The Efficacy of Live Versus Taped Progressive and Autogenic Relaxation on Reducing Two Measures of Physiological Arousal

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Benny Goodman

Approved by:

William H. Knight
Chairperson, Thesis Committee

Herbert H. Levin
Professor of Psychology

H. G. Schneider
Associate Professor of Psychology

Joyce G. Crouch
Chairperson, Department of Psychology

M. M. Dunlap, Assistant
Dean of the Graduate School

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ABSTRACT

The effects of abbreviated progressive (P.R.) and autogenic relaxation (A.R.) presented live and tape recorded were compared with a self-relaxation control procedure on reducing two measures of physiological arousal. The independent variables were 1) progressive versus autogenic relaxation, and 2) live versus tape recorded presentation. The dependent measures of physiological arousal were 1) surface skin temperature of the dominant hand, and 2) muscle action potential levels of the frontalis muscle. A pre- and post-treatment state anxiety scale was administered to assess state anxiety change. Fifty undergraduate male subject volunteers were acquired from classes at Appalachian State University for participation in this study. The subjects were evenly assigned (N=10) to the following conditions: 1) P.R. live, 2) P.R. taped, 3) A.R. live, 4) A.R. taped, 5) self-relaxation control. On the order of random assignment, each subject was scheduled for two treatment sessions at the same time of day, approximately seven days apart. Hypothesis I predicted that abbreviated P.R. presented live and taped would be more effective than like presentations of A.R. in reducing frontalis muscle tension and in increasing surface skin temperature of the dominant hand. The results failed to support this hypothesis. Analysis of the temperature data found taped A.R. superior to all other conditions in producing significant increases in surface skin temperature. Further, analysis of the EMG data failed to achieve significant results. Hypothesis II predicted that P.R. and A.R. presented live and taped would be superior to the self-relaxation control procedure in affecting these changes. The results failed to suppor this hypothesis. The self-relaxation control procedure produced significantly greater increases in surface skin temperature than occurred in all other conditions with the exception of taped A.R. The lack of achieving significant EMG changes also failed to support this hypothesis. With regard to the state anxiety measure, the current results found live presentation superior to taped presentation in producing significant decreases in state anxiety. All other effects and interactions failed to achieve significance. Specific suggestions for replicating this study and in determining the effects of other relaxation procedures on various measures of physiological arousal were made.

INTRODUCTION

In developing a historical perspective on biofeedback techniques, two areas of theoretical advancement are noted; pre 1960's, and mid 1960's to present. Prior to the 1960's, a strict dichotomy was maintained between the types of responses subject to classical and instrumental conditioning techniques (Skinner 1938). Ancient philosophers first proposed the theory in which reason, associated with the involuntary reactions of the skeletal musculature was considered superior to the visceral and glandular responses associated with emotion. Further advancement of this theory was provided by Bichat, a French neuroanatomist who differentiated between the cerebrospinal system under control of the great brain and spinal cord from the dual chain of ganglia (little brains) which runs down either side of the spinal cord. The former controls responses of the skeletal musculature while the latter dominates visceral or autonomic responses (Miller, 1969, Davidson and Krippner, 1971).

Following this theoretical foundation, early learning theorists proposed the superiority of instrumental conditioning procedures over classical conditioning techniques. The former was thought to be related to skeletal responses, the latter to autonomic or visceral responses. As late as 1961 this dichotomy remained virtually unchallenged, appearing in such respected learning texts as Kimble (1961). In a review of the literature current to 1961 which addressed learning theory and conditioning, Kimble offered the following summary (1961 p. 101):

> "Although autonomically mediated reactions such as the G.S.R. and vasoconstriction are readily conditioned classically, they seem impossible to condition by instrumental methods."

From the mid to late 1960's, this null hypothesis that autonomic responses could be conditioned instrumentally underwent a number of challenges. Several studies had produced evidence of the conditioning of such involuntary responses as the G.S.R., pulse retardation, and vasoconstriction, being conditioned by instrumental techniques (Kimmel, 1967, Kimble, 1961). However, the results of all such studies were plagued by the possible confound of skeletal responses having an effect on visceral responses, thereby making it impossible to conclude that changes in the latter were the sole product of instrumental conditioning. In more specifically addressing this issue, Miller (1969 p. 435) stated:

> "Responses that are the easiest to measure, namely heart rate, vasomotor responses and the galvanic skin responses, are known to be affected by skeletal responses, such as exercise, breathing and even tensing of certain muscles, such as those in the diaphram. Thus it is hard work to rule out the possibility that, instead of directly learning a visceral response, the subject has learned a skeletal response, the performance of which causes the visceral change being recorded."

In an endeavor to control skeletal muscle mediation, Neil Miller and his associates performed a series of animal studies, using the drug curare to paralyze the skeletal musculature. In an initial study, Miller and Carmona (1967) successfully conditioned the salivation response in water deprived dogs using instrumental training methods, but later failed in attempting to control possible skeletal mediation in this response using curare (Kimmel, 1967). Later, Trowill (1967) produced meager, yet significant, reductions in the heart rates of curarized rats with instrumental learning procedures. Finally, Miller and DiCara (1967) were able to "shape" the heart rates of these animals to criterion of increasing and decreasing difficulty with a discrimination reward training procedure. Thus, the Miller studies successfully proved the use of instrumental conditioning in the modification of visceral or autonomic responses. This basic research has since received a great deal of support from later studies, all of which offered abundant evidence indicating the traditional learning theory dichotomy was erroneous (Kimmel, 1967, Davidson and Kippner, 1971).

The impact of these early studies was crucial in laying the foundation for the development of modern biofeedback techniques. Miller (1969) addressed the use of instrumental conditioning of autonomic responses in human subjects. He suggested the use of an analogue tone to provide the subject with continual feedback as to changes in various physiological functions. Aside from the use of analogue feedback as a measure of fluctuation in a particular physiological response, it would also serve as a reward to subjects who could learn to control the tone and thereby obtain control over the response. A procedure of this nature held much promise in the clinical treatment of various physiological disfunctions. By the late 1960's biofeedback training of this nature had gained widespread acceptance. A concise definition of this training procedure is provided by Stoyva (1976 p. 12) in the following comment:

> "Biofeedback training consists of detecting an electrical signal generated by some bodily tissue. This signal is amplified and then used to trigger a visual or auditory display, thus providing the subject with continuous information as to his progress in controlling the signal; the subject is connected in a feedback loop with some physiological response he himself is generating."

REVIEW OF THE LITERATURE

One of the major areas of biofeedback research has centered around the development of electromyography, the growth of which spans about forty years. Cited as the birth of this technique is the pioneering work of neurophysiologists Adrian and Bronk (1929) who first proposed the connection between electrical signals generated by the muscles reflecting an accurate measurement of muscle activity. During the years following this initial work, research appeared minimal until a new surge of interest was facilitated in the early 1960's. These studies focused on the investigation of single motor unit training. Harrison and Mortensen (1962) presented the initial findings indicating that subjects could learn voluntary control over individual motor units (Basmajian 1979). Subsequent studies expanded this line of investigation into a broader perspective, encompassing the psycho-physiological studies of gross motor muscles. Improved instrumentation, the product of post WWII technological advancements, provided the means by which precise measurement of muscle action potentials could be conducted. This vastly increased the current knowledge of muscle physiology.

Budzynski (1969) represents a classic study in this area in which analogue feedback of muscle action potentials proved very effective in aiding subjects to reach states of deep muscle relaxation. Continuous feedback was provided by means of an analogue tone which varied in pitch as a function of muscle tension levels. The implementation of analogue feedback substantially reduced the amount of training time required for subjects to reach deep muscle relaxation as compared to more conventional techniques. During subsequent years, more precise instrumentation of this process gave birth to clinical EMG feedback, the applications of which have been extensively described (Brown, 1977, Basmajian, 1979, Schwartz and Beatty, 1977, Wickramasekera, 1976).

During the time that clinical E.M.G. feedback was making its debut in the late 1960's, another line of research was gaining momentum, centering around the operant conditioning of the vasomotor response or peripheral blood flow.

The possibility of producing significant alterations in this response resulting in either vasoconstriction (decreased blood flow) or vasodilation (increased blood flow) had previously been indicated by individuals trained in hatha yoga. These individuals appeared to demonstrate some degree of control over this response by using mediative exercises which produced changes in surface skin temperature, the direct result of changes in blood flow. Also, a relaxation exercise developed by Schultz and Luthe (1969) had demonstrated a capacity to produce changes in the surface skin temperature of the hand by means of thermal imagery. In one of the earliest experiments of this nature, Schultz (1926) found that subjects who imagined their hand was exposed to heat were able to produce an increase of 2° C in hand temperature (Barber et. al. 1975-1976). Imagining warmth in the hand produces vasodilation, thereby increasing surface skin temperature due to increased blood flow through peripheral vessels of the hand. The reciprocal reaction or vasoconstriction results in decreases in surface skin temperature.

By the late 1960's evidence was mounting for voluntary control over the vasomotor responses. However, as in the earlier Miller studies focusing on changes in heart rate, skeletal muscle reactions were also known to exert a significant influence over changes in peripheral blood flow. Snyder and Nobel (1968) controlled for this confound by using EMG instrumentation to monitor muscle activity in the arm and hand being trained. Results of this study supported those of previous investigations, all of which confirmed the human capacity to learn voluntary control of the vasomotor response.

The first clinical applications of learned vasomotor control were initiated by the Menninger group using thermal feedback for the treatment of migraine headaches. By accident, these investigators found that subjects who were able to produce large increases in hand temperature could prevent the onset of a migraine headache. Thermal feedback was used to augment autogenic suggestions of warmth and heaviness. Visual analogue feedback was provided by a light bar displayed on a meter which would raise and lower as a function of increases and decreases in skin temperature. The combination of thermal feedback and autogenic relaxation produced consistent increases in hand temperature. Subsequent research has supported these findings, indicating that learned temperature control when used in this manner, can be reliably used in the treatment of vascular disorders (Blanchard and Epstein, 1978).

Contemporary EMG and thermal biofeedback training programs frequently incorporate relaxation procedures in the treatment process. Among the first to emphasize the importance of relaxation techniques in biofeedback training were Budzynski, Stoyva and their associates who found home practice in relaxation to be a primary component of successful EMG training in the treatment of tension headaches (Barber et. al., 1975-76 p. XXIV). Also as noted above, relaxation procedures were found to play an important role in the treatment of stress related disorders. Biofeedback assisted relaxation provides the subject with precise, continuous information regarding the effect that a particular relaxation exercise is having on an on-going physiological response. The integration of these individual techniques would therefore seem desirable, as each adds a unique component to the overall treatment process which appears to be more effective than when each is used separately.

METHODOLOGICAL QUESTIONS: PROCEDURAL

There are a number of methodological questions which need further consideration in the utilization of relaxation procedures with biofeedback training. One such area involves what effects different relaxation procedures may have on physiological measurements of arousal and/or relaxation when presented in either a "live" or tape recorded manner. Information of this nature would be beneficial in the standardization of treatment procedures in either clinical or experimental settings.

Among the first to investigate live vs. tape recorded instructions as independent variables was Barber (1964) who measured the effects of these variables on hypnotic suggestibility. Eight standardized hypnotic suggestions were presented to thirty-three male subjects assigned to two treatment groups. Group A received hypnotic suggestions presented "live", that is orally by the experimenter. Those in Group B were given the same suggestions presented by means of a tape recording of the experimenter's voice. Included in these suggestions were "arm lowering, arm levitation, hand lock, thirst hallucination, verbal inhibition, body immobility, post hypnotic-like response, and selective amnesia" (Barber and Calverley, 1963 p. 591). On the basis of both objective and subjective measures, comparable effects were found in both "live" and taped modes of presentation.

Later, Gordon Paul explored live vs. taped presentation in two studies which examined the relaxation component of systematic desensitization. In the first study, (Paul 1969c) abbreviated progressive relaxation and hypnotic suggestions were presented in the live voice mode to two groups (N=20) of female subjects by the experimenter. A third control group (N=20) were instructed to relax on their own with no specific directions. Forearm muscle tension, heart rate, respiratory rate, and skin conductance were monitored by means of a polygraph as dependent measures of physiological arousal. Subjects were run individually for two treatment sessions scheduled exactly seven days apart. Results indicated that progressive relaxation produced significantly greater reductions in physiological arousal as compared to both hypnotic suggestions and the self-relaxation control procedure. These results were also consistent across both treatment sessions.

In a subsequent study, Paul and Timble (1970) repeated these experimental procedures with the sole exception of presenting both types of relaxation procedures by means of a tape recording. As opposed to the first study, the experimenter was not present in the laboratory during the delivery of these procedures. A comparison of physiological measures obtained during both studies failed to indicate significant differences in reducing physiological measures between live and taped presentation in either hypnotic or control conditions. Progressive relaxation presented live, however, produced significantly greater reductions in all measurements of physiological arousal as compared to the recorded instructions. An explanation of the apparent superiority of live progressive relaxation over the taped mode was the presence of response contingent progression in the live condition. In this condition, the experimenter would not proceed from one muscle group to the next without an indication that the current muscle group was completely relaxed. As this would not be possible in the taped condition, physiological measures from this group would naturally appear higher. Generalizations of these results was therefore limited.

A review of the literature from 1970 to May, 1979 found only one study which examines live vs. taped relaxation procedures as independent variables. Israel and Beiman (1977) compared abbreviated progressive relaxation presented both live and taped against a self relaxation control to determine the effectiveness of each procedure in reducing measures of physiological arousal and subjective tension. Subjects were selected on the basis of clinical interviews and above average scores on the Multiple Affect Checklist and the Spielberger Trait Anxiety Inventory to closely resemble a clinical population suffering from tension or anxiety. Fourteen male and eleven female subjects were randomly assigned to both experimental and control conditions in blocks of three. Subjects were run individually through three treatment sessions scheduled three to four days apart at the same time of day. Between group comparisons in reduction of tonic heart rate, respiration rate, and muscle tension failed to indicate significant difference. However, both taped relaxation and the control procedure were inferior to live relaxation in reducing subjective tension.

These results are in contrast to Paul's (1969c) earlier findings in which progressive relaxation, presented live was superior to the self-relaxation control in reducing physiological arousal. Also, the current results fail to support Paul and Timble's (1970) findings that live presentation is superior to taped procedures in reducing measurements of physiological arousal. Israel and Beiman further note, however, that failure of these results in finding live presentation to be superior to the taped mode could be the product of differences in subject populations (1977 p. 253).

STATEMENT OF THE PROBLEM

To date, no single investigation has combined mode of presentation with two relaxation procedures to examine effects on physiological arousal. A study which synthesizes these variables would be necessary in order to provide further generalization of results to both experimental and clinical populations. In the investigations of Paul (1969c) and Paul and Timble (1970) live vs. taped modes of presentation were examined in two separate studies, creating the need for a similar investigation in which these variables are tested with male subjects. Furthermore, results obtained from comparing the effects of live vs. taped procedures in reducing physiological arousal were possibly confounded by response contingent progression in the live condition. The more recent study of Israel and Beiman (1977) controlled for this confound by the experimenter systematically moving from one muscle group to the next without regard to total relaxation in the current muscle group. This study, however, used a clinical population composed of both sexes and investigated only progressive relaxation presented live and taped.

The present study departs from those discussed above on several procedural variables. Relaxation procedures used in this study include abbreviated forms of progressive and autogenic relaxation (herein termed P.R. and A.R.) presented live and tape recorded. Progressive relaxation, developed by Edmund Jacobson is a process of systematically moving throughout the body, tensing and relaxing various muscle groups. Attention is directed towards noticing the difference between feelings of tension and relaxation. The current study used a modified version of a P.R. procedure (Appendix A-1) adapted from Barbara Brown (1977). Autogenic relaxation utilizes suggestions of heaviness, warmth, and calmness throughout the body. The training process includes listening to a series of such statements, each of which focuses on a specific part of the body. Following each statement, a pause is allowed for mental repetition of the phrase. A modified version of an autogenic procedure (Appendix A-2) was used in the current study (see reference note).

Changes in surface skin temperature of the dominant hand and variations in frontalis muscle tension were monitored as dependent measures of physiological arousal. In addition, a pre- and post-treatment state anxiety scale was administered to assess changes in state anxiety. Further, an all male population was used to control for possible effects of opposite sex interactions between the experimenter and subject.

The following hypotheses were posited regarding the interrelationship of these variables: 1) abbreviated P.R. presented in both live and tape recorded modalities would be more effective than like presentations of A.R. in reducing muscle action potential levels of the frontalis muscle and in increasing surface skin temperature of the dominant hand; 2) P.R. and A.R. presented live and taped would be superior to a self-relaxation control procedure in producing these physiological changes.

METHODOLOGY

Subjects

Fifty undergraduate males, acquired from classes at Appalachian State University, Boone, N.C., volunteered for participation in this study. Each subject was briefly questioned to assure for no previous experience in meditation, yoga, or any type of relaxation procedure. All subjects were required to sign a contract which specified the conditions of their participation (Appendix B).

State Anxiety Measure

The A-State scale of the Spielberger State-Trait Anxiety Inventory was selected for use in this study to provide a means of evaluating changes between pre- and post-treatment state anxiety (Appendix C). The A-State scale is comprised of twenty statements designed to evaluate feelings of "tension, nervousness, worry, and apprehension" at a given moment (Spielberger, Gorsuch, and Lushene, 1970, p. 3). Research with the A-State scale has indicated that scores increase as a product of various forms of stress, and decrease after relaxation training (1970).

Design

A 2 by 2 factorial, random groups design was used in which type of presentation (live vs. tape recorded) and type of induction (P.R., A.R.) were the independent variables manipulated. In addition to these groups, a self-relaxation control procedure was included in which subjects were instructed to relax on their own without the aid of a specific relaxation procedure. Two dependent measures of physiological arousal were used: A) average decrease in muscle action potential levels of the frontalis muscle; B) average increase in surface skin temperature of the hand. A two-way multivariate analysis of variance (between and within groups) was employed to determine the main effects and interactions.

Experimental Setting

Two adjacent rooms were used for this study, one of which housed the biofeedback instruments and all other equipment. Subjects entered a second room which was furnished with a reclining lounge chair for the subjects to sit in during the treatment process. A second straight back chair was placed off to the right of this one for the experimenter to use while conducting live presentations. An 8 ohm speaker was placed on top of a small end table which was placed to the left of the lounge chair. All tape recorded relaxation procedures were played through this speaker. The experimental room was dimly lit by two directional lamps mounted on the wall about three feet above the back of the lounge chair. Directly below the lamps was a one-way observational mirror to permit observation of the subjects from the instrument room during the treatment process.

Apparatus and Physiological Measures

An Autogen series 1700 feedback myograph was used to monitor variations in muscle action potential levels of the frontalis muscle at a bandpass setting of 100-200 H.Z. Standard electrodes were placed on the forehead with the ground placed on the midline and both active electrodes positioned approximately one inch on either side. This unit was connected to an Autogen series 5100 pulse wave analyzer, which allows integrated averaging of the data. The Autogen 5100 was set to average microvolt levels of the frontalis muscle over a time interval of fifteen seconds. The digital display of this average was set to hold for 15 seconds, allowing sufficient time to take a temperature reading prior to taking that of the EMG. Variations in hand temperature were monitored by an Autogen series 2000b feedback thermometer. Standard thermal electrodes were placed on the thumb, middle and fourth finger of the dominant hand. The meter scale selector of this instrument was set at a maximum sensitivity of xl where each increment equals 1/20 of a degree Fahrenheit. The 2000b automatically averages temperature changes in the analogue function. Temperature readings were taken by calibrating the needle of the temperature meter to zero. This changes the display of the baseline temperature quantifier, providing an accurate reading of the current temperature level. Temperature readings were taken first, signaled by the "reading light" on the Autogen 5100. This assured that both temperature and EMG readings had been averaged over a fifteen second time interval. A data sheet was designed for recording all physiological measures (Appendix D).

Procedure

Subjects were randomly assigned to four experimental groups and a control condition (N=10), using the random assignment procedure outlined by Wood (1977, pp. 62-63). These conditions include: 1) P.R. live; 2) P.R. taped; 3) A.P. live; 4) A.P. taped; 5) self-relaxation control. Each subject was run through two treatment sessions scheduled over a two-week period, exactly seven days apart at approximately the same time of day. Upon entering the laboratory, subjects were seated in a large lounge chair and connected by the experimenter to the physiological measurement instruments. In all experimental and control conditions, subjects received the following instructions. "The purpose of this experiment is to assess the efficiency of different procedures in facilitating bodily relaxation. Please assume a relaxed position in the chair and afterwards refrain from further bodily movement as much as possible. For the next few minutes, just relax as best as you can on your own with your eyes closed." At that point the experimenter left the room and a five minute adaptation period began, the last minute of which was used to record the pre-treatment physiological measurements. At the end of the adaptation period, the examiner re-entered the experimental room. Subjects in the "live" conditions received the following instructions: "In a moment I will guide you through a procedure which will aid you in reaching a state of deep bodily relaxation. Please listen carefully and just allow yourself to go with the process as much as possible." Depending on the assigned conditions, each subject then received either an abbreviated form of progressive relaxation or autogenic relaxation. At the end of each relaxation procedure, subjects were instructed to continue relaxing for a few minutes. The experimenter again left the room and a five minute post-relaxation period began, the last minute of which was used to take the post-treatment measures. Subjects in the "taped" conditions received the same instructions except the first sentence was modified to read, "In a moment you will hear a tape of my voice that will guide you through a procedure . . . ." After giving these instructions the experimenter left the experimental room and started the tape recorder. Instructions were included on the end of both tapes to continue relaxing for a few minutes which began the five minute post relaxation period. In the self-relaxation control condition, the examiner entered the room after the pre-treatment measure and handed each subject a sheet of paper containing the following instructions: "For the next 15 minutes continue to relax as best as you can on your own with your eyes closed. I will let you know when the relaxation period is over by entering the room and asking you to open your eyes." The last minute of the 15 minute relaxation period was used to record the post-treatment measures. Subjects in the five conditions were run according to the order of random assignment.

RESULTS

Physiological Data

Relaxation in the current study was assessed by two measures of physiological arousal; reductions in muscle action potential of the frontalis muscle (MAP), and increases in surface skin temperature (S.S.T.) of the dominant hand. The independent variables were 1) live versus tape recorded presentation; and 2) progressive (P.R.) versus autogenic (A.R.) relaxation. The data was analyzed employing a 2 X 2 factorial analysis of variance.

Temperature Data

Total temperature change (T.T.C.) was assessed by subtracting the pre-treatment reading from the post-treatment reading in each of the two treatment sessions. The two differences were then added together. Higher means are correlated with an increase in S.S.T., which indicates a less active state of physiological arousal. Lower means are interpreted in the opposite manner. The analysis indicated a significant main effect for T.T.C. with type of induction, $F(1,36) = 5.53$; $p < .05$. Means and standard deviations for the autogenic and progressive conditions were 1.19 (2.024) and -.05 (1.280) respectively. These results indicate that A.R. produced significantly greater increases in T.T.C. than occurred in the P.R. conditions. The two-way interactions for this measure failed to achieve significance. The anova summary and means are presented in Appendix E, Tables 1 and 2.

Session I temperature change was assessed by subtracting the pre-treatment reading from the post-treatment reading. Means are interpreted in the same manner as was explained above. The analysis indicated a significant main effect for this variable with type of induction, $F(1,36) = 4.21$; $p < .05$. Means and standard deviations for the autogenic and progressive conditions were

1.17 (2.956) and -.230 (1.016) respectively. These results indicate that A.R. produced significantly greater increases in S.S.T. than occurred with P.R. within the first treatment session. The two-way interaction for this variable failed to achieve significance. The anova summary and means are presented in Appendix E, Tables 3 and 4.

Session II temperature change was assessed in the same manner as for session I. The means are interpreted in the same manner. All main effects and interactions failed to achieve significance. The anova summary is presented in Appendix E, Table 5.

Electromyograph Data

Total EMG change was assessed by subtracting the post-treatment reading from the pre-treatment reading in each of the two treatment sessions. The two differences were then added together. Lower means are correlated with a decrease in MAPs of the frontalis muscle which indicates a less active state of physiological arousal. Higher means are interpreted in the opposite manner. The analysis of total EMG change failed to achieve significance. However, a trend was detected, $F\ (1,36) = 3.30$; $p = .074$, which indicates that live presentation produced slightly greater reductions in MAPs of the frontalis muscle than occurred with taped presentation. The anova summary and means are presented in Appendix E, Tables 6 and 7.

An additional one-way analysis of variance was performed to include the control condition with the four experimental groups. This analysis allowed for comparisons to be made between the control condition and the four experimental groups on the same dependent variables discussed above. Means are interpreted in the same manner as previously discussed for these variables. A significant main effect was detected for total temperature change, $F\ (4,45) = 2.845$; $p < .05$. This result indicated that one or more of these groups differed significantly on affecting significant T.T.C. increases. The anova summary and means are provided in Appendix E, Tables 8 and 9.

To determine which of the groups differed significantly, a multiple t-test was employed with which a critical difference was computed. This allowed for the mean scores of the five conditions to be compared so significant differences could be determined. The difference between these means was significant, t (45) = 16.14; $p < .05$. Conditions with mean scores which fell above the critical difference value of 16.14 were significantly different from all other conditions in affecting increases in T.T.C. These results indicate that the autogenic taped and control conditions produced greater increases in T.T.C. than occurred in all other conditions with the greatest increase occurring in the control condition. Analysis of all other dependent variables failed to achieve significance. The t-test summary is presented in Appendix E, Table 10.

<u>State Anxiety Change</u>

Changes in state anxiety were assessed by subtracting the post-treatment score from the pre-treatment score. Higher means are correlated with an increased level of state anxiety. Lower means are interpreted in the opposite manner. The analysis indicated a significant main effect with type of presentation, F (1,36) = 8.48; $p < .05$. Means and standard deviations for the live and taped conditions were -4.10 (4.587) and .05 (4.211) respectively. These results indicate that live presentation produced significantly greater reductions in state anxiety than occurred in the taped conditions. The anova summary and means are presented in Appendix E, Tables 11 and 12.

In addition to these measures, pr - and post-treatment state anxiety scores were separately grouped and included in the analysis. A significant main effect was detected for the pre-treatment scores with type of presentation, F (1,36) = 5.76; $p < .05$. Means and standard deviations for the live and taped conditions were 43.10 (3.986) and 46.45 (5.031) respectively. These results indicate that a significantly greater level of pre-treatment state anxiety existed in the taped conditions than was present in the live conditions. On the basis of this finding it appeared that the small number of subjects in each cell (N=10) prevented randomization from creating equivalent groups prior to treatment. The anova summary and measure presented is in Appendix E, Tables 13 and 14.

The hypothesis that total temperature change was significantly effected by existing pre-treatment state anxiety was tested employing a follow-up covariate analysis of variance. The four experimental groups were included in this analysis which allowed for the assessment of T.T.C. based solely upon the effects of the independent variables, excluding the possible effects of pre-treatment state anxiety. The analysis indicated a significant main effect for T.T.C. with type of induction, $F(1,36) = 5.24$; $p < .05$. The covariates for this variable failed to achieve significance. These results indicate that even though pre-treatment state anxiety differed among groups, it did not significantly effect the pattern of results. The anova summary is presented in Appendix E, Table 15. Lastly, analysis of the post-treatment state anxiety scores failed to achieve significance. The anova summary is presented in Appendix E, Table 16.

DISCUSSION

Physiological Data

Hypothesis I predicted that abbreviated P.R. presented live and taped would be more effective than like presentations of A.R. in reducing MAPs of the frontalis muscle and in increasing S.S.T. of the dominant hand. With regard to the temperature data, the results indicate that A.R. is superior to P.R. in affecting S.S.T. increases, even within one treatment session. Further, the current results found taped A.R. to be superior to live A.R. and P.R. or taped P.R. in producing S.S.T. increases.

No significant results were found with regard to reductions in frontalis muscle MAPs. However, a strong trend ($p=.074$) was detected which indicated that live presentations produced slightly greater reductions in this physiological measure as compared to taped presentations of the same. A second trend further indicated the occurrence of this pattern even within one treatment session.

Hypothesis II predicted that P.R. and A.R. presented live and taped would be superior to the self-relaxation control in affecting these physiological changes. The results failed to support this hypothesis with both physiological measures. Analysis of the temperature data found that with the exception of the A.R. taped condition, the control procedure produced significantly greater increases in S.S.T. as compared to all other conditions. Further, results of the EMG data described above also failed to support this hypothesis.

State Anxiety Measure

No hypothesis was posited regarding state anxiety change. However, analysis of this data found live presentation to be superior to taped presentation in affecting a greater reduction in total state anxiety change. Further, a significant main effect with the pre-treatment state anxiety measure was detected, which indicated that randomization failed to create equivalent groups prior to treatment. However, in a follow up covariate analysis of variance on total temperature change, the effects of non-equivalent groups failed to achieve significance.

The results of the current study are inconsistent with the findings of Paul (1969c) and Paul and Timble (1970). In the former study live P.R. produced significantly greater reductions in forearm muscle tension, heart rate, respiratory rate, and skin conductance as compared to live hypnotic suggestions and a self-relaxation control procedure. Comparisons of these results with those of the latter study in which tape recorded instructions were used found no significant differences between live and taped instructions. The superiority of live P.R. in the former study was attributed to response contingent progression in this condition. In a follow-up study Israel and Beiman (1977) compared live and taped P.R. with a self-relaxation control procedure on reducing tonic heart rate, respiratory rate and frontalis muscle tension. The effects of response contingent progression in the P.R. live condition were controlled by the experimenter systematically moving from one muscle group to the next without assuring for total relaxation in the former muscle group. The results failed to indicate significant differences between either of the three conditions on reducing physiological arousal. However, both taped P.R. and the control procedure were inferior to live P.R. in reducing subjective tension.

The current study failed to indicate significant differences between either type of presentation or type of induction on reducing frontalis muscle tension. However, a strong trend (p=.074) was found which indicated that live presentation produced slightly greater reduction in this measure than occurred with taped presentation. In contrast to this finding, taped A.R. was superior to all other conditions, with the exception of the self-relaxation control procedure, in increasing S.S.T. of the dominant hand.

The fact that analysis of the EMG data failed to indicate significant results poses an interesting question as to what muscle group is best suited for research in measuring reductions in physiological arousal. As a fine motor muscle, the frontalis may be more difficult to relax as compared to a gross motor muscle such as the forearm. Therefore, it is probable that relaxation of the frontalis muscle is a less accurate measure of overall reduction of physiological arousal than would be indicated by relaxation of a gross motor muscle. At the time of the current study, no empirical evidence was found which would substantiate this hypothesis. However, monitoring muscle tension in a gross motor muscle may be more desirable in providing evidence of reductions in physiological arousal which would more closely parallel evidence of the same as indicated by increases in S.S.T. of the dominant hand. Further clarification of this issue is called for.

With regard to increasing S.S.T. of the dominant hand, the current evidence indicates that subjects can achieve substantial temperature increases when simply directed to relax on their own without being guided through specific relaxation procedures. A possible confound with this finding exists with the procedure for the control conditions. Subjects in the control condition were left uninterrupted by the experimenter for fifteen minutes. For subjects who experience relatively low levels of tension as compared to a more clinical population, fifteen minutes may be sufficient time to produce moderate levels of physiological relaxation.

Lastly, Israel and Beiman (1977) found live relaxation superior to both taped relaxation and the self-relaxation control procedure in reducing subjective tension. The current results lend further support to this finding.

Live presentation produced greater reductions in subjective tension as measured by scores on the Spielberger A-state scale than occurred in all other conditions.

Suggestions for Future Research

The evidence presented in the current study calls for further investigation into the effects of various procedures in reducing measures of physiological arousal. The need for replication of the procedures herein presented is apparent to determine consistency of the current results. Further, replication of these procedures is called for with a clinical population suffering from high levels of tension and anxiety. Finally, more empirical evidence is needed to determine the correlation between relaxation of fine and gross motor muscles and other measures of reductions in physiological arousal.

REFERENCE NOTE

Attributed to Schultz and Luthe through personal communication with Dumont K. Schmidt, Ph.D.

REFERENCES

Barber, T.X. and Calverley, D.S. "Hypnotic-like" Suggestibility In Children and Adults. Journal of Abnormal Psychology, 1963, 66, 589-597.

Barber, T.X. and Calverley, D.S. Comparative Effects on "Hypnotic-like" Suggestibility of Recorded and Spoken Suggestions. Journal of Consulting Psychology, 1964, 28, 384.

Barber, T.X., Dicara, L.W., Kamiya, J., Miller, N.E., Shapiro, D., and Stoyva, J. Introduction. Biofeedback and Self-Control, 1975/76, xii-xxix.

Basmajian, J.V. Biofeedback: Principles and Practices For Clinicians. Baltimore: The Williams and Wilkins Company, 1979.

Blanchard, E.B. and Epstein, L.H. A Biofeedback Primer. Reading, Mass.: Addison-Wesley Publishing Company, 1978.

Brown, B.B. Stress and the Art of Biofeedback. New York: Harper & Row, Publishers, 1977.

Budzynski, L.H. and Stoyva, J.M. An Instrument for Producing Deep Muscle Relaxation by Means of Analog Information Feedback. Journal of Applied Behavior Analysis, 1969, 2, 231-237.

Davidson, R. and Krippner, S. Biofeedback Research: The Data and Their Implications. Biofeedback and Self-Control, 1971, 3-34.

Israel, E. and Beiman, I. Live vs. Recorded Relaxation Training: A Controlled Investigation. Behavior Therapy, 1977, 8, 251-254.

Kimble, G.A. Hilgard and Marqui's Conditioning and Learning. New York: Appleton-Century-Crafts, 1961.

Kimmel, H.D. Instrumental Conditioning of Autonomically Mediated Behavior. Psychological Bulletin, 1967, 67, 337-345.

Miller, N.E. Learning of Visceral and Glandular Responses. Science, 1969, 163, 434-445.

Miller, N.E. and Carmona, A. Modification of a Visceral Response, Salivation in Thirsty Dogs, by Instrumental Training with Water Reward. Journal of Comparative and Physiological Psychology, 1967, 63, 7-11.

Miller, N.E. and DiCara, L. *Instrumental Learning of Heart Rate Changes in Curarized Rats: Shaping and Specificity to Discrimination Stimulus.* Journal of Comparative and Physiological Psychology, 1967, 63, 12-19.

Paul, G.L. *Physiological Effects of Relaxation Training and Hypnotic Suggestions.* Journal of Abnormal Psychology, 1969c, 74, 425-437.

Paul, G.L. and Timble, R.W. *Recorded vs. "Live" Relaxation Training and Hypnotic Suggestion: Comparative Effectiveness for Reducing Physiological Arousal and Inhibiting Stress Response.* Behavior Therapy, 1970, 1, 285-301.

Schwartz, Gary E. and Beatty, J. *Biofeedback, Theory and Research.* New York: 1977.

Schultz, J.H. and Luthe, A. *Autogenic Training.* (Vol. I) New York: Grave and Stratton, 1964.

Skinner, B.F. *The Behavior of Organisms: An Experimental Analysis.* New York: Appleton-Century-Crafts, 1938, 152.

Snyder, C. and Noble, M.E. *Operant Conditioning of Vasoconstriction.* Journal of Experimental Psychology, 1968, 77, 263-268.

Spielberger, C.D., Gorsuch, R.L. and Lushene, R.E. *STAI Manual*, California: Consulting Psychologists Press, Inc., 1970.

Stoyva, J. *Self-Regulation and the Stress-Related Disorders: A Perspective On Biofeedback.* Biofeedback and Self-Control, 1976-77, 3-21.

Trowill, J.A. *Instrumental Conditioning of the Heart Rate In the Curarized Rat.* Journal of Comparative and Physiological Psychology, 1967, 63, 7-11.

Wickramasehera, I. *Biofeedback, Behavior Therapy and Phynosis: Potentiating the Verbal Control of Behavior for Clinicians.* Chicago: Nelson-Hall, 1976.

Wood, G. *Fundamentals of Physiological Research* (2nd Edition). Boston: Little, Brown and Company, 1977.

APPENDICES

APPENDIX A-1

Progressive Procedure

In the following relaxation exercise you will hear a series of statements instructing you to tense and to relax various groups of muscles throughout your body. Listen carefully and follow the instructions to the best of your ability. Just allow yourself to go with the process as much as possible.

Select a comfortable sitting or reclining position. Loosen any tight clothing. Now, tense your toes and your feet . . . curl the toes and turn your feet in and out. Hold the tension and study it. And now, relax your toes and your feet. Notice the difference between tension and relaxation. Now, tense your lower legs, your knees, and your thighs. Hold it, and study it. And now relax. Just continue to relax further and further. Now, tense your buttocks . . . hold . . . and study the tension. And now relax. Tense the fingers and the hands . . . hold it . . . notice the tension. And now relax. Next, tense your lower arms and your elbows and your upper arms . . . hold it and study it . . . and now relax. Continuing to relax further and further, more and more. Now, tense your stomach . . . make these muscles firm and very hard . . . hold it . . . and now relax, noting once again the difference between tension and relaxation. Now, tense your chest . . . take a deep breath and hold it . . . note the tension beginning to build in the muscles around the chest. Relax now, exhale slowly and continuing breathing as you were. Tense the lower back . . . hold . . . and study the tension. And now, relax. Tense the upper back . . . hold it and study it . . . and now, relax. Continuing to relax deeper and deeper. Now, tense the shoulders . . . bring your shoulders up toward your ears so that you can feel the tension beginning to mount in the muscles around the shoulder area . . . hold it . . . and now, relax. Allow your shoulders to drop comfortably to your side. Now, tense your neck, the back and the front of your neck . . . hold it . . . and now, relax. Now, tense your face, make a grimace on your face so that you can feel the tension building throughout your facial muscles . . . hold it . . . and now, relax . . . allowing the muscles of your face to become smooth and rested. And now, try to tense every muscle in your body . . . hold it . . . and study it . . . and now, relax. Continuing to relax further and further your entire body. Now, let's review those groups of muscles that we have successfully tensed and relaxed. Relax the muscles in your legs, and your thighs, and your shins, and your calves. Allow your feet to feel heavy and relaxed. Relax your buttocks. And now, relax your stomach. Let go of the tensions in your chest and allow your breathing to be natural. And now, relax the muscles of your neck. Relax the muscles in your arms, your upper arms, your lower arms, and your hands, right down to the tips of your fingers. Let go of the tension in your back, your upper back and your lower back. And now, relax your head. Allow this relaxation now to flow down into your face, relaxing your forehead, your eyes, and your cheeks, and your lips . . . making your whole body feel refreshed. Just continue to relax quietly on your own for a few minutes.

APPENDIX A-2

Autogenic Procedure

In the following relaxation exercise you will hear a series of statements which suggest feelings of warmth, heaviness, and relaxation in various parts of your body. After each statement, time will be allowed for you to repeat the phrase mentally to yourself. Listen carefully and just allow yourself to go with the process as best as you can.

I feel quite calm. I am beginning to feel quite relaxed. My feet feel heavy and relaxed. My ankles, my knees, and my hips feel heavy, relaxed, and comfortable. The whole central portion of my body feels relaxed and quiet. My hands, my arms, and my shoulders feel heavy, relaxed and comfortable. My neck, my jaws, and my forehead feel relaxed . . . they feel comfortable and smooth. My whole body feels quiet, heavy, comfortable and relaxed. I am quite relaxed. My arms and hands are heavy and warm. I feel quite calm. My whole body is relaxed and my hands are warm . . . relaxed and warm. I can feel the warmth flowing down my arms and into my hands. My whole body feels quiet, comfortable, and relaxed. My mind is quiet. I withdraw my thoughts from my surroundings and I feel serene and still. My thoughts are turned inward and I am at ease. Deep within my mind I can visualize and experience myself as relaxed, comfortable, and still. I am alert, but in an easy, quiet, inward turned way. My mind is calm and quiet. I feel an inward quietness. I feel quiet and easily relaxed. I am beginning to feel my relaxation deepening. My feet feel heavy and relaxed. My ankles and my hips feel heavy, relaxed, and comfortable. My stomach and the whole central portion of my body feels relaxed and quiet. My hands, my arms, and my shoulders feel heavy, relaxed, and comfortable. My neck, my jaws, and my forehead feel relaxed, comfortable and more and more deeply relaxed. I feel very quiet and mellow. My legs and my feet are heavy and warm. I can feel the warmth flowing down my legs and into my feet. My whole body feels warm and relaxed. Deep within my mind I can see myself being relaxed, comfortable, and still. Just continue to relax quietly on your own for a few minutes.

APPENDIX B

Contract for Participation

I understand that participation in this study requires that I attend two lab sessions scheduled over a two-week period. I also hereby verify that I have had no previous experience with meditation, yoga, or any type of relaxation procedure. I further agree to abstain from any drug use during the course of this study. Lastly, I realize that failure to follow through with the above stated agreements will result in my being withdrawn from the study and further, will result in my losing extra credit points and/or any other rewards I might have received through this participation.

Signed ______________________

Date ______________________

APPENDIX C

State Anxiety Measure

SELF-EVALUATION QUESTIONNAIRE

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

STAI FORM X-1

Name ______________________ Date ______________

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

	Not At All	Somewhat	Moderately So	Very Much So
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense.	1	2	3	4
4. I am regretful.	1	2	3	4
5. I feel at ease.	1	2	3	4
6. I feel upset.	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel rested	1	2	3	4
9. I feel anxious.	1	2	3	4
10. I feel comfortable.	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous.	1	2	3	4
13. I am jittery.	1	2	3	4
14. I feel "high strung".	1	2	3	4
15. I am relaxed.	1	2	3	4
16. I feel content.	1	2	3	4
17. I am worried.	1	2	3	4
18. I feel over-excited and "rattled"	1	2	3	4
19. I feel joyful	1	2	3	4
20. I feel pleasant	1	2	3	4

APPENDIX D

Data Sheet

					Session 1			Session 2			Average	
	Day/Date	Time	Name		Pre	Post		Pre	Post	Post Treatment		
				EMG			EMG			EMG		
1				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
2				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
3				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
4				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
5				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
6				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
7				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
8				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
9				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
10				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
11				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
12				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		
				EMG			EMG			EMG		
13				Temp			Temp			Temp		
				Spiel.			Spiel.			Spiel. Diff.		

APPENDIX E

Statistical Tables

Table 1

Analysis of Variance For Total Temperature Change

Source	D.F.	Mean Square	F
Type of Induction	1	15.500	5.53*
Type of Presentation	1	.306	.109
Induction X Presentation	1	7.656	2.730
Within Groups	36	2.804	
Total	39	3.190	

*$p < .05$

Table 2

Means and Standard Devistions
(Total Temperature Change)

Condition	Mean	Standard Deviation
Progressive Relaxation	-.05	1.280
Live	.300	1.098
Taped	-.400	1.406
Autogenic Relaxation	1.195	2.024
Live	.670	.677
Taped	1.720	2.752

Table 3

Analysis of Variance for Temperature Change Within Session I

Source	D.F.	Mean Square	F
Type of Induction	1	19.600	4.211*
Type of Presentation	1	2.704	.581
Induction X Presentation	1	15.376	3.304
Within Groups	36	4.654	
Total	39	5.262	

*$p < .05$

Table 4

Means and Standard Deviations
(Temperature Change Within Session I)

Condition	Mean	Standard Deviation
Progressive Relaxation	-.230	1.016
Live	.130	.371
Taped	-.590	1.324
Autogenic Relaxation	1.170	2.956
Live	.290	.840
Taped	2.050	4.003

Table 5

Analysis of Variance for Temperature Change Within Session II

Source	D.F.	Mean Square	F
Type of Induction	1	.240	.218
Type of Presentation	1	1.190	1.082
Induction X Presentation	1	1.332	1.211
Within Groups	36	1.100	
Total	39	1.086	

Table 6

Analysis of Variance for Total E.M.G. Change

Source	D.F.	Mean Square	F
Type of Induction	1	1.580	.627
Type of Presentation	1	8.327	3.307*
Induction X Presentation	1	.329	.131
Within Groups	36	2.518	
Total	39	2.587	

*p = .074

Table 7

Means and Standard Deviations
(Total E.M.G. Change)

Condition	Mean	Standard Deviations
Progressive Relaxation	1.248	1.913
Live	.701	.643
Taped	1.795	2.578
Autogenic Relaxation	.805	1.252
Live	.485	.775
Taped	1.216	1.553

Table 8

Analysis of Variance for Total Temperature Change
(All Groups)

Source	D.F.	Mean Square	F
All Groups	4	9.079	2.845*
Within Groups	45	3.191	
Total	49	3.671	

*$p < .05$

Table 9

Means and Standard Deviations for All Groups
(Total Temperature Change)

Condition	Mean	Standard Deviation
Progressive Relaxation Live	.300	1.098
Autogenic Relaxation Live	.670	.677
Progressive Relaxation Taped	-.400	1.406
Autogenic Relaxation Taped	1.720	2.752
Control	1.840	2.176

Table 10

Multiple T-test: Total Temperature Change - All Groups

Source	d.f.	S.S	M.S.	F	Sig. of F
Between Groups	4	36.315	9.08	2.845	.034
Error (Within Groups)	45	143.580	3.19		
Total	45				

Order	1	2	3	4	5
Group	3	1	2	4	5
Total	-4.00	3.00	6.700	17.200	18.400

Group					
P.T. 3	---	7	10.7	*21.2	*22.4
P.L. 1		---	3.7	14.2	15.4
A.L. 2			---	10.5	11.7
A.T. 4				---	1.2
C. 5					---

Critical Difference: 16.14

Table 11

Analysis of Variance for Total State Anxiety Change

Source	D.F.	Mean Square	F
Type of Induction	1	3.025	.149
Type of Presentation	1	172.225	8.485*
Induction X Presentation	1	3.025	.149
Within Groups	36	20.297	
Total	39	20.307	

*p < .05

Table 12

Means and Standard Deviations
(Total State Anxiety Change)

Condition	Mean	Standard Deviation
Live	-4.100	4.587
Progressive Relaxation	-4.100	4.067
Autogenic Relaxation	-4.100	5.280
Taped	.050	4.211
Progressive Relaxation	-.500	5.817
Autogenic Relaxation	.600	1.713

Table 13

Analysis of Variance for Pre-treatment State Anxiety Measure

Source	D.F.	Mean Square	F
Type of Induction	1	11.025	.566
Type of Presentation	1	112.225	5.759*
Induction X Presentation	1	70.225	3.604
Within Groups	36	19.486	
Total	39	22.948	

*$p < .05$

Table 14

Means and Standard Deviations
(Pre-treatment State Anxiety Measure)

Condition	Mean	Standard Deviation
Progressive Relaxation	44.250	4.241
Live	43.900	3.900
Taped	44.600	4.742
Autogenic Relaxation	45.300	5.342
Live	42.300	4.111
Taped	48.300	4.832

Table 15

Covariate Analysis of Variance for Total Temperature Change

Source	D.F.	Mean Square	F
Covariates	1	.718	.250
Type of Induction	1	15.068	5.245*
Type of Presentation	1	.189	.066
Induction X Presentation	1	8.004	2.786
Within Groups	35	2.873	
Total	39	3.190	

*$p < .05$

Table 16

Analysis of Variance for Post-treatment State Anxiety Change

Source	D.F.	Mean Square	F
Type of Induction	1	2.500	.153
Type of Presentation	1	6.400	.392
Induction X Presentation	1	44.100	2.703
Within Groups	36	16.317	
Total	3[illegible]	16.420	