Barlow & Oliveau, 1969; Oliveau, Agras, Leitenberg, Moore & Wright, 1969; O'Neil & Howell, 1969; Davidson & Hiebert, 1971; Stoudenmire, 1972). Generally, the subjects received 2 to 4 sessions of relaxation training presented via tape recording of approximately 20-30 minutes duration. The majority of the tapes used were reported to

have been based upon an abbreviated Jacobson (1938) deep muscle relaxation procedure.

It is of considerable interest that in all of the studies utilizing taped relaxation in treatment, only Davidson and Hiebert (1971) question the efficacy of the taped procedures. This lack of concern may be due in part to the success of SD when taped procedures were used; however, the methodological designs of these studies were such that the comparative efficacy of the taped procedures remains in question. Several of the studies failed to use either no-treatment or attention placebo controls which would be necessary in evaluating the effectiveness of desensitization based upon recorded relaxation instructions (Barlow, Leitenberg, Agras & Wincze, 1969; Goldberg & D'Zurilla, 1968; Ihli & Garlington, 1969; Kahn & Baker, 1968; O'Neil & Howell, 1969; Oliveau, Agras, Leitenberg, Moore & Wright, 1969). Those studies which did include no-treatment controls unfortunately failed to include attention placebo procedures without recorded instructions (Colter & Garlington, 1969; Donner & Guerney, 1969; Garlington & Colter, 1968; Leitenberg, Agras, Barlow & Oliveau, 1969).

The only study which has investigated the comparative effects of live and taped relaxation instructions was conducted by Paul and Trimble (1970). Thirty female college students were assigned to 1 of 3 treatment conditions: 1) progressive relaxation, 2) hypnotically induced relaxation, 3) self-relaxation control. Both the progressive relaxation and hypnotic

relaxation instructions were presented to the subjects via tape recording with the same experimenter making both tapes. The progressive relaxation instructions were based on Paul's (1966) experimental manual and consisted of the usual tension-relaxation cycle for 16 major muscle groups. Each muscle group was tensed and relaxed twice before progressing to the next group. The hypnotic relaxation instructions consisted of direct suggestions of heaviness, drowsiness, and relaxation. Direct suggestions were also focused upon the subjects' own muscle groups. In the self-relaxation control procedure, the subjects were instructed to become as completely comfortable as possible without going to sleep. All treatment conditions ran for approximately 28 minutes.

Dependent measures included pre- and post-tests of self-reported anxiety by means of an anxiety differential scale (Husek & Alexander, 1963) and measures of physiological arousal as measured by heart rate, muscle tension, skin conductance, and respiratory rate sampled 5 times during the session.

The data collected in this study were compared to data collected in an earlier study (Paul, 1969b) in which all methodological procedures were said to be identical except for the mode of presenting the relaxation instructions. Data analysis indicated that the live condition was significantly superior to the taped relaxation condition on 2 of the 4 physiological variables (heart rate and muscle tension) with

a third (respiratory rate) approaching significance. Only on the self-reported anxiety scale did the live and tape procedures indicate equivalence. These findings prompted Bernstein and Borkovec (1973) to "strongly advise against the routine use of such procedures in either research or clinical settings (unless the particular tapes used can be shown to be equivalent in effectiveness to live presentations) [p.6]".

Although presented with what initially appears strong support against the use of taped procedures, Bernstein and Borkovec rightfully qualify their recommendation against the use of taped relaxation instructions because serious methodological and procedural problems were found in the Paul & Trimble (1970) study. The most critical problem with their study was that the mode of presentation of the relaxation instructions was not the only variable manipulated. Paul and Trimble actually compared two significantly different relaxation procedures. In the live relaxation procedure, the progression through the muscle groups was response contingent in that a muscle group had to be as relaxed as the previous muscle group before progressing to the next muscle group. Under this procedure, a particular muscle group could have been tensed and relaxed as many as four times before progressing to the subsequent group. After progression through the muscle groups had been completed, the subject was asked if he felt any tension remaining in any muscle groups. If tension

was reported, more tension-release cycles were used to further relax those muscles. In the taped relaxation instructions, each muscle group was relaxed only twice, and there was no provision to return to any muscle group remaining tense after the completion of the 16 basic muscle groups.

Another problem of considerable importance involves the quality of the relaxation tapes used in the Paul and Trimble study. The relaxation tapes reported by Paul (personal communication, 1974) to be the ones used in his study are full of extraneous background noises, such as the sound of a typewriter, a squeeking chair, and the noise of passing motor vehicles. In his experimental manual (Paul, 1966) from which all subsequent procedures have been adapted, Paul places great emphasis upon such procedural subtleties as voice inflection and timing, duration of tension-release cycles, and environmental setting. It is therefore difficult to understand why similar precision was not exercised in eliminating distracting noise from his relaxation tape.

In retrospect, the concept of automated relaxation training is an appealing one with wide ranging clinical and experimental implications. Enough initial success has been experienced in the utilization of taped relaxation instructions in treatment to encourage research in this area. An evaluation of the previous research conducted with regard to taped versus live procedures suggests that an adequate investigation of the problem has yet to be accomplished. Several important

questions remain unanswered. First, are there significant differences between the effectiveness of identical live and taped instructions in inducing relaxation? No one has yet made a direct comparison of identical relaxation training procedures which varied only by mode of presentation, i.e., live vs. tape. Second, is it possible for a relaxation procedure to be effective when it has the subject relax each muscle group a specific number of times instead of relaxing the muscles as many times as necessary in order to be as relaxed as the previous muscle group? Theoretically, response contingent progression through the muscle groups is thought to be a necessary process of relaxation training (Bernstein & Borkoveck, 1974; Jacobson, 1938; Paul, 1966; Wolpe, 1958); however, the success of automated relaxation training suggests otherwise.

Third, if one accepts Paul and Trimble's (1970) basic, but untested, premise that live relaxation instructions will produce significantly greater relaxation than identical relaxation instructions presented via tape, the question arises as to what produces the differential effects. If the instructions the subject hears are as identical as possible with regard to speed, tone, inflection, and content, then any differential effects in relaxation may be due to cognitive factors influencing the perception of the relaxation procedure instead of differences between the procedures themselves.

A primary difference between any live and mechanized therapeutic procedure is the machine's inability to adjust to the patient's idiosyncratic progression through the therapeutic procedure. In Paul and Trimble's (1970) live relaxation procedure, the therapist had the ability to adjust the speed, tone, timing, and content of the relaxation instructions depending upon the response of the subjects. Paul, in fact, did personalize the procedure by making progression through the muscle groups response contingent. In the taped relaxation procedure, there was no mechanism by which the tape could assimilate the subject's progression through the exercises and modify the instructions accordingly. The subject received a rote presentation which was incapable of adjusting to the subject's idiosyncratic progression through the training procedure.

In the Paul and Trimble (1970) study, the subject's expectation of therapist involvement was verified when the therapist gave differential training to muscle groups needing more attention. However, it is possible that such an expectancy was already established by the mere presence of the therapist in the room giving the instructions. When relaxation training is presented under live conditions with the experimenter (therapist) present, the subject may feel that the experimenter is manipulating therapy to personalize the instruction to match the subject's progression through the procedure. Even if the subject is not aware of how the

relaxation procedures normally proceed, the fact that the experimenter is present during the condition allows for the possibility that he may be modifying the training instructions and procedures to meet the needs of the subject.

It is, therefore, possible that a critical variable involved in the difference between live and taped procedures found by Paul and Trimble may have been the subject's expectancy of the experimenter's involvement in the training procedures. This expectancy of involvement would be defined as the amount of control the subject felt the experimenter had in manipulating the training procedure to be commensurate with the subject's progression through the training procedure. If expectancy of involvement is a critical variable in influencing the effectiveness of relaxation training procedures, then those conditions in which the subject expects there to be experimenter involvement should produce more effective results than those conditions in which there is no expectancy of experimenter involvement.

The question concerning the efficacy of taped relaxation training needs further attention. If Paul and Trimble's (1970) findings are supported, then serious consideration would have to be given before taped procedures were utilized in either clinical or experimental settings. If, on the other hand, taped instructions or a combination of live and taped instructions were found to be as effective in inducing relaxation as live instructions, then considerable support would be given to the continued use of taped procedures.

The present study examined the effects of two modes of presentation of relaxation instructions (live vs tape) and two levels of subjects' expectancy of the experimenter's involvement in the training procedures (involved vs rote) on muscle tension, heart rate, Anxiety Differential (Husek & Alexander, 1963), Subjective Units of Distress/Discomfort, and Level of Relaxation. Two sessions of relaxation training were conducted under the following four Experimental conditions: 1) live-involved, 2) live-rote, 3) taped-involved, 4) taped-rote. The two Control conditions consisted of self-relaxation sessions conducted under live and taped conditions.

The research by Paul and Trimble (1970) suggests that live relaxation training is significantly more effective than tape relaxation training in producing a state of relaxation. However, it is possible that if the confounding methodological problems of the Paul and Trimble study mentioned previously are eliminated, there may be no significant difference in effectiveness between live and tape relaxation procedures. If a difference does exist between live and tape relaxation procedures, it may be a function of the subject's expectancy of the experimenter's involvement in the therapeutic procedure. Groups for which expectancy of experimenter's involvement is maximized would be expected to achieve a significantly greater state of relaxation in comparison to groups in which such expectancy is minimized.

METHOD

Subjects

The subjects were undergraduate or graduate non-psychology students enrolled at the University of North Carolina at Greensboro. A total of 60 volunteer subjects were used in the study, unselected except for the absence of drug use, good physical health, and no prior training in deep muscle relaxation. The subjects were not given any prior information about the study except that they would be scheduled for two one-hour sessions, seven days apart. Subjects were randomly assigned to one of four Experimental or two Control conditions. Eight subjects were replaced during the experiment because they either experienced physical discomfort (n=3) or went to sleep during the session (n=5).

Dependent Measures

Five dependent measures were obtained from each subject during each session, with data collection procedures being identical across all experimental conditions. Physiological measures consisted of heart rate, muscle tension recorded on a three channel Grass Polygraph and a Bio-Electric Information Feedback System (BIFS). Muscle tension was recorded from the frantalis muscles of the forehead, and heart rate was recorded from electrodes placed over the radial artery of each wrist.

Two self-report measures were used to assess changes in anxiety. The Anxiety Differential (AD) was administered at the beginning of each session. The subjects were also asked to rate their subjective feelings of anxiety on a scale of 0 to 100, with 100 being the most anxious possible and 0 being a state of absolute calm. Scores obtained by this measure will be referred to as Subjective Units of Discomfort/ Distress (SUDS).

A level of relaxation (LOR) score was obtained at the end of each session by having the subjects rate their level of relaxation on a scale of 0 to 100. The following scale was provided to the subjects as a reference for numerical scores associated with levels of relaxation: 100/awake; 80-100/light; 60-80/medium; 40-60/deep; 20-40/complete; 0-20/asleep.

Procedure

All subjects were run individually by one experimenter. Upon entering the experimental room, the subject was seated in a reclining chair and asked to complete the Subjective Units of Discomfort and Anxiety Differential scales. After these scales had been completed, the subject was placed in a semirecumbent position in a recliner chair, and the experimenter attached the electrodes for physiological recording. The subject was then given instructions according to the specific experimental condition to which they were assigned. After answering any questions, the subject was asked to sit

quietly with his eyes open while the experimenter calibrated the equipment. This instruction initiated a 10-minute silent adaptation period, with the last minute of this period serving as the pre-treatment basal level (Period 1) for the physiological measures. The experimental condition commenced at the end of Period 1 and lasted approximately 29 minutes. Physiological measures were recorded at two times during the experimental condition. For all Experimental groups, physiological measures were recorded during the first minute after the tension-release phase of the relaxation training had concluded (Period 2). Physiological measures (Period 2) on the Control groups were recorded 24 minutes after the experimental condition had begun, corresponding temporally with Period 2 recordings of the experimental groups. The last minute of the experimental condition prior to termination instructions served as the post-treatment assessment period (Period 3) for both the Experimental and Control groups. Upon termination of the experimental condition, the subjects completed post-experimental scales of AD, SUDS, and LOR before being disengaged from the apparatus.

The procedures for the second session were basically identical to those of the first session. Upon arrival for the second session, the subjects received a brief review of the instructions and were given the pre-experimental scales to complete. Electrodes were then attached and a 10-minute adaptation period preceded the experimental condition.

Physiological measures were taken during the same three periods. Upon completion of the experimental condition, the subjects were asked to complete post-experimental AD, SUDS, and LOR scales and were given a Post Experimental Questionnaire (Appendix A) to assess the subject's perception of the experimenter's involvement in the experimental procedure.

Experimental Conditions

The instructions presented to the subjects were designed to manipulate their expectancy of the experimenter's involvement or control over the experimental procedures. All subjects received the same basic instructions (Paul, 1969a) except for one paragraph specific to the experimental condition to which the subject was assigned (Appendix B). This paragraph was the next to the last paragraph in all of the instructions.

The relaxation training instructions were an adaptation of the Paul and Trimble (1970) instructions which utilized a basic Wolpian (1958) procedure of two tension-release cycles for 16 major muscle groups (Appendix B). The tension phase lasted for 5-7 seconds during which time the subject was asked to focus on the sensations of tension and where they occurred. The release phase immediately followed the tension phase and lasted 25-30 seconds during which time the subject was asked to focus on the sensations of warmth, heaviness, and relaxation in the muscles. Each muscle group underwent

two tension-release cycles before progressing to the next muscle group. At the end of the tension-release phase of the relaxation training, the subjects received 5 minutes of passive relaxation instructions. These instructions had the subjects focus on various sensations of heaviness, relaxation, and deep breathing without requiring any active motor response. At the end of the passive relaxation instructions, termination instructions were presented, and the subjects were aroused. Identical relaxation training instructions were used with all Experimental groups in both Session 1 and Session 2.

Live Relaxation Training. In the Live relaxation training condition, the experimenter was present with the subject at all times except during the 10-minute adaptation period (Period 1). The experimenter sat to the left and slightly behind the subject.

Taped Relaxation Training. In the Taped relaxation training condition, the experimenter presented the introductory instructions in person to the subject and then left the room during the adaptation period. At the end of the adaptation period, the experimenter returned to the experimental room to turn on the tape recorder and then he left immediately. The relaxation instructions were then presented to the subject on tape. At the end of the relaxation training, the experimenter returned to the experimental room to administer the post-experiment scales and to disengage the subject from the equipment.

Control Conditions. After completion of pre-experimental scales, the subjects were given instructions that they were to sit quietly and relax themselves as deeply as possible without going to sleep. They were then asked to sit quietly for a few minutes while the instruments were calibrated and at the end of the 10-minute adaptation period, they were asked to get comfortable and relax quietly during the remainder of the period. At the end of the 29-minute rest period, termination instructions identical to those of the Experimental conditions were given.

In the Live Control condition, the experimenter remained in the room throughout the session except for the adaptation period, and gave all instructions in person. The Taped Control procedures were similar to the live procedures except that after the adaptation period the experimenter returned to the room to turn on the tape recorder which gave the final instruction to get comfortable and to relax for the remainder of the period and 29-minutes later, gave the termination instructions. The experimenter left the experimental room after turning on the tape recorder and returned after the termination instructions had been given.

Apparatus

All experimental and control conditions were conducted in an air-conditioned experimental room. The physiological recording equipment was located in an adjoining room with electrodes feeding into the experimental room through a conduit in the wall.

Physiological measures were recorded on a Model B-1 Bio-Electric Information Feedback System (BIFS) and a 3 channel Grass Model 79 EEG and Polygraph Data Recording System, equipped with a Model 7P4A Tachograph Pre-Amplifier and a Model 7DAC Driver, on Grass Polygraph chart paper driven at 5mm/sec. The beginning of each recording was denoted by the polygraph event recorder which was operated manually.

Muscle tension was recorded by the BIFS from surface electrodes, encased in an elastic headband, placed 1 inch above the subject's eyebrows. An integrated EMG reading in peak to peak milli-volt minutes was displayed on the digital readout panel on the BIFS. The EMG signal was also fed from the BIFS into the J5 input of the Grass DC Driver, thus producing a visual display of the EMG activity on the chart paper.

Heart rate was recorded from electrodes placed over the radial artery of each wrist with the signal being fed through a Grass Model 7P4A Tachograph. Heart rate in beats/ minute was determined by counting pulses from the Tachograph.

All electrodes were cleaned and recoated after each subject had been run. Beckman electrode paste was used for all connections. The skin area for electrode placement was first cleaned with Brasivol (Fine) cleansing soap, and paste-coated electrodes were taped over the radial arteries with Johnson and Johnson First Aid Tape. The electrodes in the elastic headband were also filled with electrode paste and the headband strapped over the frontalis muscles.

RESULTS

Tables 1 and 2 present the mean percent change scores for EMG, SUDS, and AD and the difference scores for HR for the four Experimental and two Control groups for Session 1 and Session 2, respectively. A multivariate analysis of variance[1] was performed on the pretest-posttest percent change scores for the EMG, SUDS, and AD and the pretest-posttest difference scores for HR for the four Experimental and two Control groups. The multivariate analysis of variance indicated a significant main effect of Level of Involvement (Approximate $F=5.92$, df 8/102, $p<.01$) indicating a differential effect among the experimental conditions across the dependent measures.

Physiological Measures

Figure 1 presents the pretest, intermediate, and posttest mean EMG scores for the four Experimental and two Control groups for Session 1 and Session 2. A univariate analysis of variance on the pretest-posttest EMG percent change scores indicated that there were significant differences in the percent of EMG change occurring among the Involvement groups ($F=7.60$, df 2/54, $p<.01$). The main effect for Sessions was

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[1]All statistical tables appear in Appendix C.

TABLE 1

Percent Change Scores or Difference Score Means For Each Dependent Variable For Experimental and Control Groups During Session 1

	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
EMG % Mean Change Pre-Post	27.39	29.20	-2.30*	23.20	47.70	14.90
EMG % Mean Change Pre-Int	16.20	23.20	3.90	18.00	38.40	22.50
EMG % Mean Change Int-Post	13.00	9.00	-8.20*	4.00	5.10	-25.70*

* A minus sign indicates an increase in the percent or difference score.

TABLE 1 (continued)

	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
HR Diff Score Pre-Post	2.30	7.80	5.70	7.10	5.30	7.60
HR Diff Score Pre-Int	2.50	6.90	3.70	6.40	4.30	8.20
HR Diff Score Int-Post	-0.20*	0.90	2.00	0.70	0.80	-0.80*

* A minus sign indicates an increase in the percent or difference score.

TABLE 1 (continued)

	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
SUDS % Mean Change Pre-Post	73.10	59.20	45.80	59.30	56.40	52.40
AD % Mean Change Pre-Post	23.10	12.50	14.20	15.20	11.50	12.10

TABLE 2

Percent Change Scores or Difference Score Means For Each Dependent Variable For Experimental and Control Groups During Session 2

	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
EMG % Mean Change Pre-Post	26.60	21.70	-16.10*	55.50	41.30	-0.10*
EMG % Mean Change Pre-Int	13.00	16.80	-10.40*	50.70	35.40	3.60
EMG % Mean Change Int-Post	19.90	4.70	-18.40*	3.80	4.90	-3.20*

* A minus sign indicates an increase in the present or difference score.

TABLE 2 (continued)

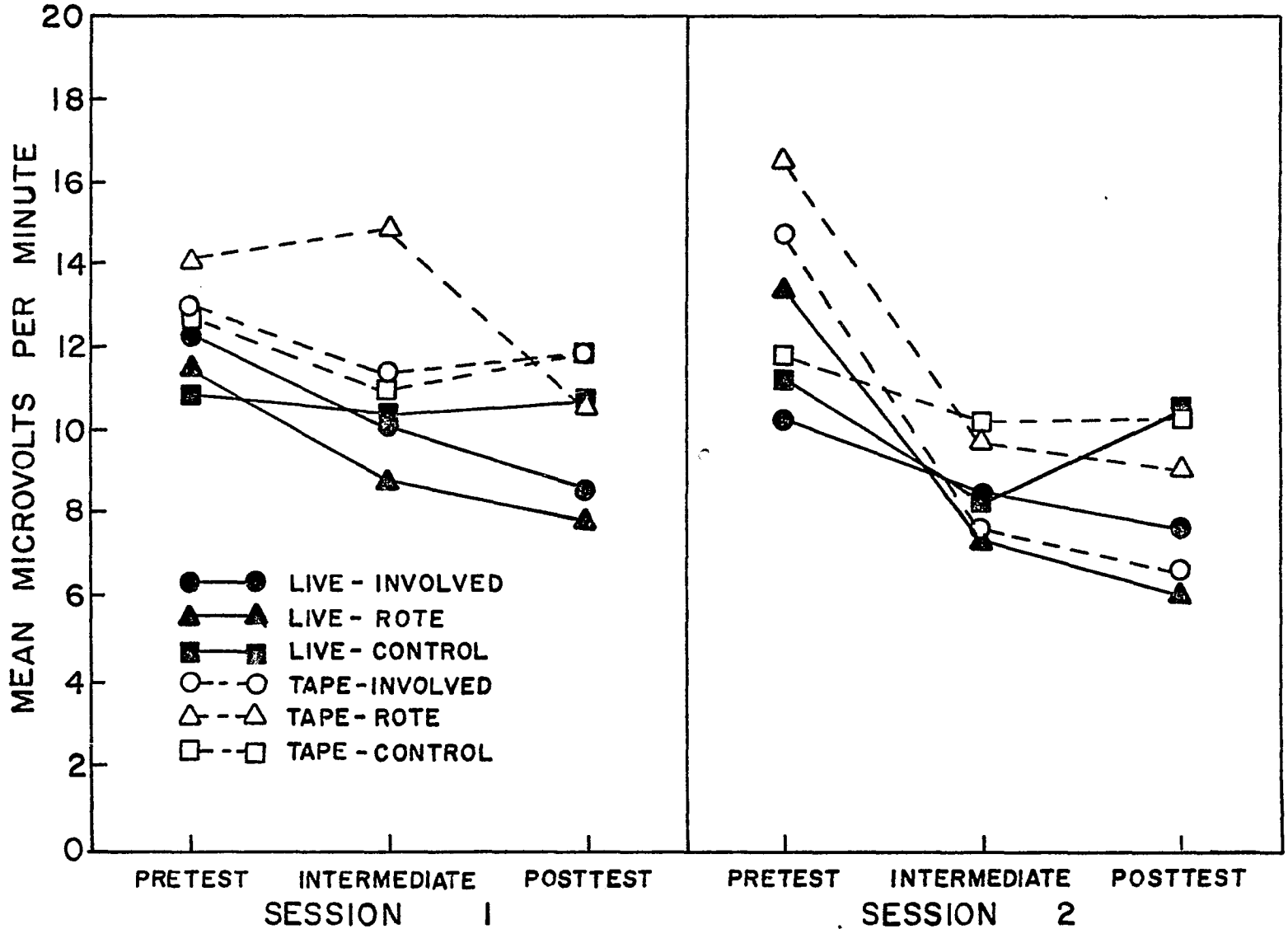
	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
HR Diff Score Pre-Post	8.40	2.70	2.70	8.70	3.40	3.70
HR Diff Score	6.90	2.60	1.80	8.10	5.00	4.30
HR Diff Score Int-Post	1.50	0.10	0.90	0.60	-1.60*	0.20

* A minus sign indicates an increase in the percent or difference score.

TABLE 2 (continued)

	Live Involved	Live Rote	Live Control	Tape Involved	Tape Rote	Tape Control
SUDS % Mean Change Pre-Post	68.40	56.20	56.70	59.70	54.00	35.80
AD % Mean Change Pre-Post	23.10	17.40	19.60	21.90	13.50	15.00

Figure 1. Pretest, Intermediate, and Posttest Mean EMG Scores for the Four Experimental and Two Control Groups for Session 1 and Session 2.


MEAN MICROVOLTS PER MINUTE
20
18
16
14
12
10
8
6
4
2
0
LIVE - INVOLVED
LIVE - ROTE
LIVE - CONTROL
TAPE - INVOLVED
TAPE - ROTE
TAPE - CONTROL
PRETEST
INTERMEDIATE
POSTTEST
SESSION 1
PRETEST
INTERMEDIATE
POSTTEST
SESSION 2

significant ($F=6.43$, df 2/54, $p<.05$) indicating that the percent of EMG change was greater for all groups in Session 2 than in Session 1. The EMG data for Involvement groups were submitted to a Newman-Keuls post-hoc comparison of means. Both the Involved and Rote groups obtained greater decreases in the percent of EMG change than the two Control groups ($p<.05$, both comparisons); however, there was no significant difference between the Involved and Rote groups. Although the average subject showed a decrease in the percent of EMG change, 10% of the subjects in the Experimental groups experienced an increase in muscle tension in Session 1, and 2% of the subjects in the Experimental groups experienced an increase in muscle tension in Session 2.

A four way analysis of variance on pretest, intermediate, and posttest EMG scores was conducted with two between subject variables, Mode of Presentation and Level of Involvement, and two within subject variables, EMG Intervals and Sessions. The results indicated a significant EMG Interval main effect ($F=38.93$, df 2/108, $p<.01$), a Level of Involvement by EMG Interval interaction ($F=4.88$, df 4/108, $p<.01$), and a Sessions by EMG Interval interaction ($F=6.59$, df 2/108, $p<.01$). The data for the EMG Interval groups were submitted to a Newman-Keuls post-hoc comparison of means, and a significant decrease in pretest-intermediate and pretest-posttest EMG scores was obtained ($p<.05$, both comparisons). There was no significant difference between intermediate-

posttest EMG scores. The data for the Level of Involvement by EMG Interval interaction were submitted to a Newman-Keuls post-hoc comparison of means. There was a significant decrease in pretest-intermediate and pretest-posttest EMG scores for both the Involved and Rote groups ($p<.05$, both comparisons), with no significant difference found between intermediate-posttest scores. There was no significant difference among the Control group EMG scores. The post-hoc comparisons also indicated that there were no significant differences among the Involved, Rote, or Control groups at any of the EMG intervals (pretest, intermediate, and post-test). These results indicate that the four Experimental groups experienced a significant decrease in EMG as compared to the two Control groups, although there were no significant differences among the groups at the pretest, intermediate, or posttest intervals.

The data for the Sessions by EMG Interval interaction were submitted to a Newman-Keuls post-hoc comparison of means. There was a significant difference between pretest-intermediate EMG scores in Session 1 and a significant difference between pretest-intermediate and pretest-posttest EMG scores in Session 2, indicating a decrease in pretest-intermediate EMG in both Sessions, with the decrease being maintained in Session 2 but not in Session 1. There was a significant difference between Session 1 and Session 2 intermediate EMG scores and Session 1 and Session 2 posttest EMG scores,

with no significant difference found between Session 1 and Session 2 pretest EMG scores. This indicates that there was no significant difference between the Session 1 and Session 2 pretest levels of EMG; however, EMG scores were significantly lower at the intermediate and posttest intervals in Session 2 as compared to Session 1.

A univariate analysis of variance on the Session 1 posttest and Session 2 pretest EMG scores indicated a significant Mode of Presentation effect ($F=5.32$, df 1/54, $p<.05$), a significant Sessions effect ($F=17.07$, df 1/54, $p<.01$), and a significant Level of Involvement by Sessions effect ($F=3.85$, df 2/54, $p<.05$). The significant Mode of Presentation effect indicates that the Tape conditions resulted in a significantly higher EMG score as compared to the Live conditions, and the significant Sessions effect indicates that the EMG scores for all groups were higher in Session 2 as compared to Session 1. The data for the Level of Involvement by Sessions interaction were submitted to a Newman-Keuls post-hoc comparison of means. Both the Involved and Rote groups experienced significantly higher EMG pretest scores in Session 2 as compared to Session 1 posttest scores, with no significant difference found for the Control group. There were no significant differences among the Session 1 posttest EMG scores or among the Session 2 pretest EMG scores.

A multivariate analysis of variance was performed on the pretest-intermediate percent change scores for the EMG

and the difference scores for HR. The results indicated a significant Level of Involvement effect (Approximate F=3.09, df 4/106, $p<.05$), a significant Sessions effect (Approximate F=5.78, df 1/54, $p<.01$), and a significant Level of Involvement by Mode of Presentation interaction (Approximate F=2.51, df 4/106, $p<.05$). A univariate analysis of variance indicated that there were significant differences in the percent of pretest-posttest EMG change occurring among the Involvement groups (F=3.20, df 2/54, $p<.05$). The EMG data for Involvement groups were submitted to a Newman-Keuls post-hoc comparison of means; however, no significant differences were found among the groups. Although the average subject showed a decrease in the percent of EMG change, 25% of the subjects in the Experimental groups experienced an increase in muscle tension in Session 1. And 10% of the subjects in the Experimental groups experienced an increase in muscle tension in Session 2.

A multivariate analysis of variance was performed on the intermediate-posttest change scores for the EMG and the difference scores for HR. The results indicated a significant Level of Involvement effect (Approximate F=3.04, df 4/106, $p<.025$). A univariate analysis of variance indicated that there were significant differences in the percent of EMG change occurring among the Involvement groups (F=6.49, df 2/54, $p<.025$). The EMG data for Involvement groups were submitted to Newman-Keuls post-hoc comparison

of means. No significant differences were found among the groups, although there was a trend ($p<.10$) for both the Involved and Rote groups to have greater decreases in the percent of EMG change than the two Control groups.

Figure 2 presents the pretest, intermediate, and posttest mean HR scores for the four Experimental and two Control groups for Session 1 and Session 2. A univariate analysis of variance on the pretest-posttest HR change scores indicated a significant Mode of Presentation by Level of Involvement interaction ($F=3.60$, df 2/54, $p<.05$). The HR data for the Mode of Presentation by Level of Involvement interaction were submitted to a Newman-Keuls post-hoc comparison of means; however, no significant differences were found among the groups.

A univariate analysis of variance on the pretest-intermediate HR change scores indicated no significant differences among the groups. A univariate analysis of variance on the intermediate-posttest HR change scores also indicated no significant differences among the groups.

Self-Report Measures

Figure 3 presents the pretest and posttest mean SUDS scores for the four Experimental and two Control groups for Session 1 and Session 2. A univariate analysis of variance on the pretest-posttest SUDS percent change scores indicated that a significantly larger decrease in the percent of SUDS change was found in Session 1 as compared to Session 2 ($F=4.50$, df 1/54, $p<.05$).

Figure 2. Pretest, Intermediate, and Posttest Mean HR Scores for the Four Experimental and Two Control Groups for Session 1 and Session 2.

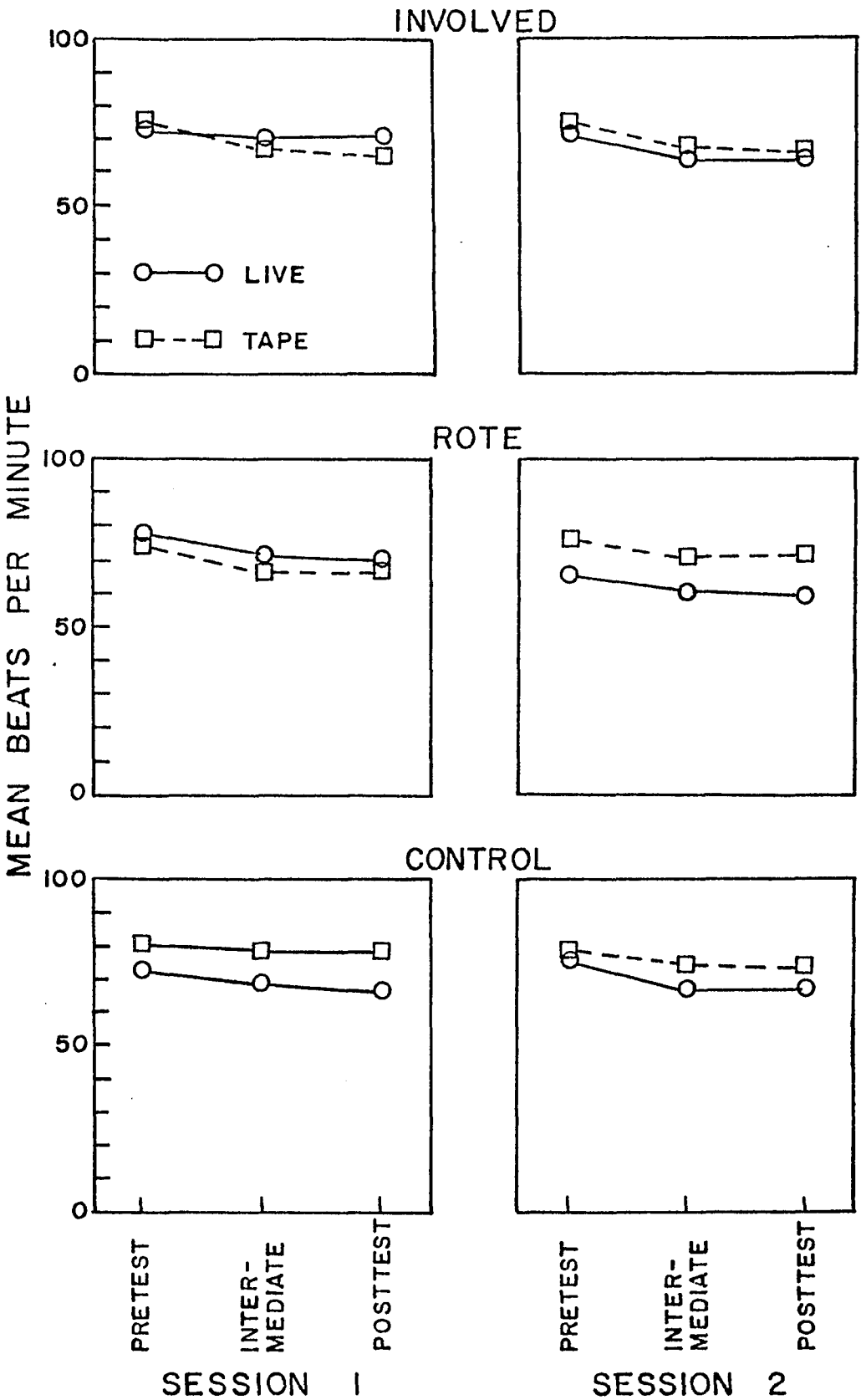

INVOLVED
ROTE
CONTROL
MEAN BEATS PER MINUTE
100
50
0
LIVE
TAPE
PRETEST
INTER-MEDIATE
POSTTEST
SESSION 1
SESSION 2

Figure 3. Pretest and Posttest Mean SUDS Scores for the Four Experimental and Two Control Groups for Session 1 and Session 2.

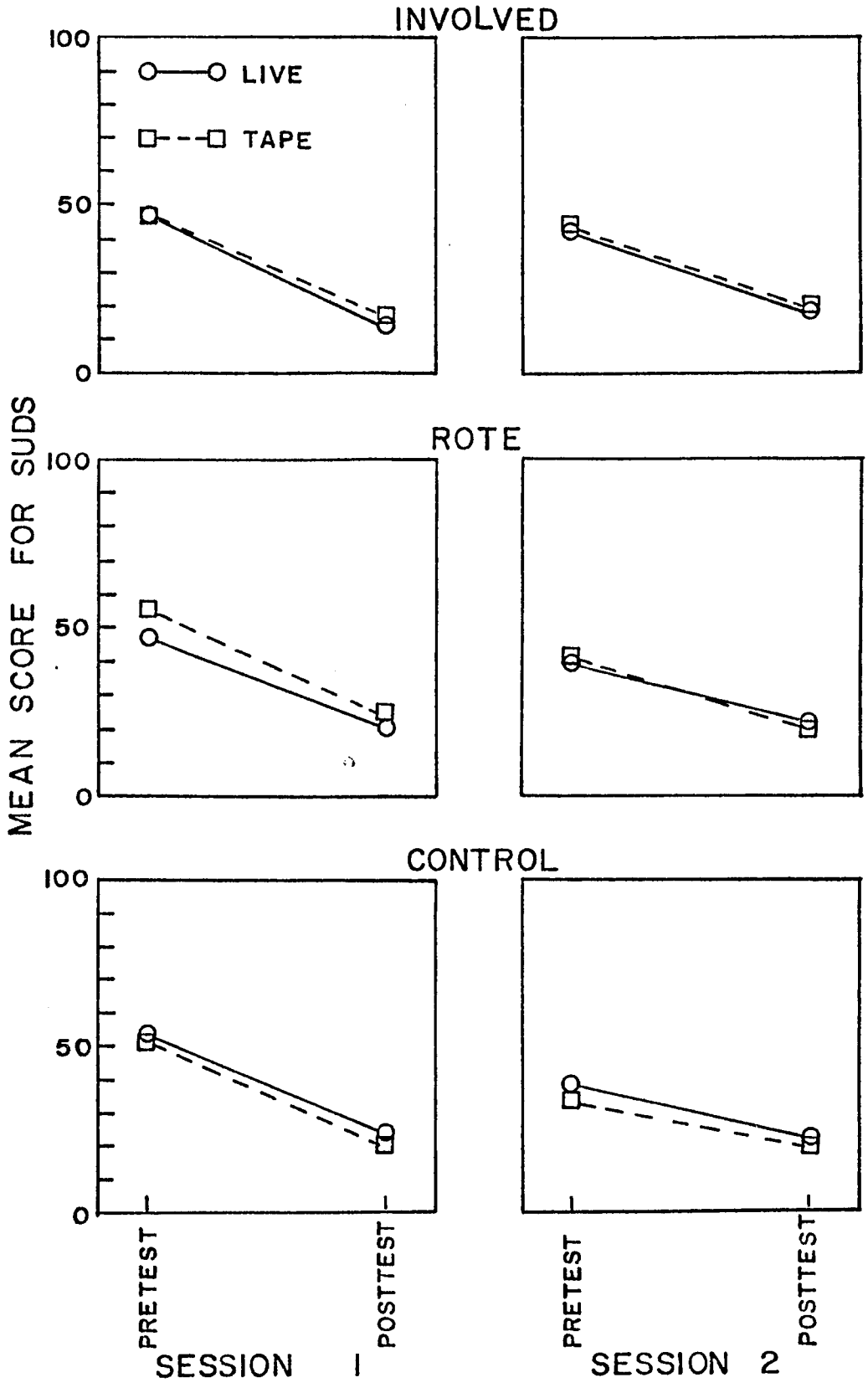

INVOLVED
ROTE
CONTROL
LIVE
TAPE
100
50
0
MEAN SCORE FOR SUDS
PRETEST
POSTTEST
SESSION 1
SESSION 2

Figure 4 presents the pretest and posttest mean AD scores for the four Experimental and two Control groups for Session 1 and Session 2. A univariate analysis of variance on the pretest-posttest AD percent change scores indicated no significant differences among the groups.

Figure 5 presents the Session 1 and Session 2 mean LOR scores for the four Experimental and two Control groups. A univariate analysis of variance on the Session 1-Session 2 LOR percent change scores indicated no significant differences among the groups. A univariate analysis of variance comparing Session 1 and Session 2 LOR scores indicated a significantly lower LOR score for all groups in Session 2 in comparison to Session 1 ($F=14.19$, df 1/54, $p<.01$). Univariate analysis of variance on Session 1 and Session 2 LOR scores indicated no significant differences among the groups.

A multivariate analysis of variance was performed on Questions 1-3 of the Post-Experiment Questionnaire data for the four Experimental and two Control groups, with no significant differences indicated among the groups. A multivariate analysis of variance was performed on Questions 1-5 of the Post-Experiment Questionnaire data for the four Experimental groups, with no significant differences indicated among the groups.

Figure 4. Pretest and Posttest Mean AD Scores for the Four Experimental and Two Control Groups for Session 1 and Session 2.

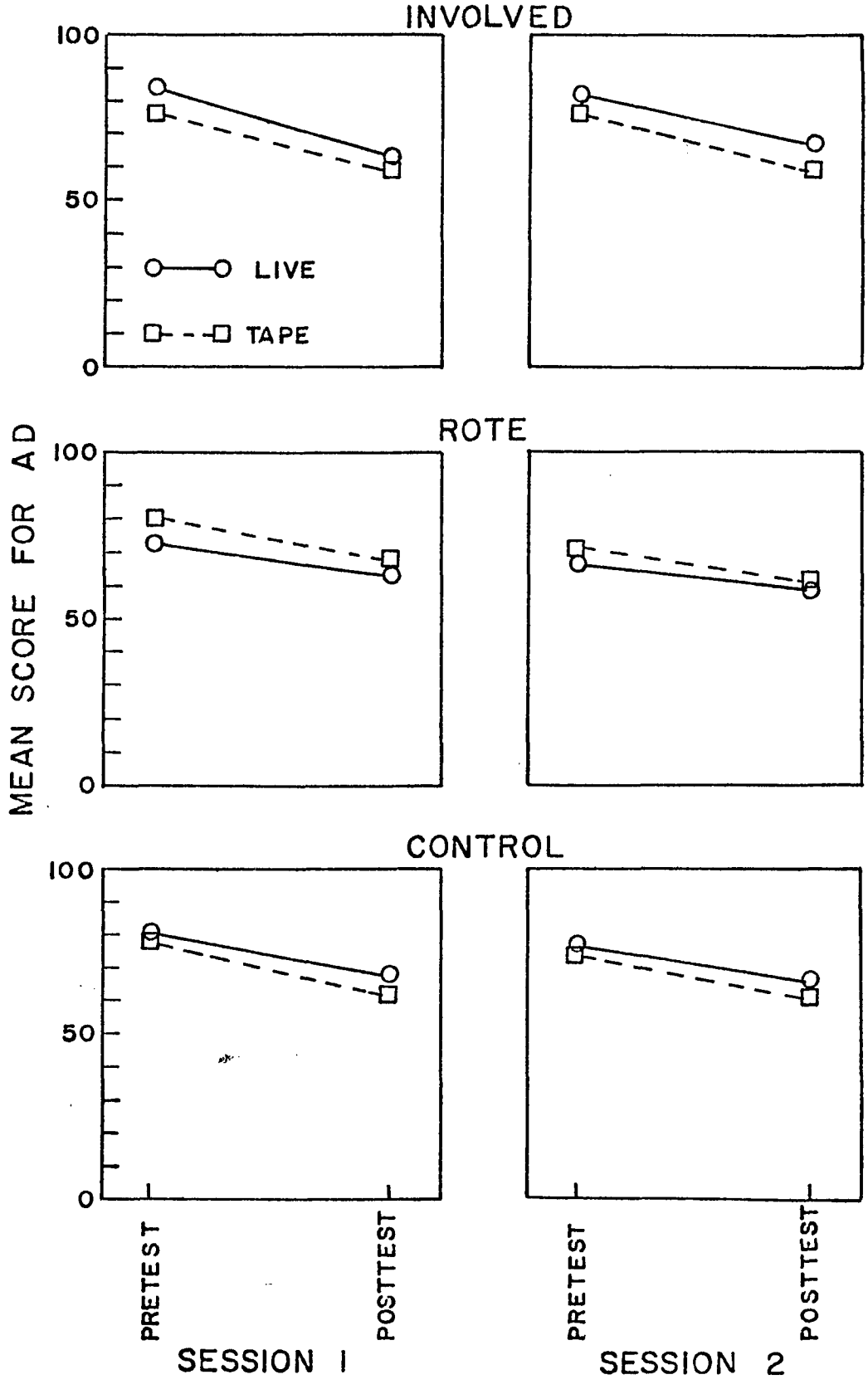
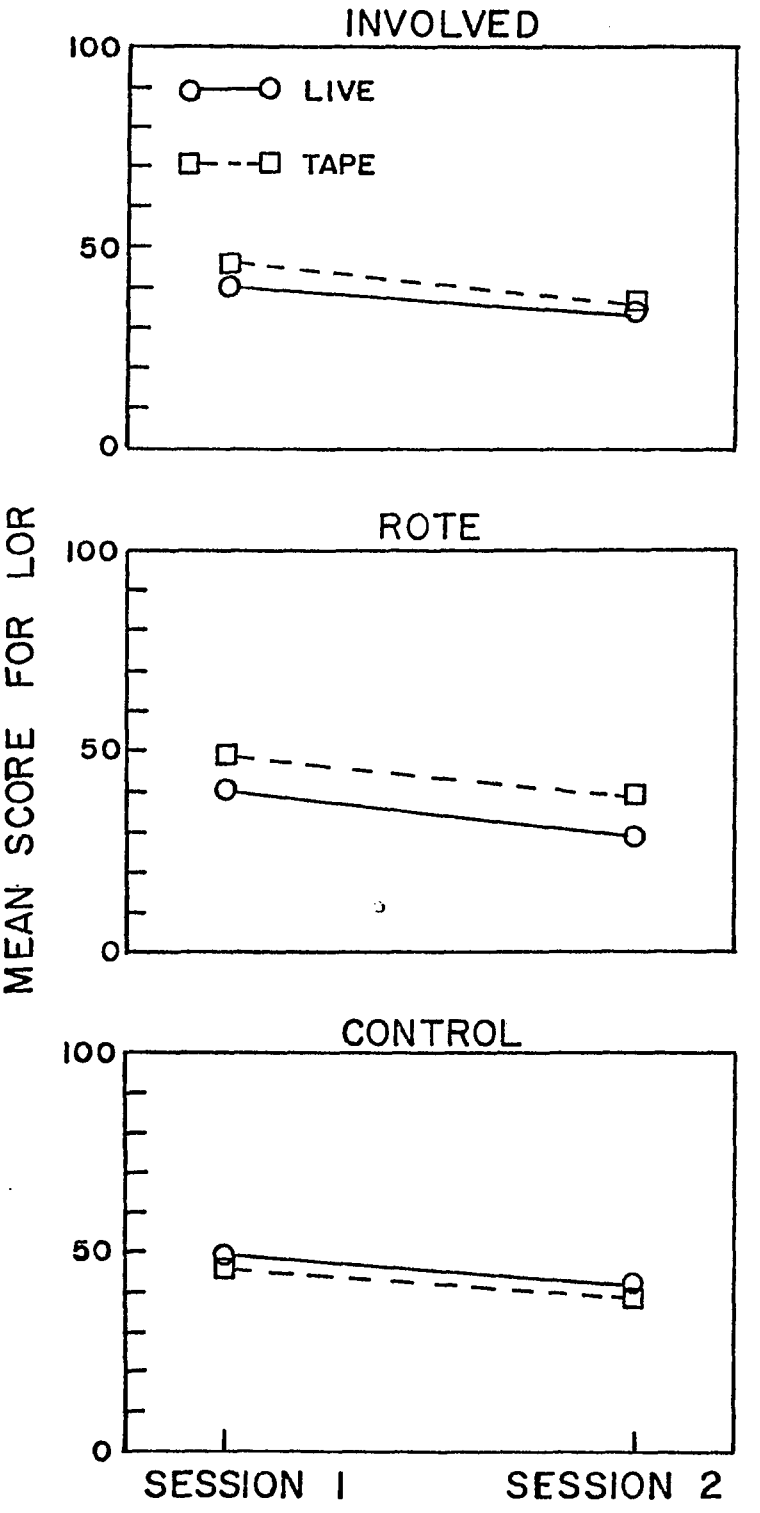

INVOLVED
ROTE
CONTROL
MEAN SCORE FOR AD
100
50
0
LIVE
TAPE
PRETEST
POSTTEST
SESSION 1
SESSION 2

Figure 5. Session 1 and Session 2 Mean LOR Scores for the Four Experimental and Two Control Groups.


INVOLVED
100
LIVE
TAPE
50
0
ROTE
100
50
0
MEAN SCORE FOR LOR
CONTROL
100
50
0
SESSION 1
SESSION 2

DISCUSSION

The first important comparison in the present study concerns the efficacy of the Experimental conditions in inducing relaxation. Both the Live and Taped relaxation groups in the present study obtained a significant decrease in EMG in comparison to their Control groups during both Session 1 and 2, indicating the effectiveness of relaxation training in significantly reducing muscle tension within both the first and second sessions. However, it must be noted that although the Experimental groups did experience a significant reduction in EMG, there was no significant difference between the Experimental and Control group posttest EMG levels. While relaxation procedures produced an overall decrease in heart rate, the Experimental groups did not obtain greater decreases than the Control groups. Therefore, the relaxation procedures did produce a reduction in physiological arousal, with muscle tension, the most critical variable in assessing skeletal-muscular relaxation, obtaining a significant reduction by the Experimental groups. These findings are in the direction of, but not as strong as, those of Paul and Trimble (1970) who obtained significant differences for three out of four physiological measures (muscle tension, heart rate and respiration).

A reduction in physiological arousal was accompanied by a reduction in subjective or cognitive arousal as evidenced

by pretest-posttest reduction in SUDS and AD mean scores and low LOR ratings. However, no significant differences were found among the Experimental and Control groups on any subjective measures. These findings differed from those of Paul and Trimble (1970) who obtained significant differences between Experimental and Control groups on the AD.

A second important comparison in the present study involved the efficacy of live and taped relaxation procedures. Consistent throughout the present study was the lack of significant differences between live and taped relaxation procedures on any dependent measures. These findings are in partial contradiction to the Paul and Trimble (1970) study in which the live procedure produced significantly greater decreases in muscle tension and heart rate than did the tape procedure, but no significant difference between the live and taped Experimental groups on the only subjective measure used, the AD. However, findings of the present study do seem to be in essential agreement with the previous studies which effectively used taped relaxation in successful treatment programs.

In attempting to explain their results, Paul and Trimble (1970) stated that the most viable explanation for the difference between the live and tape procedures was the lack of response-contingent progression in the tape procedure. They hypothesized that the use of a standard pace in the tape procedure might prematurely advance a subject from one muscle

group to the next, thus producing a deleterious effect on the relaxation procedure. Although Paul and Trimble intended to make a comparison between live and taped relaxation training, they cannot make any substantial statement concerning the differential effectiveness of the two procedures because their relaxation procedures differed radically in both format and mode of presentation. The present study suggests that two relaxation procedures, differing only by mode of presentation, can be equally effective in producing relaxation. It also suggests that relaxation training with a standard pace can be effective in inducing deep muscle relaxation. These findings support the continued use of taped relaxation procedures as a means of inducing relaxation.

Serious theoretical and practical implications for the therapeutic use of relaxation training are indicated by the findings that 25% of the subjects in the Experimental groups showed an increase in muscle tension at the end of the tension-release phase of the relaxation training in Session 1. Customarily, it is at the end of the tension-release phase of relaxation training that the reciprocal inhibition process of systematic desensitization begins (Wolpe, 1958; Bernstein & Borkovec, 1973). The findings from the present study suggest that certain therapeutic procedures which require a subject to be relaxed may actually commence while the subject is in a state of increased skeletal-muscular tension. Theoretically, the increased isometric

tension of a muscle groups is supposed to result in a "non-contracting" resting phase after the muscle has been relaxed (Jacobson, 1938; Wolpe, 1958). The increase in muscle tension observed in the Experimental subjects in the present study suggests that the physiological explanations for the process of relaxation may need reexamination.

From a clinical viewpoint, one possible way of reducing the probability of starting a therapeutic procedure while the subject is still tense is the use of passive relaxation instructions at the end of the tension-release phase. The present study used relaxation instructions which included five minutes of passive relaxation instructions at the end of the tension-release phase (Appendix B). The use of the passive instructions was correlated with a reduction in the number of tense subjects from 25% at the end of the tension-release phase to 10% at the end of Session 1, and from 10% to 2% in Session 2. Although the use of passive relaxation instructions does not insure that subjects will be relaxed at the end of the training session, it does tend to reduce the probability of the subject being tense.

One unexpected finding was that the Tape Experimental groups had elevated pretest EMG in both Session 1 and Session 2, suggesting that something inherent in the Tape condition was artificially increasing EMG. However, the data indicated that there were no significant differences among Session 1 pretest EMG scores, and that all Experimental groups began

Session 2 more tense than they were at the end of Session 1. Since there was no significant difference between Session 1 and Session 2 pretest EMG scores, the data suggest that the difference between Session 1 and posttest EMG and Session 2 pretest EMG is more a function of the treatment procedure reducing Session 1 posttest EMG than of the Experimental procedures artificially increasing Session 2 pretest EMG. The results also suggest that there was no carryover relaxation effect from the end of Session 1 to the beginning of Session 2.

Close consideration should be given to the negative results obtained for the measures of subjective arousal. At least three possible hypotheses may be developed to explain these findings. First, the demand characteristics of the experiment, the experimental cues which may convey the experimental hypothesis to the subject, may have prompted the Control subjects to report subjective decreases in anxiety and low ratings of LOR. Although the experimental instructions were designed to elicit unbiased subjective reports, the demand characteristics of an experimental study of relaxation may have prompted subjective responses consistent with relaxation. Also, the experimental condition was designed to have the Control subjects view themselves as Experimental subjects, and this condition may have influenced their responses (Orne, 1971).

Second, the results obtained for the Control subjects may have been a function of placebo therapy, the process of a behavioral change occurring as a result of a social influence principles (Fish, 1973). Being part of a legitimate research project in which impressive equipment was used to assess an expected relaxation response may have produced a subjective state of relaxation apart from any experimental manipulation.

The third, and most intriguing alternative, is that relaxation may consist of distinct cognitive and physiological components, both of which are related, but under independent control. Subjects may, therefore, experience a significant decrease in cognitive arousal which is interpreted correctly by the subject as relaxation, but which is not accompanied directly with a significantly large decrease in physiological arousal. The finding that subjects who were asked to relax themselves achieved a substantial decrease in cognitive arousal without the accompanying decrease in physiological arousal may indicate that the cognitive component of relaxation is under more direct voluntary control of the subject. The physiological component may be under more involuntary control, thus requiring a longer period of time to achieve a significant decrease, and perhaps requiring special procedures such as the tension-release procedures of relaxation training.

A dual component conception of relaxation could also explain those instances in which subjects showed an increase in physiological arousal but rated their subjective arousal as having decreased. Examination of individual subject records revealed a number of discrepancies between physiological and subjective measures. In one case (tape-involved), a subject showed an increase from 22 microvolts (mu) to 41 mu in her EMG during Session 1, yet rated herself 40 units more relaxed than during Session 2 when she showed a decrease from 28 mu to 9 mu. In another case (live-rote), a subject who showed a decrease from 14 mu to 7 mu reported being considerably more relaxed than when he showed a decrease from 15 mu to 4 mu. In both cases, the subjects rated themselves as less subjectively relaxed in the session during which they experienced the largest decrease and obtained the lowest absolute level of muscle tension. Future research might be designed to explore the relative effectiveness of relaxation procedures on the cognitive and physiological response systems.

Although a dual component conception of relaxation may give a parital explanation for the discrepancy between physiological and subjective measures in the present study, no suitable solution has been presented as to which variable, or combination of variables, constitutes the best criterion for assessing relaxation. Even within the variables themselves, there is no indication as to which of the different

measures is the best to use. For example, with physiological measures, such as muscle tension, one question is whether the absolute level of EMG obtained is a better indicator of relaxation than is the amount of decrease in EMG. Similarly, which of the available subjective measures should be considered maximally valid? For both the experimenter and clinician, these are critical questions which may be answered by comparing therapeutic results obtained under different relaxation assessment procedures. A comparison could be made of the effects of a therapeutic procedure, such as systematic desensitization, begun when relaxation had been indicated by a physiological variable alone, subjective variable alone, with both variables indicating relaxation, and without either variable indicating relaxation. Within each variable, different measurement criteria could be used in order to determine the most valid measure of relaxation.

The original hypothesis that the subject's expectancy of the amount of control possessed by the experimenter might influence the results of relaxation training was developed in response to previous research suggesting a difference between live and taped relaxation procedures (Paul & Trimble, 1970). The finding that the subjects in the Rote condition did not perceive the experimenter as having less control than subjects in the Involved condition were unexpected. In spite of the lack of difference found between live and taped procedures, subjects in the Rote condition

would be expected to rate the experimenter as having little control in modifying the relaxation instructions, especially when four statements to that effect were included in the instructions. Since it was possible that the subjects did not pay attention to or listen to these instructions, the last half of the subjects in the experiment were asked during the post-experiment assessment period if they remembered any instructions which indicated whether the experimenter had had any control in modifying the relaxation instructions. Ninety-three percent of these subjects were able to repeat instruction content sufficiently to indicate that they had heard and remembered this aspect of the instructions. When the subjects in the Rote condition were asked what factors influenced their rating of experimenter control, they responded with more generalized statements concerning the total experimental situation. They stated that the experimenter's professional manner and friendliness put them at ease as did his explaining the procedures fully, calling them by their first name, and asking if they had any questions. Responding more directly to the relaxation procedures, the subjects in the Tape-Rote condition stated that the experimenter exercised control over the relaxation instructions by making a tape in which his voice was soothing and relaxing, had appropriate intonation at critical periods (voice fast while tensing, slower while relaxing), and became lower and softer toward the end of the tape when the subjects were

relaxing deeply. Subjects in the Live-Rote condition inferred control by the experimenter when he utilized a verbally relaxing presentation instead of reading the instructions with great boredom. The responses of the Rote subjects tended to suggest that the subjects' expectancy is a powerful factor in the relaxation training session, but that the locus of control was extended over a much more general area by the experimenter's behavior instead of being restricted by the experimental instructions. The amount of control attributed to the experimenter was much greater when it covered the entire experimental procedure and was not obviated by instructions indicating the experimenter's inability to modify the relaxation instructions. The clinical implications seem to be that the perception of control is more a function of the therapist's manipulation of the total therapeutic experimence rather than his ability to modify the actual therapeutic proceudre. Implicit in the use of a standard procedure may be the patient's belief that the procedure would not be used with them if it were not appropriate.

A major problem which must be addressed in future research on relaxation is the use of adequate control procedures. One problem encountered in this study was subjects falling asleep, especially in the Control groups in which subjects were asked to rest quietly with their eyes closed for 29 minutes in a quiet room. Earlier studies have not adequately controlled for this problem. Paul (personal communication, 1974) stated that when subjects in his

experimental groups fell asleep, the instructions were repeated to the subject until the subject responded. Subjects who were asleep at the end of the relaxation period were aroused and posttest recordings were taken. Unfortunately, both of these procedures confound the data by having the subjects receiving different relaxation procedures and having a final set of physiological data from an aroused subject at least three minutes later than from the other subjects. Paul failed to have any contingencies for subjects falling asleep during taped procedures.

Future research should be considered in which the experimental subject is used as his own control in order to reduce the variability among subjects in physiological responses during resting periods. Such a design would entail the subject participating in 1 to 2 control sessions in which he is asked to relax himself, and later receiving several sessions of deep muscle training. By experiencing both self-relaxation and deep muscle relaxation, the subject should be able to assess more accurately any subjective differences experienced between a normal resting state and an induced state of relaxation. This design would control for individual differences in basal physiological levels, and allow for a more accurate assessment and comparison of any differential decreases in physiological arousal obtained between the resting and induced relaxed states.

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APPENDIX A

Post Experiment Questionnaire

Please answer the following questions by circling the number that most closely represents the way you feel.

1. To what extent did you enjoy this experiment?

   Very much 1 2 3 4 5 6 7 Not at all

2. How successful were the procedures in enabling you to relax during the experiment?

   Very successful 1 2 3 4 5 6 7 Not successful

3. How interested do you feel the experimenter was in making you feel comfortable and in explaining the procedures?

   Very interested 1 2 3 4 5 6 7 Not interested

4. How much control do you feel that the experimenter had in modifying the relaxation instructions to personalize the procedure?

   Very much 1 2 3 4 5 6 7 None at all

5. How much control do you feel that the experimenter exercised in modifying the relaxation instructions to personalize the procedure?

   Very much 1 2 3 4 5 6 7 None at all

6. Do you feel that the experimenter's control or lack of control over relaxation procedures influenced your training?

   Yes_____ No_____

If yes, was the effect positive_____or negative_____? Please explain your answer.

7. What other factors may have influenced the effectiveness or ineffectiveness of the relaxation procedures?

APPENDIX B

Session 1 Instructions for the Live and Tape Control Groups

The rest of the period will be spent with you merely sitting quietly and relaxing while we record your physiological responses on the polygraph. We're especially interested in the different rates at which people become relaxed in various physiological systems, and the way in which you relax yourself.

Continuation of Instructions for Live Group Only

I'll just sit in the room with you while you rest quietly with your eyes closed.

Continuation of Instructions for Tape Group Only

I'll be in the next room while you rest quietly here with your eyes closed.

The only thing you'll have to do for this session is to be sure that you don't fall asleep; however, I'll have to ask you not to talk during this period, so do you have any questions now? Alright, just sit quietly with your eyes open for a few minutes while we finish calibrating the instruments.

Continuation of Instructions After Adaptation Period

Now just get completely comfortable and rest quietly with your eyes closed for the remainder of the time. Try to become completely relaxed, but be sure that you don't go to sleep.

Session 1 Instructions for Live Involved and Rote Groups

The rest of the period will be spent training you to learn how to relax - probably to become more relaxed than you've ever been before. In order for you to learn this, we will use a clinical technique which was first developed by Dr. Edmund Jacobson of the University of Chicago back in the 1930's. Basically, the procedure hinges on the fact that complete relaxation is the absence of tension. If you are completely relaxed, it is physiologically impossible to be tense or anxious. Since the modified Jacobson technique can be learned readily, the real advantage is that you can use relaxation to counter any anxeity or tension you might feel in the future.

The way in which we'll do this is to have you systematically focus your attention on the various muscle groups throughout your body, first tensing the muscles for a few seconds, holding them long enough for you to identify exactly where you feel the tension, and what it feels like. Then, when I say relax, I want you to immediately let go - to stop tensing - merely focus your attention on what those muscles feel like as relaxation takes place. By first tensing your muscles, the level of tension increases over your current operating level, such that when you release the muscles, the level of tension drops below the point where you started. Each time you tense and release a muscle group, the resulting level of tension becomes progressively lower and lower - to the point where just thinking or recalling the experience is

sufficient to bring about relaxation itself.

Continuation of Instructions for Live Involved Group Only

During this training session, I will be monitoring your progress both physiologically and behaviorally. By monitoring your progress I will be able to modify the training instructions, if necessary, in order to insure the most effective results.

Continuation of Instructions for Live Rote Group Only

Since this relaxation training is a standard procedure, I will be giving you instructions verbatim. By not deviating from the standard procedure, we insure that everyone receives identically effective training.

It is important that you remember to focus your attention only on the specific muscle group we're working on at any given time. Since I'll ask you not to talk during the training procedure, do you have any questions at this time? Alright, just sit quietly with your eyes open for a few minutes while we finish calibrating the instruments.

Session 1 Instructions for Tape Involved and Rote Groups

The rest of the period will be spent training you to learn how to relax - probably to become more relaxed than you've ever been before. In order for you to learn this, we will use a clinical technique which was first developed by Dr. Edmund Jacobson of the University of Chicago back in the 1930's. Basically, the procedure hinges on the fact that complete relaxation is the absence of tension. If you are completely relaxed, it is physiologically impossible to be tense or anxious. Since the modified Jacobson technique can be learned readily, the real advantage is that you can use relaxation to counter any anxiety or tension you might feel in the future.

The way in which we'll do this is to have you listen to a tape recording of relaxation instructions prepared by me which will have you systematically focus your attention on the various muscle groups throughout your body, first tensing the muscles for a few seconds, holding them long enough for you to identify exactly where you feel the tension, and what it feels like. Then, when I say "relax", I want you to immediately let go - to stop tensing - and merely focus your attention on what those muscles feel like as relaxation takes place. By first tensing your muscles, the level of tension increases over your current operating level, such that when you release the muscles, the level of tension drops below

the point where you started. Each time you tense and release a muscle group, the resulting level of tension becomes progressively lower and lower - to the point where just thinking or recalling the experience is sufficient to bring about relaxation itself.

Continuation of Instructions for Tape Involved Group Only

During this training session, I will be monitoring your progress both physiologically and behaviorally. By monitoring your progress, I will be able to supplement the tape instructions, if necessary, in order to insure the most effective results.

Continuation of Instructions for Tape Rote Group Only

Since this relaxation training is a standard procedure, I will be giving you the instructions verbatim. By using taped instructions and not deviating from the standard procedure, we insure that everyone receives identically effective training.

It is important that you remember to focus your attention only on the specific muscle group we're working on at any given time. Since I'll ask you not to talk during the training procedure, do you have any questions at this time? Alright, just sit quietly with your eyes open for a few minutes while I finish calibrating the instruments.

Session 2 Instructions for the Live and Tape Control Groups

Again today I want you to sit quietly and relax while we record your physiological responses on the polygraph. As I mentioned last time, I'm especially interested in the different rates at which people become relaxed in various physiological systems, and the way in which you relax yourself.

Continuation of Instructions for Live Group Only

I'll just sit in the room with you while you rest quietly with your eyes closed.

Continuation of Instructions for Tape Group Only

I'll be in the next room while you rest quietly here with your eyes closed.

The only thing you'll have to do for this session is to be sure that you don't fall asleep; however, I'll have to ask you not to talk during this period, so do you have any questions now? Alright, just sit quietly with your eyes open for a few minutes while we finish calibrating the instruments.

Continuation of Instructions After Adaptation Period

Now just get completely comfortable and rest quietly with your eyes closed for the remainder of the time. Try to become completely relaxed but be sure that you don't go to sleep.

Session 2 Instructions for Live Involved and Rote Groups

Today we will continue the relaxation training we began last week. As you remember, the procedure hinges on the fact that complete relaxation is the absence of tension. If you are completely relaxed, it is physiologically impossible to be tense or anxious.

Again, the way in which we'll have you do this is to have you systematically focus your attention on the various muscle groups throughout your body. First, I'll ask you to tense the muscles for a few seconds, holding them long enough for you to identify exactly where you feel the tension and what it feels like. Then, when I say relax, I want you to immediately let go - to stop tensing - and merely focus your attention on what those muscles feel like as relaxation takes place. By first tensing the muscles, the level of tension increases over your current operating level, such that when you release the muscles, the level of tension drops below the point where you started. Each time you tense and release a muscle group, the resulting level of tension becomes progressively lower and lower - to the point where just thinking or recalling the experience is sufficient to bring about relaxation itself.

Continuation of Instructions for Live Involved Group Only

Again, today during this session I will be monitoring your progress both physiologically and behaviorally. By

monitoring your progress, I will be able to modify the training instructions, if necessary, inorder to insure the most effective results.

Continuation of Instructions for Live Rote Group Only

Again today, this relaxation training will be a standard procedure, and I will be giving you the instructions verbatim. By not deviating from the standard procedure, I insure that everyone receives identically effective training.

It is very important that you remember to focus your attention only on the specific muscle group we're working on at any given time. I want you to relax as completely as possible, but be sure that you don't go to sleep. Since I'll ask you not to talk during the training procedure again, do you have any questions at this time? Alright, just sit quietly with your eyes open for a few minutes while I finish calibrating the instruments.

Session 2 Instructions for Tape Involved and Rote Groups

Today we will continue the relaxation training we began last week. As you remember, the procedure hinges on the fact that complete relaxation is the absence of tension. If you are completely relaxed, it is physiologically impossible to be tense or anxious.

Again the way in which we'll do this is to have you listen to a tape recording of relaxation instructions prepared by me which will have you systematically focus your attention on the various muscle groups throughout your body. First, I'll ask you to tense the muscles for a few seconds, holding them long enough for you to identify exactly where you feel the tension and what it feels like. Then, when I say relax, I want you to immediately let go - to stop tensing - and merely focus your attention on what those muscles feel like as relaxation takes place. By first tensing the muscles, the level of tension increases over your current operating level, such that when you release the muscles, the level of tension drops below the point where you started. Each time you tense and release a muscle group, the resulting level of tension becomes progressively lower and lower - to the point where just thinking or recalling the experience is sufficient to bring about relaxation itself.

Continuation of Instructions for Tape Involved Group Only

Again today during this session, I will be monitoring

your progress, I will be able to supplement the tape instructions, if necessary, in order to insure the most effective results.

Continuation of Instructions for Tape Rote Group Only

Again today, this relaxation training will be a standard procedure, and I will be giving you the instructions verbatim. By using taped instructions and not deviating from the standard procedure, I insure that everyone receives identically effective training.

It is very important that you remember to focus your attention only on the specific muscle group we're working on at any given time. I want you to relax as completely as possible, but be sure that you don't go to sleep. Since I'll ask you not to talk during the training procedure again, do you have any questions at this time? Alright, just sit quietly with your eyes open for a few minutes while I finish calibrating the instruments.

Deep Muscle Relaxation Training Instructions

Leaving your eyes closed and continuing to relax in the chair, I want you to focus all of your attention on your right hand and forearm. I'd like you to make a tight fist with your right hand, make a tight fist now, and feel the pull across the knuckles...identify the tense feeling. Alright, relax, just let it go and begin to focus on the way those muscles feel as they begin to loosen up and become relaxed. Notice a warm, heavy feeling working through from the tops of your fingers to the back of your hand. Again, I want you to make a tight fist with your right hand, make it now, and feel the pull across the knuckles...hold it. Alright, relax, just let it go, and focus on how the muscles in your right hand and forearm feel as they become more and more relaxed...feeling warmer and heavier now. Just letting the muscles become more and more relaxed. Heavier and more relaxed.

Leaving your hand and arm supported by the chair, I want you to shift your attention to the muscles of your right bicep, and without moving your hand and forearm, I want you to tense the muscles of your bicep by pushing your elbow down against the arm of the chair, push down now, and feel the tension in these muscles as you push against the chair... identify the tension. Alright, relax and just let it go. Just focus on these muscles...feel these muscles stretching

out, becoming loose and relaxed. Feeling them become more and more relaxed as they become warmer and heavier. Again, I would like for you to tense the muscles in your bicep, push down with your elbow now, make the muscles very tight and feel the tugging through these muscles...alright, relax, just let those muscles become very, very relaxed. Just feel them becoming warmer and heavier...just letting them become more and more relaxed, as they continue to be supported by the chair...heavy and relaxed.

Now I would like for you to shift your attention to your left hand and forearm and to make a tight fist with your left hand, make it now, and feel it tight across your knuckles...identify the tension...alright, relax, and just focus on how those muscles feel. Just noticing the heavy warm feeling beginning to work its way across the tops of your fingers, through the back of your hand, and into your forearm. Just noticing the very warm pleasant, relaxed feeling spreading through these muscles. Again, I want you to make a tight fist with your left hand, make it now, and feel the tension across your knuckles, through your hand and forearm, identify the tension. Alright, relax, just relax and experience the sensations of warmth, heaviness and relaxation spreading through the tops of your fingers, throughout your hand, and up through your forearm. Those muscles becoming loose and relaxed and heavy.

Now leaving your left hand and forearm supported by the chair, shift your attention to your left bicep, and without moving your left hand and forearm, tense your left bicep by pressing your elbow against the chair, tense it now, and feel the pulling...feel the tension in your bicep. Alright, relax, just let it go...and focus all of your attention on the muscles of your left bicep...noticing a very pleasant and warm and relaxed feeling flowing through these muscles. These muscles feeling more and more relaxed all of the time. Again, tense your left bicep, push your elbow down now, and feel the tension through your bicep as you push down...hold it...identify the tension...alright relax...just relax...and notice the very pleasant, warm and heavy sensation of relaxation flowing through these muscles. Just relax and focus on the very loose and heavy and relaxed feeling of the muscles as they stretch out and become more relaxed.

I want you to shift your attention to the muscles of your forehead...I want you to make a tight frown by pulling your eyebrows together tightly...make a tight frown now, and become aware of the tight, pulling sensation across these muscles...identify the tension. Alright, relax, just let it go and focus in on these muscles. Notice how the relaxation flows through these muscles...these muscles becoming heavier and more relaxed. Identify the feeling as these muscles become loose and more relaxed. Again, I want you to make a

tight frown, make it now, and pull your eyebrows together making a tight frown...hold it...identify the tension. Alright, relax, just relax and feel the warm, pleasant, heavy sensation of relaxation flowing through these muscles as they smooth out, becoming more and more relaxed...getting heavier and more relaxed all the time.

Now I want you to shift your attention to the muscles of your nose and eyes, and in tensing these muscles, I want you to wrinkle your nose and squeeze your eyes together. Alright, wrinkle your nose and squeeze your eyes together now, make these muscles very tight...hold it...identify the tension. Alright, relax, just relax and feel these muscles sag down, becoming very loose and relaxed...the muscles smoothing out...feeling very heavy and relaxed. Just noticing how these muscles feel as they relax deeper and deeper. Again, I want you to tense these muscles around your nose and eyes... tense them tightly now...wrinkle your nose and squeeze your eyes...identify the tension. Alright, relax, just let it go and focus on the warmth and heaviness working into these muscles of your nose, eyes, and all across the tops of your cheeks. Feeling more and more relaxed all the time...smoothing out, becoming more and more relaxed.

I want you to shift your attention to the muscles of your lower face. I want you to bite down very hard and at the same time turn up the corners of your mouth. Okay, bite down hard now, and draw up the corners of your mouth...make

it very tight...feel the tension. Alright, relax, just let it go, and notice the feeling of heaviness and warmth working into these muscles...notice the feeling of warmth in your jaw muscles...the feeling of relaxation in your lips...all the muscles becoming more and more relaxed. Again, I want you to bite down hard and turn up the corners of your mouth...tense these muscles now...and feel the pulling, tight feelings through these muscles...identify the tension. Alright, relax...just relax and let it go. Just focus on the feelings of relaxation that you feel in your lower face...these muscles becoming heavier and relaxed. Just noticing the feelings of relaxation spreading through these muscles.

I want you to now focus your attention on the muscles of your neck and throat, and without moving your head, I want you to tense these muscles by pulling down with the muscles which are used to pull your chin towards your chest. Okay, tense these muscles now...make them very tight...identify the tension...alright, stop and relax, just relax and let these muscles become very loose and relaxed...notice the feeling of warmth and heaviness and relaxation in these muscles as your head rests comfortably against the back of the chair. A very pleasant sensation of relaxation. Again, I want you to tense the muscles in your neck...tense them up now, and feel the pull and the strain...feel the tension through these muscles...hold it. Alright, relax, just let it go...just

notice the feeling of warmth and relaxation in these muscles... feeling heavier and warmer...the feeling of relaxation spreading throughout your entire neck and face. The muscles becoming more and more loose and relaxed.

Now shift your attention to the muscles of your chest and back. Focusing on these muscles, I want you to tense these muscles by pushing your shoulderblades together and down into the back of the chair. Tense these muscles now... push down against the chair and identify the tightness and tension. Alright, relax, just relax and let it go...let these big muscles sag down into the chair. Just letting these muscles become more and more relaxed. Feeling warmer and heavier. Again, I want you to tense the muscles in your shoulderblades and back...tense them now...pushing your shoulderblades together and back into the chair...identify the tension. Alright, relax, just let it go...and feel the warmth and relaxation flowing through these muscles. Just letting these large muscles become loose and relaxed. Sagging down into the chair as they become more and more relaxed.

Now I would like you to shift your attention to the muscles of your stomach, just focusing on these muscles, I want you to tense the muscles of your stomach just as if you were going to be hit there, tense them now...hold it... identify the tension...alright, relax, just let it go...just let the muscles become very, very relaxed. No need for the

muscles to be tense...no need to hold the stomach muscles in...just a need for the muscles to become very, very relaxed. Again, I want you to tense these muscles...tense them now, and make them very tight...hold it...identify the tension. Alright, relax, just relax and let it go. Just let the muscles become loose and relaxed. Noticing the feeling of warmth and relaxation flowing through the muscles. Noticing how they feel as they become more relaxed.

Now I want you to shift your attention to the muscles of your right upper leg...I want you to tense your right thigh...tense it now, and feel the pulling and tension in these large muscles...hold it. Alright, relax, just let it go. Let these muscles become loose and relaxed. Feeling the tension drain from these muscles as they become very heavy and relaxed. Focus on the pleasant feeling of these muscles loosening up and becoming more relaxed. Again, I want you to tense the muscles in your right thigh, tense them now, and feel the tightness and the pulling sensation... hold it...identify the tension. Alright, relax, just relax and let the warm, pleasant sensation of relaxation flow through these muscles. As the muscles become heavier and more relaxed. Just becoming very heavy and relaxed. A very pleasant and warm sensation...heavy and relaxed.

Now shift your attention to the muscles of your right calf, focus on these muscles and tense them tightly, tense them now, identify the tension...hold it. Alright, relax. Just focus on the feeling of relaxation...the feeling flowing

through the muscles of your right calf. Notice the heaviness and the warmth and the relaxation working into these muscles. These muscles feeling heavier and warmer...becoming more and more relaxed. Again, I want you to tense the muscles of your right calf, tense them now...make them tight...hold it... identify the tension. Alright, relax, just relax and let it go. Just let the muscles become heavier and more relaxed. Becoming aware of the very pleasant warm feeling of relaxation working into these muscles. These muscles feeling heavier and warmer and more relaxed.

Now shift your attention to the muscles of your right foot. I want you to tense the muscles in your foot by pulling your toes underneath...curl your toes up now, and focus on the sensation of tension pulling across the top of your foot...hold it. Alright, relax, just let it go. Just notice the warm, heavy feeling working through the muscles of your right foot, through the right arch, across the top of your toes. Notice throughout your entire right foot a feeling of warmth and heaviness and relaxation. Again, I want you to tense the muscles in your right foot, tense them now, curl the toes up, feel the tension throughout the foot. Alright, relax, just let the muscles in the foot become more and more relaxed. Feel the warm and heavy sensation flowing through the muscles of your foot...the muscles becoming loose and heavy and relaxed.

Now I want you to shift your attention to the muscles of your left thigh, I want you to make these muscles tense, tense them now and feel the tension running through them... hold it. Alright, relax, just let it go. Let the muscles become loose and relaxed. Feel the tension drain from these muscles as they become very loose and relaxed. Just feel the muscles sagging down into the chair...becoming heavier and more relaxed. Again, I want you to tense the muscles in your left thigh, tense them now...hold it...identify the tension. Alright, relax, just let it go. Just focus on the feeling of relaxation flowing through these large muscles. Notice the heaviness and warmth and relaxation working into these muscles...heavy and relaxed.

Now shift your attention to the muscles of your left calf, I want you to tense the muscles in your left calf, tense them now, feel the tugging through these muscles...hold it. Alright, relax, just relax and let it go. Just notice how these muscles feel now as they become more relaxed... feeling heavier and warmer...and more relaxed. A heavy, warm feeling spreading through the muscle. Again, I want you to tense the muscles of your left calf, tense them now...hold it... identify the tension. Alright, relax, just relax, and feel the warmth and heaviness flowing through the calf. Just feel the very warm and pleasant sensation of the heaviness spreading through the muscles of your calf...focusing on the feeling of relaxation...deeper and deeper.

Now I would like for you to focus your attention on the muscles of your left foot. I want you to tense these muscles by curling up your toes, curl your toes now and identify the tension...tense the muscles tightly. Alright, relax, just let it go. Focus on the feeling of relaxation spreading from under your arch, across the top of your foot through your toes...all of these muscles loosening up, becoming warmer, and heavier. Heavier and more realxed. Again, I want you to tense the muscles of your foot, curl your toes under now and make the muscles very tight...hold it...identify the tension. Alright, relax. Just let the muscles smooth out, lengthen out as they become heavier and more relaxed. Just becoming aware of the warm, heavy and relaxed feeling throughout the muscles of your foot. Identifying the comfortable, pleasant feeling of relaxation flowing through your muscles.

As you continue to relax, I want you to become aware of the very pleasant, warm, and relaxed state of relaxation throughout your body. Your entire body very relaxed...your arms and hands supported by the chair...your head leaned back comfortably against the chair...your back and legs supported very comfortably by the chair...your entire body resting gently in the chair. Just breathing very slowly and deeply...your breathing having become very natural and relaxed. As you continue to breath slowly and deeply you may notice that you have a heavier and more relaxed feeling each time you exhale...

each time the air leaves your body, you may notice a feeling of heaviness and warmth and relaxation flowing through your body...heavier and more relaxed...deeper and deeper...just noticing the very pleasant feeling of relaxation throughout your entire body...just resting gently in the chair...the chair supporting you in every way...feeling very warm, very relaxed and very comfortable...just being aware of how good and comfortable it feels for the body to be in such a relaxed state...a state that you find very comfortable...having no need for any tension...having only a need for the body to become more and more relaxed...resting very comfortably and relaxed...just focusing on the warm and heavy feelings that flow through the body...continuing to feel more and more relaxed. As your breathing becomes deeper and deeper, you may notice that you feel yourself becoming deeper and deeper relaxed, deeper and deeper relaxed. The warm and heavy feeling making you feel more and more comfortable. Your body totally supported by the chair...with no need for any muscle tension...only the need for the muscles to become very, very relaxed...just letting all the tension drain from the muscles... the muscles becoming heavier and more relaxed...just noticing the very pleasant and comfortable state you are in when your muscles are deeply relaxed, relaxed so deeply...identify the warm and pleasant sensations of the muscles when they feel so relaxed. Relax, simply relax...relax simply relax...relax simply relax. Deeper and deeper, more and more relaxed.

Now in a moment I am going to count very slowly from one to ten...as I count from one to ten, you will become more and more alert until, when I reach the number ten, your eyes will be open, you will be wide awake, you'll feel very calm, and very refreshed, and feel very, very good. And you'll feel very calm, and very refreshed, and feel very, very good. And you'll feel very good for the remainder of the day. Again, I will count very slowly from one to ten, and as I count from one to ten you will become more and more alert, until when I reach the number ten, your eyes will be open, you'll be wide awake, you'll feel very calm, and very refreshed and you'll feel very good for the remainder of the day. Beginning now, one... two...three, becoming more and more alert...four...five... six, becoming more and more alert...becoming more and more alert...seven...eight...eyes beginning to open...eyes beginning to open...becoming more and more alert...nine... eyes opening...becoming more alert...and ten...eyes open, wide awake, feeling very, very, good, very, very refreshed. Eyes open, wide awake, feeling very calm, very refreshed, and you'll feel very good for the remainder of the day.

APPENDIX C
Table 3

Multivariate Analysis of Variance of Pretest-Posttest EMG, SUDS, and AD Percent Change Scores and HR Difference Scores

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
R (Mode of Presentation)	37.55	0.92	4,1,54	1.13	4,51.0
I (Level of Involvement)	38.23	0.47	4,2,54	5.92***	8,102.0
T (Sessions)	37.67	0.81	4,1,54	2.87	4,51.0
IR	37.68	0.81	4,2,54	1.44	8,102.0
RT	37.50	0.96	4,1,54	0.56	4,51.0

***$p < .01$

Table 3
Multivariate Analysis of Variance of Pretest-Posttest
EMG, SUDS, and AD Percent Change Scores
and HR Difference Scores
(Continued)

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
IT	37.53	0.94	4,2,54	0.38	8,102.0
S (IR)	42.11	0.01	4,54,54	2.10	216,206.4
IRT	37.64	0.84	4,2,54	1.18	8,102.0
TOTAL	37.47				

Table 4
Analysis of Variance of Pretest-Posttest
EMG Percent Change Scores

Source	SS	df	MS	F
R (Mode of Presentation)	104.55	1	104.55	.05
I (Level of Involvement)	32684.81	2	16342.41	7.60***
T (Sessions)	7680.00	1	7680.00	6.43*
IR	4932.69	2	2466.34	1.15
RT	907.51	1	907.51	.76
IT	229.88	2	114.94	.09

*** $p < .01$
* $p < .05$

Table 4
Analysis of Variance of Pretest-Posttest
EMG Percent Change Scores
(Continued)

Source	SS	df	MS	F
S (IR)	116056.00	54	2149.19	1.80
IRT	1838.13	2	919.06	.77
TOTAL	64453.75	54	1193.59	

Table 5
Analysis of Variance of Pretest, Intermediate, Posttest EMG Scores

Source	SS	df	MS	F
R (Mode of Presentation)	273.19	1	273.18	3.60
I (Level of Involvement)	19.36	2	9.68	.13
T (Sessions)	74.88	1	74.88	3.29
E (EMG Interval)	925.91	2	462.95	38.93***
RI	62.72	2	31.36	.41

*** $p < .01$

Table 5
Analysis of Variance of Pretest,
Intermediate, Posttest
EMG Scores
(Continued)

Source	SS	df	MS	F
RT	.95	1	.95	.04
IT	9.14	2	4.57	.20
RE	46.12	2	23.06	1.94
IE	232.29	4	58.07	4.88***
TE	114.96	2	57.48	6.53***

*** $p < .01$

Table 5
Analysis of Variance of Pretest,
Intermediate, Posttest
EMG Scores
(Continued)

Source	SS	df	MS	F
S (RI)	4099.41	54	75.92	
RIT	5.76	2	2.88	.13
RIE	40.55	4	10.14	.85
RTE	42.68	2	21.34	2.42
ITE	24.71	4	6.18	.70

Table 5
Analysis of Variance of Pretest,
Intermediate, Posttest
EMG Scores
(Continued)

Source	SS	df	MS	F
ST (RI)	1227.59	54	22.73	
SE (RI)	1284.23	108	11.89	
RITE	82.44	4	20.61	2.34
TOTAL	950.73	108	8.80	

Table 6
Analysis of Variance of Session 1 Posttest
and Session 2 Pretest EMG Scores

Source	SS	df	MS	F
R (Mode of Presentation)	236.21	1	236.21	5.32*
I (Level of Involvement)	3.15	2	1.58	.04
T (Sessions)	290.72	1	290.72	17.07***
RI	56.28	2	28.14	.63
RT	29.28	1	29.28	1.72

*** $p<.01$
* $p<.05$

Table 6
Analysis of Variance of Session 1 Posttest
and Session 2 Pretest EMG Scores
(Continued)

Source	SS	df	MS	F
IT	131.11	2	65.55	3.85*
S (RI)	2397.13	54	44.39	
RIT	41.26	2	20.63	1.21
TOTAL	919.72	54	17.03	

* $p < .05$

Table 7
Multivariate Analysis of Variance of Pretest-Intermediate EMG Percent Change Scores and HR Difference Scores

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
R (Mode of presentation)	18.37	0.99	2,1,54	0.20	2,53
I (Level of Involvement)	18.59	0.80	2,2,54	3.09*	4,106
T (Sessions)	18.56	0.82	2,1,54	5.78***	2,53
IR	18.55	0.83	2,2,54	2.51*	4,106
RT	18.38	0.98	2,1,54	0.45	2,53

*$p < .05$
***$p < .01$

Table 7
Multivariate Analysis of Variance of Pretest-Intermediate EMG Percent Change Scores and HR Difference Scores (Continued)

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
IT	18.41	0.95	2,2,54	0.59	4,106
S (IR)	20.34	0.13	2,54,54	1.66	108,106
IRT	18.46	0.90	2,2,54	1.30	4,106
TOTAL	18.36				

Table 8
Analysis of Variance of Pretest-Intermediate
EMG Percent Change Scores

Source	SS	df	MS	F
R (Mode of presentation)	143.02	1	143.02	.07
I (Level of Involvement)	12714.41	2	6357.20	3.20*
T (Sessions)	9345.66	1	9345.65	8.46
IR	5009.13	2	2504.56	1.26
RT	1003.42	1	1003.42	.91

*$p < .05$

Table 8
Analysis of Variance of Pretest-Intermediate
EMG Percent Change Scores
(Continued)

Source	SS	df	MS	F
IT	67.96	2	33.98	.03
S (IR)	107185.44	54	1984.92	1.80
IRT	2300.41	2	1150.20	1.04
TOTAL	59652.91	54	1104.68	

Table 9
Multivariate Analysis of Variance of
Intermediate-Posttest EMG Percent
Change Scores and HR
Difference Scores

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
R (Mode of presentation)	17.51	0.99	2,1,54	0.20	2,53
I (Level of Involvement)	17.72	0.80	2,2,54	3.04**	4,106
T (Sessions)	17.55	0.96	2,1,54	1.14	2,53
IR	17.55	0.96	2,2,54	0.62	4,106
RT	17.52	0.98	2,1,54	0.42	2,53

**$p < .025$

Table 9
Multivariate Analysis of Variance of
Intermediate-Posttest EMG Percent
Change Scores and HR
Difference Scores
(Continued)

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
IT	17.55	0.96	2,2,54	0.53	4,106
S (IR)	18.65	0.32	2,54,54	0.75	108,106
IRT	17.57	0.94	2,2,54	0.83	4,106
TOTAL	17.50				

Table 10
Analysis of Variance of Intermediate-Posttest
EMG Percent Change Scores

Source	SS	df	MS	F
R (Mode of Presentation)	175.22	1	175.22	.17
I (Level of Involvement)	13180.03	2	6590.02	6.49**
T (Sessions)	806.02	1	806.02	.73
IR	365.88	2	182.94	.18
RT	735.09	1	735.09	.67

**$p < .025$

Table 10
Analysis of Variance of Intermediate-Posttest
EMG Percent Change Scores
(Continued)

Source	SS	df	MS	F
IT	816.47	2	408.24	.37
S (IR)	54811.03	54	1015.02	.92
IRT	2106.20	2	1053.10	.95
TOTAL	59606.72	54	1103.83	

Table 11
Analysis of Variance of Pretest-Posttest
HR Difference Scores

Source	SS	df	MS	F
R (Mode of Presentation)	32.03	1	32.03	.64
I (Level of Involvement)	83.15	2	41.58	.84
T (Sessions)	32.03	1	32.03	.92
IR	357.72	2	178.86	3.60*
RT	4.03	1	4.03	.12

*$p < .05$

Table 11
Analysis of Variance of Pretest-Posttest
HR Difference Scores
(Continued)

Source	SS	df	MS	F
IT	62.12	2	31.06	.89
S (IR)	2682.75	54	49.68	1.42
IRT	74.22	2	37.11	1.06
TOTAL	1883.46	54	34.88	

Analysis of Variance of Pretest-Intermediate
HR Difference Scores

Source	SS	df	MS	F
R (Mode of Presentation)	9.06	1	9.06	.20
I (Level of Involvement)	51.22	2	25.61	.55
T (Sessions)	118.01	1	118.01	4.00
IR	200.45	2	100.22	2.16
RT	0.08	1	0.08	.00

Table 12
Analysis of Variance of Pretest-Intermediate
HR Difference Scores
(Continued)

Source	SS	df	MS	F
IT	69.62	2	34.81	1.18
S (IR)	2506.30	54	46.41	1.58
IRT	90.65	2	45.32	1.54
TOTAL	1591.09	54	29.46	

Table 13
Analysis of Variance of Intermediate-Posttest
HR Difference Scores

Source	SS	df	MS	F
R (Mode of Presentation)	2.41	1	2.41	.27
I (Level of Involvement)	8.55	2	4.27	.48
T (Sessions)	23.41	1	23.41	1.85
IR	29.62	2	14.80	1.65
RT	1.41	1	1.41	.11

Table 13
Analysis of Variance of Intermediate-Posttest
HR Difference Scores
(Continued)

Source	SS	df	MS	F
IT	15.32	2	7.66	.61
S (IR)	485.24	54	8.99	.71
IRT	24.12	2	12.06	.95
TOTAL	683.23	54	12.65	

Table 14
Analysis of Variance on Pretest-Posttest
SUDS Percent Change Scores

Source	SS	df	MS	F
R (Mode of Presentation)	197.63	1	197.63	.14
I (Level of Involvement)	6090.11	2	3045.06	2.16
T (Sessions)	1456.03	1	1456.03	4.50*
IR	2.70	2	1.35	.00
RT	396.03	1	396.03	1.22

*$p < .05$

Table 14
Analysis of Variance on Pretest-Posttest
SUDS Percent Change Scores
(Continued)

Source	SS	df	MS	F
IT	383.30	2	191.65	.59
S (IR)	76038.69	54	1408.12	4.35
IRT	1560.52	2	780.26	2.41
TOTAL	17476.04	54	323.63	

Table 15
Analysis of Variance of Pretest-Posttest
AD Percent Change Scores

Source	SS	df	MS	F
R (Mode of Presentation)	399.67	1	399.67	1.10
I (Level of Involvement)	1120.27	2	560.13	1.54
T (Sessions)	357.07	1	357.07	2.02
IR	3.80	2	1.90	.01
RT	1.41	1	1.41	.01

Table 15
Analysis of Variance of Pretest-Posttest
AD Percent Change Scores
(Continued)

Source	SS	df	MS	F
IT	22.20	2	22.20	0.06
S (IR)	19643.65	54	363.77	2.06
IRT	147.46	2	73.73	.42
TOTAL	9535.04	54	176.57	

Table 16
Analysis of Variance of Session 1-Session 2
LOR Percent Change Scores

Source	SS	df	MS	F
R (Mode of Presentation)	756.15	1	756.15	0.40
I (Level of Involvement)	603.43	2	301.72	0.16
IR	25.90	2	12.95	0.01
TOTAL	101478.70	54	1879.24	

Table 17
Analysis of Variance of
Session 1-Session 2
LOR Scores

Source	SS	df	MS	F
R (Mode of Presentation)	88.41	1	88.41	0.22
I (Level of Involvement)	481.27	2	240.63	0.61
T (Sessions)	2403.08	1	2403.08	14.19***
IR	385.87	2	192.93	0.48
RT	.41	1	.41	.00

*** $p < .01$

Table 17
Analysis of Variance of
Session 1-Session 2
LOR Scores
(Continued)

Source	SS	df	MS	F
IT	185.00	2	92.50	.55
S (IR)	21435.46	54	396.95	
IRT	120.87	2	60.43	0.36
TOTAL	9141.84	54	169.29	

Table 18
Multivariate Analysis of Variance on
Post-Experiment Questionnaire
Questions 1-3 for the Four
Experimental Groups and
Two Control Groups

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
R (Mode of Presentation)	10.94	0.96	3,1,54	0.64	3,52
I (Level of Involvement)	11.06	0.85	3,2,54	1.46	6,104
IR	10.97	0.94	3,2,54	.55	6,104
TOTAL	10.90				

Table 19
Multivariate Analysis of Variance of Post-Experiment Questionnaire Questions 1-5 for the Four Experimental Groups

Source	Log (Variance Generalized)	U-Statistic	df	Approximate F	df
R (Mode of Presentation)	16.88	0.89	5,1,36	0.82	5,32
I (Level of Involvement)	16.91	0.86	5,1,36	1.02	5,32
IR	16.86	0.91	5,1,36	0.62	5,32
TOTAL	16.76				