DIFFERENCES IN THE ABILITY TO ENGAGE IN DEEP MUSCLE RELAXATION AS A FUNCTION OF AGE AND SEX IN CHILDREN

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An Abstract

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in Psychology

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by

Virginia Louise Takacs

August 1975

ABSTRACT

The primary purpose of this study was to determine if there were any age or sex differences in a child's ability to learn the techniques of Deep Muscle Relaxation. This ability was measured via a pre- and post-treatment test on the Electromyograph which measures the muscle tension in the frontalis muscle. Twenty children were used as the experimental group and twenty children were used in the control group.

A pre- and post-treatment test was conducted on the EMG approximately 14 to 15 days apart. In the interim period, the experimental group received nine days of relaxation training. The control group received no training and was not in contact with the experimenter during this period.

An analysis of variance using the mean EMG scores revealed no significant difference on the following variables: initial scores between the experimental and control group, post-treatment mean gain scores between the experimental and control group, mean gain in EMG scores for muscle tension between the younger and older children in the experimental group and mean gain in the EMG scores for muscle tension between the male and female children in the experimental group.

Subjective data collected via questionnaire and direct verbal feedback from the children, indicates that the children enjoyed participating in the relaxation training and that they

had learned to relax the major muscle groups in their bodies.

Considering the relatively short training period, the experimenter feels that the subjective data is an indication that children are able to learn the DMR procedures and that this ability would be reflected in changes in EMG mean scores if the training period could be extended.

DIFFERENCES IN THE ABILITY TO ENGAGE IN DEEP MUSCLE RELAXATION AS A FUNCTION OF AGE AND SEX IN CHILDREN

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August 1975

To the Graduate Council:

I am submitting herewith a Thesis written by Virginia Louise Takacs entitled "Differences in the Ability to Engage in Deep Muscle Relaxation as a Function of Age and Sex in Children." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts in Psychology.

Elizabeth A. Stokes
Major Professor

We have read this thesis and recommend its acceptance:

Garland E. Blair
Minor Professor

Stephen F. Davis
Third Committee Member

Accepted for the Council:

Wayne E. Stamey
Dean of the Graduate School

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CHAPTER I

INTRODUCTION

Physicians believe that from 50 to 80 per cent of human diseases are psychosomatic, that is, they result from the body's unconscious reaction to psychological stress. Thus, it is possible, in theory, to train patients to control 50 to 80 per cent of their diseases and hopefully to decrease their dependence on drugs (Green & Green, 1974). Relaxation Therapy or Deep Muscle Relaxation (DMR) is a technique whereby subjects learn to relax their muscles deeply and "turn on" this relaxation in situations in which they ordinarily feel tense (Werner, 1972).

Edmund Jacobson (1938) is the originator of the technique of Deep Muscle Relaxation. Jacobson is a physician who developed the original process of DMR in the 1930's to treat his patients. Jacobson's treatment often lasted for years, while the patient made weekly or bi-weekly visits to his office, learning to relax each specific muscle group, one group at a time (Jacobson, 1938). It was Jacobson's original contention that patients could be trained to use their own initiative in relieving tensions. "He learns to localize tensions when they occur during nervous irritability and excitement and to relax them away." (Jacobson, 1938 p. 40)

Jacobson was striving to develop a method whereby residual tension would be eliminated. This residual tension is the tension in the muscles that remains even after a subject appears to be a rest. Jacobson also concluded that the average

person does not know when he is tense. Training in his method tends to make the individual observant of muscular contractions in various parts of the body. Jacobson developed his procedure based on physiological studies carried out in the labratory, dating from approximately 1908 to the time of publication of his book, Progressive Relaxation, in 1938.

The youngest patient that Jacobson treated was an eight and one-half year old girl. He felt at that time that children may require special methods of training. This technique was employed successfully by Jacobson for such diseases as nervous hypertension, mucous colitis, stuttering, stammering, hypochondria, cyclothymic depression and bronchial asthma.

Jacobson's Deep Muscle Relaxation techniques were incorporated into a therapy program developed by Joseph Wolpe, also a physician. Unlike Jacobson, who normally conducted 100 to 200 relaxation sessions, Wolpe's training rarely exceeds seven sessions. It was Wolpe's belief that Jacobson's method was successful because "if a person can maintain differential relaxation all the time, he will obtain some measure of reciprocal inhibition of the effects of any anxiety-evoking stimuli he happens to encounter" (Wolpe, 1958, p. 136). Wolpe's basic approach to psychotherapy is founded on this theory of reciprocal inhibition. Wolpe utilizes anxiety inhibiting responses such as relaxation, assertion and sexual responses in an attempt to overcome neuroses. The application of these new responses, in situations previously dealt with through the

use of neurotic behavior, leads to new patterns of behavior that are more adaptive than the previous neurotic behavior (Shertzer & Stone, 1974).

Wolpe adapted Jacobson's DMR for use with his most well know technique, systematic desensitization, shortening the process and often conducting it while the client is under hypnosis. Systematic desensitization consists of training in DMR, construction of anxiety heirarchies and counterposing relaxation and anxiety stimuli from the heirarchies. Wolpe maintains that muscles cannot be both relaxed and tense at the same time, therefore, as a subject learns to relax his muscles, the tension in these muscles is reduced. The relaxation exercises in DMR are designed to build up a sense of kinesthetic feedback (Jacobson, 1938).

Arnold Lazarus (Lazarus, 1970) also uses an adapted form of Jacobson's relaxation training as psychotherapy for his clients. Lazarus feels that relaxation training offers the most direct method of coping with anxiety and tension. He maintains that a client must practice relaxation in order to gain maximum benefit from it. Lazarus recommends that it be practiced in a quiet, darkened, reasonably warm room. Daily training is suggested in order to develop relaxation as a habit, which is his goal. According to Lazarus, most people feel a difference in their ability to relax the muscles by the end of a ten day training period. He feels that relaxation training makes a client less nervous and therefore more self-confident. He supports Jacobson's contention that it is a viable treatment for many psychosomatic illnesses.

REVIEW OF THE LITERATURE

A review of the literature reveals that the majority of research involving DMR is conducted in conjunction with systematic desensitization with adults. Folkins (1969) reports that relatively "pure" relaxation treatment is effective in the reduction of phobias.

Cooke (1966) conducted a study wherein he evaluated the effects of relaxation per se in the systematic desensitization process and concluded that relaxation was not the efficacious agent. This evaluation was based on the assumption that subjects would be more relaxed under the condition of imagined exposure to phobic agent compared with direct exposure to the phobic agent. Since the direct exposure treatment was more effective in reducing anxiety, they concluded that relaxation is not the effective agent.

In a study by Schaffer (1971) the conclusion was drawn that systematic desensitization without relaxation was just as effective as systematic desensitization with relaxation. However, the writer feels that these results are questionable based on the fact that subjects received only two hours of relaxation training.

Rachman (1965) reports that Lazarus found the following: Relaxation and hypnosis alone, do not reduce the phobia. Relaxation and hypnosis accompanied by pseudo-therapeutic interviews do not reduce phobic behavior. Interpretive therapy combined with relaxation, does not reduce phobic behavior. With these

findings in mind, he attempted to separate the effects of relaxation and desensitization. Rachman (1965) conducted his research using groups of three people. His relaxation group was given 10 bi-weekly sessions in DMR. An abbreviated form of Jacobson's method (1938) was used and was induced without hypnosis. He found that DMR alone was not effective in reducing phobic behavior, but also that desensitization with relaxation training was significantly more effective than desensitization without relaxation. Thus, they concluded that repetitive presentations of the anxiety-evoking stimuli did not reduce phobia except when they were accompanied by relaxation. The repeated imposition of an antagonistic response, that of relaxation, upon anxiety reactions seems to be the effective process. Thus, the results of the Rachman study suggests that this widely used technique developed by Wolpe is dependent on the effectiveness of the relaxation training.

Gillan teamed up with Rachman (1974) to explore various treatment methods with snake phobic patients. Their four treatment conditions consisted of (1) relaxation and talk about topics unrelated to phobia (2) desensitization without relaxation (3) conventional desensitization with relaxation and (4) psychotherapy combining insight development and rational therapy. Systematic desensitization with relaxation proved to be the most successful treatment with these phobic patients. Laxer and Walker (1970) also support the contention that at least some of the beneficial effects produced by systematic

desensitization can be attributed to the generalized effects of relaxation training. Treatment was effective only in those conditions where relaxation training was involved.

It is apparent from the literature that relaxation training has been useful in helping to deal with many life situations that involve stress, either situational or chronic, in nature. For example, Nideffer and Deckner (1970) worked with a 20-year-old student who participated in intercollegiate shot-putting. This student was a poised and confident person according to the authors with no abnormal tension or anxiety. The subject agreed to participate in the experiment at the suggestion of one of the authors, just to see what might happen. That a measurable and rather consistent improvement occurred within four weeks following introduction of the relaxation procedures, after a long period of no improvement, is suggestive of the important role of the procedures. Caution must once again be employed, however, in the interpretation of this data based on one individual and employing no control group.

Over the past decade evidence has also grown that indicates that there is a negative correlation between scores on test-anxiety scales and academic performance (Laxer, Quarter, Kooman & Walker, 1969). Preliminary research by these authors showed that test-anxious high school students have a high-level of general anxiety. This raised the question of the appropriateness of systematic desensitization procedures for generally anxious subjects as opposed to subjects with specific anxiety. They hypothesized that relaxation per se would be more effective

than systematic desensitization for subjects with pervasive anxiety. In research conducted on thirty-three high school students divided into groups of Grades 9 through 12 and students in Grade 13, their hypothesis was supported. The results showed that anxiety level was reduced with DMR alone for all groups, however, this reduction was reflected in increased academic performance by the Grade 13 students only. The researchers felt this was due to motivational differences in the two groups as their final examinations served as a basis for college admission.

Russell (1973) recently was successful in reducing severe test anxiety in a 21-year-old female student through the use of DMR coupled with cue-control words. After repeated presentation of various cue words during DMR, over a five week training period, the subject was able to reduce her muscle tension by subvocalizing the cue word. Self-report data was used as the criterion for success in this study.

Stone's (1971) research also supports the positive effects of DMR training alone as he found a decrease in state anxiety and irrational ideas at the .05 level of significance with his subjects. Stone used the Adult Irrational Ideas Inventory, The Way I See Myself via a self-concept differential and the A-Trait Anxiety Scales as his pre- and post-evaluative tools. Dawley (1973) also found a program of self-administered relaxation to be effective in treating a forty-year-old male with a history of chronic anxiety. After four weeks, improvement had occurred to the extent that the patient could begin both work and counseling.

Muscle relaxation treatment for tension headaches was conducted by Tasto, and Hinkle (1973). They found this technique to be particularly useful where self-administration was a beneficial aspect of treatment. Whenever a headache occurred, the subjects would practice the DMR technique. After two and one-half months of treatment, four subjects reported no headaches and two reported one headache each during a one week period compared with a mean of 5.5 headaches reported before treatment.

Fichtler and Zimmermann (1973) utilized a record form on which subjects recorded the duration of their headaches, intensity on a five-point scale and the amount of interference in daily activity caused by a headache also on a five-point scale. He reported a significant decrease in the means of pre- and post-training scores for subjects trained in DMR by taped relaxation training sessions. All subjects had been diagnosed as having tension headaches. Four, two-week training sessions wherein the training period decreased gradually from one hour to fifteen minutes in length were completed by all subjects. The subjects had one training session with the experimenter present, but the training was on tape. The subjects were then given a copy of the training tape with instructions to listen to the tape twice a day, in the morning and in the evening. No control group was used in this experiment, therefore it could not be concluded from this study that DMR training reduces tension headaches. However, it does indicate that self-reports of the duration, intensity and interference of headaches can be altered through the use of DMR.

Further support for this form of therapy can be seen if we look at the work of Budzynski, Stoyva & Adler (1970). They also found that the reduction of tension is effective for the alleviation of headaches. His DMR training was facilitated by the use of biofeedback with an Electromyograph (EMG), which indicated to the subjects when the muscle was actually relaxing. After DMR training, his subjects were able to decrease headache incidence and to abort slight-to-moderate intensity headaches. They became more aware of rising muscle tension, especially in the neck and head area, and were able to relax these muscles even if they were not lying down. Success was based on subjective reports of number and intensity of headaches and decreased frontalis EMG activity.

The use of biofeedback is becoming more and more prevalent in DMR research and application. Biofeedback is defined as the immediate ongoing presentation of information to a person concerning his own physiological processes and state. With the advent of biofeedback technology, more precise objective measures can be made. The electromyograph (EMG) has been proven to be an effective measurement tool for muscle tension (Sudzynski, et al, 1970).

The need for further research in the area of DMR therapy with children is evidenced by the relatively limited number of publications to be found in the professional journals. According to Jacobson (1970) recent investigations at the University of Montreal indicate that DMR training can be readily learned by children.

Research has been conducted by Davis, Saunders, Creer and Chai (1973) using children from six to sixteen years of age, half of whom were severe asthmatics and half of whom were non-severe asthmatics. DMR therapy, especially when aided by biofeedback, reduced asthmatic symptoms of those subjects diagnosed as non-severe asthmatics, but did not occur in several severely asthmatic subjects. DMR training also was shown to improve respiratory efficiency on a short-term basis in research conducted by Philipp, Wilde and Day (1972) with asthmatic children.

Relaxation therapy is currently being used in the clinical field by many people. One of these people is Judith A. Green of the Menninger Foundation. Through personal correspondence with the author, Green stated that she is presently working with a ten-year-old boy diagnosed as hyperactive. Green has been successful in lowering the child's tension level as measured by an EMG and consequently has been able to reduce his daily Ritalin intake from 30 mg to 20 mg.

A school in Houston, Texas, has also recently participated in research involving DMR training with children (Carter & Synolds, 1974). An audio-taped relaxation program, seven minutes in length was presented to thirty-two boys who were in a special class for minimally brain-injured children. DMR training was administered to the experimental group three days a week for four weeks. Carter, et al, found that this was an effective means of improving the quality of handwriting and that the effect was transferred to nonexperimental situations and that

these changes were stable over time. These children ranged in age from 8-3 to 11-5 years with a WISC Full Scale IQ range from 87 to 107.

Weil and Goldfried (1973) reported the case that demonstrates the use of DMR in the treatment of insomnia in an 11-year-old child. The client was provided with taped DMR instructions, which were used each evening at bedtime. These external directions were gradually faded over a period of several weeks. The client quickly became capable of rapidly placing herself in a deep state of relaxation completely of her own accord. Self-relaxation was found to be successful in eliminating the insomnia, as well as other related difficulties.

Separation of groups by male and female is a further variable to be considered. Kahn, Baker and Weiss (1968) conducted their research with females and males with insomnia and had them in separate groups. He conducted two, thirty-minute training sessions per week for two weeks. The subjects were instructed to practice at home for five minutes each day. Self-reports were again used as an evaluative tool in determining the success of treatment in this study. Weiss reported a significant improvement in the subjects' insomnia.

Shank (1969) has shown that the relaxation training is effective in reduction of physiological responses to stress as shown by decreased heart and respiratory rate as compared to a control group. The importance of response contingent feedback has been examined by Riddick and Meyer (1973) as it applied to DMR. They found that the introduction of response

contingent feedback into an automated delivery system for relaxation training made it equally effective to face-to-face training on the gross motor movement and heart rate scales.

One further aspect of the DMR procedure that has been investigated is the significance of warm versus cold automated therapist procedure. The only procedural difference between these two DMR groups was the manner in which taped therapist verbalized the treatment procedure. Morris and Suckerman (1974) found that subjects in the warm therapist group improved significantly more than subjects, based on behavioral avoidance scores, in either the cold automated therapist or control group. This relationship was largely maintained during the follow-up evaluation.

NEED FOR THE STUDY

Very little research has been conducted on the actual process of Deep Muscle Relaxation training. The importance of relaxation therapy both alone as a therapeutic tool and in conjunction with systematic desensitization is firmly established. The question remains, however, what variables effect the efficacy of DMR training? It is the purpose of this study to evaluate the effect that age has on the DMR training effect. In addition, sex will also be evaluated as an independent variable.

STATEMENT OF THE PROBLEM

This study is being conducted with 40 children, 20 experimental subjects who will receive DMR training, and 20 control subjects who will receive no training. All children, both experimental and control will be given a pre- and post-treatment test on the Electromyograph (EMG) to obtain objective data on their ability to learn the relaxation procedure as indicated by the amount of measured muscle tension in the trontalis muscle. Subjective data will also be collected in the form of direct personal feedback to the experimenter from the children following each training session and questionnaires sent out to the subjects and their parents following the final post-treatment test.

This data will be evaluated for differences in the amount of muscle tension as measured by the EMG, between the control group and the experimental group and also for differences using the same measure with regard to age and sex within the experimental group.

HYPOTHESIS

1. There is no significant difference in the level of tension as measured by the means of the EMG scores initially received between the experimental and the control group.

2. There is no significant difference in the level of tension as measured by the mean gain in the EMG scores received after the treatment interval between the experimental group and the control group.

3. There is no significant difference in the level of tension as measured by the mean gain in the EMG scores received after the treatment interval between the older subjects and the younger subjects in the experimental group.

4. There is no significant difference in the level of tension as measured by the mean gain in the EMG scores received after the treatment interval between the male and female subjects in the experimental group.

LIMITATIONS OF THE STUDY

1. Subjects were volunteers, and operated under no reward incentive to cooperate with the instructions being given to them on the tape. There was no guarantee that the subjects concentrated on what they were doing during each session.

2. The time of day at which the relaxation training took place, was varied of necessity for several children who could not always make it to their regularly scheduled class in the morning. This necessitated the institution of a class at 1PM, which approximately half of the young children attended on any given day.

3. Having the children participate in groups led to the occasional disruption of all the children in the group by one or two restless subjects.

4. The group structure also prevented the variance of the instructions to suit the progress and pace of any individual child on any given day.

6. Significance of the scores obtained on the EMG were dependent on the exact placement of electrodes on each child in the same place in order to insure that they all started from the same point. This was often impossible to obtain.

7. Ten continuous days of treatment could not be given to the experimental group. Treatment could not be given on the weekends and could not be extended for an additional week due to the upcoming holiday weekend at which time several of the children were going on vacation. Four consecutive days of treatment, followed by two days without and five further consecutive days of treatment were given.

CHAPTER II

THE EXPERIMENTAL PROCEDURE

SUBJECTS

The subjects were 41 children ranging from 5 to 11 years of age. Subjects were recruited from several sources, which included The Clarksville Academy, Austin Peay State University faculty children, area Nursery School programs and the Public School system in Clarksville. The children were randomly selected for inclusion in the experimental group, which included 21 children, and the control group, which included 20 children. One extra child was included in the experimental group in the event of the loss of a child's participation through illness or lack of interest. One child was randomly eliminated from the data collected on the experimental group in order to equalize the sample size with that of the control group. The groups on which data was analyzed were as follows:

Experimental Groups

1. Ten subjects ranging in age from 9 to 11 including six males and four females.

2. Ten subjects ranging in age from 5 to 7 including five males and five females.

Control Groups

1. Ten subjects ranging in age from 9 to 11 including six females and four males.

2. Ten subjects ranging in age from 5 to 7 including five males and five females.

APPARATUS

The Feedback Myograph BFT 401 is designed to measure the degree of electrical activity of muscle groups. The Myograph (EMG) is connected to a Time Period Integrator - BFT 215, to get a reading of the average microvolt (tension) level for any given period of time. The lower the score, the less electrical activity is occuring in the muscle being measured and thus the more relaxed the muscle.

The electrodes are placed in a line across the forehead of the subject, equally spaced, with the ground being the center electrode with the reference electrode on the right and the active electrode on the left. These electrodes are held in place through the use of a headband which extends around the head. The subjects are prepared for electrode attachment by first cleaning the forehead with alcohol to breakdown the natural oils, which are insulators. Second, the area is rubbed with an abrasive tissue to remove some of the horny epidermis, which is also an insulator. Electrode cream is placed on each electrode and the band with all three electrodes attached is placed on the forehead of the subject. The jack from the electordes is then plugged into the Time Period Integrator and a test is run to determine if the electrodes are properly placed and functioning. The jack is then plugged into "Operate" and the test is started. The average tension per 10-second period is then recorded in microvolts. A manual reset button is employed to start a new 10-second period after the digital

readout is recorded by the experimenter. After recording readings for 3 minutes, the electrodes are removed and the subject's forehead is again cleaned as are the electrodes between use on each subject.

PROCEDURE FOR EXPERIMENTAL GROUPS

Pre-treatment Test

All subjects were initially given a pre-treatment reading on the EMG following the prescribed conditions stated above. After being properly connected to the apparatus, all subjects listened to Myograph Tape 1. This tape, previously recorded by the experimenter, asked them to close their eyes and to relax as much as possible. A few words suggesting relaxation were spoken on the tape at approximately 1 minute intervals. The period of measurement and suggested relaxation was 3 minutes in length. During the relaxation period, the scores were recorded at approximately 10-second intervals. The EMG had to be reset manually which resulted in a varying number of scores for the children measured.

Treatment

The subjects were given training in Deep Muscle Relaxation at the Clarksville Academy. The subjects were divided into five groups: Older male subjects, older female subjects, younger male subjects, younger female subjects, and younger male and female subjects. This last group was mixed by sex due to the time factor involving when the children were available for training. Each group met at the same time each day. Daily

sessions lasted approximately 17 minutes and were conducted Tuesday through Friday of week one and Monday through Friday of week two. No relaxation training sessions were conducted on the weekends which resulted in breaks in the training program. There was also a two-day break between the last relaxation session and the follow-up EMG reading. The study was conducted for nine days due to the upcoming holiday weekend which would have interfered with the continuity of the relaxation training as many of the children were going out of town.

Relaxation training consisted of three tapes which were modifications of a program developed by Elizabeth Stokes, and recorded by the experimenter. Tape 1 was basic training in DMR and included all the major muscle groups. This tape was played on days one through five, on day seven and on day nine. Tape 2 was introduced in order to break the monotony for the subjects. This tape contained visual imagery as well as the basic DMR training. Tape 2 was played on day six. Tape 3 consisted again of visual imagery and basic DMR training, but with some varying instruction. Tape 3 was played on day eight.

All subjects were instructed to lie comfortably on blankets on the floor and to take off their shoes and to loosen their belts. The sessions were conducted in a darkened room. The tapes were all approximately 17 minutes in length. Following each group's session, the subjects were encouraged to express to the experimenter what they had felt, what they visualized during the imagery sessions and whether or not they had used

this new technique at home to help them sleep or overcome a headache or any other tension. The experimenter was always present in the room during the taped relaxation sessions.

Post-treatment Test

Upon completion of the DMR training, all subjects were given a post-treatment test on the EMG following the same procedures used in the pre-treatment test. The same time period was followed in testing the children from both groups. This schedule averaged 14 or 15 days from the first to the second EMG testing for all children. The post-treatment testing of all children required three days to complete. Therefore it was necessary to begin post-treatment testing on Monday in order to be completed prior to the long holiday weekend.

A questionnaire was mailed to all subjects and parents of subjects in the experimental group with a stamped self-addressed return envelope after the post-treatment test. The purpose of the questionnaire was to obtain a subjective evaluation of the effectiveness of the training from both the subjects and the parents.

PROCEDURE FOR CONTROL GROUPS

Pre-treatment Test

All control subjects were also given a pre-treatment test on the EMG, following the exact basic procedure used with the experimental groups.

Treatment

The control subjects received no treatment and were not seen by the experimenter for the two week treatment period.

Post-treatment Test

After a two week interval, all control subjects were again administered a test on the EMG following the same procedure used initially with them and the experimental subjects.

ANALYSIS OF DATA

An analysis of variance was made to determine if there were significant differences in the pre- and post-treatment mean tension scores of the groups as measured by the EMG readings. A further analysis of variance was conducted to ascertain if there were significant differences in the mean tension scores within the experimental group with regard to the age and sex variables. Basis for rejections of the null hypothesis will be the .05 level of significance.

CHAPTER III

RESULTS

Objective Data

Hypothesis 1 stated that there was no significant difference in the level of relaxation as measured by the mean EMG scores initially received between the experimental and the control group. The analysis of variance indicated no significant difference between these two groups, $F(3,36) = .26$, $p < .05$.

Hypothesis 2 stated that there was no significant difference in the level of relaxation as measured by the mean gain in the EMG scores received after the treatment interval between the experimental group and the control group. The analysis of variance indicated no significant difference between these two groups in the post-treatment test, $F(3,36) = .17$, $p < .05$.

Hypothesis 3 stated that there was no significant difference in the level of relaxation as measured by the mean gain in the EMG scores received after the treatment interval between the older subjects and the younger subjects in the experimental group. Again, the analysis of variance revealed no significant difference between these two groups, $F(1,18) = .03$, $p < .05$.

Hypothesis 4 stated that there was no significant difference in the level of relaxation as measured by the mean gain in the EMG score received after the treatment interval between the male and female subjects in the experimental group.

Here too, the analysis of variance revealed no significant difference between these two groups, $F(1,18) = .02$, $p < .05$.

Subjective Data

Questionnaires were sent out to both parents and experimental subjects who received the DMR training, in order to obtain further input as to the effectiveness of this training. In general, the response was very favorable, with almost all the children indicating that they enjoyed the training and would recommend it to their friends, if the opportunity presented itself. The parents' responses were also positive, indicating to the experimenter that their children participated eagerly and often tried to demonstrate the technique on other members of the family.

After each training session, the subjects were asked to give a verbal report as to the effect the training had on them on that particular day. These reports varied for each child from day to day, however, a general trend was evident. The younger children (ages 5 and 6) were less able to express what they were feeling during relaxation. This could be attributed either to their lack of experience in expressing themselves in these terms, due to age, or to the lack of ability to carry out the relaxation instructions closely enough to derive some physical sensation.

The older children made comments such as: "I feel like I'm floating down the river on a raft." "I feel like I have a pile of pillows all over me." "My arms tingle so much I can hardly stand it." Whereas, the younger children made

comments such as: "I feel tired," and "I feel sleepy," or "I don't feel anything." These comments have led the experimenter to believe that older children are more adept at learning the DMR procedure than the younger children. Based on verbal reports such as these, the experimenter was able to draw an age line between those having difficulty and those who were apparently learning the procedure. This line fell at approximately age six. Most of the seven year olds were able to learn DMR, some of the six year olds were able to learn it and most of the five year olds were unable to learn it based on their verbal reports to the experimenter at the conclusion of each session.

Based on the objective data which is questionable for reasons stated in Chapter IV, it would appear that the relaxation training was not effective for these children, however, based on the subjective data both in the questionnaires and in personal feedback to the experimenter, the majority of the children did learn how to relax their major muscle groups through Deep Muscle Relaxation training.

DISCUSSION

The analysis of the data failed to yield any difference between the control group and the experimental group, or difference within the experimental group with regard to age and sex.

The failure to obtain any significant difference can possibly be attributed to a number of variables:

1. Relaxation training was conducted in small groups averaging five subjects in each. The effect that one restless child has on the group can be very disruptive to the other children's ability to concentrate on the DMR training. When working with children as young as five, the control of this variable is very difficult to manage. Even in the older children who averaged approximately ten-years-old, there were occasional verbal comments and unnecessary movements that temporarily attracted the attention of the other participants.

2. The Electromyograph is an important tool in the evaluation of effects of relaxation training. However, certain considerations should be made prior to its incorporation into research studies. Considerable training should be given on the use of the machine, prior to any actual research work. It would be a benefit to practice with the EMG machine on perhaps ten or twelve children, in order to build up a knowledge of the idiosyncracies of the readouts.

3. A soundproof room should be used in order to minimize outside distractions. In this study, a different room was

used for the pre- and post-treatment tests. The post-treatment room was located under the stairs that led to the main floor. These stairs are well travelled and the noise was considerable. Although instructions were given to hold all calls during the testing sessions, on occasion, the telephone rang, causing an increase in tension in the frontalis muscle of the subject connected to the EMG. This increase in tension was reflected in an increase in scores for several 10-second intervals. Voices could occasionally be heard in the hall outside the testing room. All these noise factors contributed to the confounding of the scores as a true measure of the child's ability to relax under optimum conditions.

4. Anxiety was expressed by several children about having the testing conducted at the Mental Health Center, expressing concern that someone might see them there and think that they were "crazy." A neutral environment should be chosen in which to test and train children.

5. Due to the experimenter's lack of knowledge regarding the fine details of the EMG, exact placement of the electrodes was not carried out consistently with the children. The instrument that indicates whether or not the electrodes are properly placed gives an acceptable range within which the test can be conducted. The exact place within this range is important, however, since the lower the electrode resistance the more accurate are the scores obtained. Some of the children were tested with the electrode indicator register in the

upper range of acceptability and others were tested with the electrode indicator register in the lower range of acceptability. This had the effect of raising or lowering the general starting point, and all subsequent scores during the testing period. The experimenter was not made aware of this variable until the testing was completed.

6. Of necessity, electrode cream was changed during the post-treatment testing session. The change in cream seemed to affect the electrode resistance leading to lower scores in general for many of the children who were tested after this change was made. The second electrode solution was a saline solution which, depending on the specific amount of salt present, affected the electrode resistance. This change further lowered the experimenter's confidence in the accuracy of the scores as a valid indication of each child's ability to carry out the DMR technique.

7. Lazarus recommends continuous training on a daily basis in order to attain full benefit from the relaxation training. In this study, training was not given on weekends which interjected a two day break into the training period. There was also a two or three day break prior to the final post-treatment test. The training period could not be extended to compensate for these breaks in training due to the holiday weekend. The experimenter feels that these breaks reduced the overall effect of the relaxation training that the children did receive.

8. Attendance is an important factor to consider when evaluating the effectiveness of the training. Of the children

who's data was analyzed in the experimental group, only one child missed a session. All others attended regularly.

SUMMARY AND CONCLUSIONS

This study was conducted to determine if there were any age or sex differences in a child's ability to learn the techniques of Deep Muscle Relaxation. This ability was measured via a pre- and post-treatment test on the Electromyograph which measures the muscle tension in the frontalis muscle. Twenty children were used as the experimental group and twenty children were used in the control group. The make-up of the control and experimental groups consisted of approximately same age and sex children, with ten older and ten younger children in each group.

A pre- and post-treatment test was conducted on the Electromyograph (EMG) approximately 14 to 15 days apart. In the interim period, the experimental group received nine days of relaxation training. The control group received no training and was not in contact with the experimenter during this period.

The data was analyzed using the mean EMG scores as indicators of the amount of muscle tension occuring in the frontalis muscle of the child connected to the machine. This data yielded no significant difference in the mean EMG scores on the following variables; initial scores between the experimental and control group, post-treatment mean gain scores between the experimental and control group, mean gain in EMG

scores for muscle tension between the younger and older children in the experimental group and mean gain in EMG scores for muscle tension between the male and female children in the experimental group.

A questionnaire was sent to both parents and children in the experimental group to obtain subjective data as a supplemental source of information of the effectiveness of the training. One negative response was received back from one of the five year old children who indicated that the relaxation training made her feel "rotten." This child does, however, enjoy pretending that she is conducting relaxation sessions with her playmates and her dolls, which is an indication to the experimenter that although this child probably was not able to learn the relaxation technique it was not an entirely negative experience for her. The other children who have sent back their questionnaires have indicated positive results from the training and an enjoyment in the training procedure.

Direct feedback to the experimenter after each session from each of the children, also supports the contention that most of the children over 7 years of age were able to learn the procedure and also enjoyed the training. The 5 year old children did not seem as capable of learning this procedure in the group setting and were often restless and uncooperative in carrying out the instructions as they were given.

The attendance record of the 20 children who participated in the DMR training was excellent with only one absence

by one child which was due to a family trip out of the state for a day. All other children attended each session which is an indication to the experimenter of the interest the children held in the DMR training.

RECOMMENDATIONS FOR FURTHER STUDY

1. Complete training on the Electromyograph (EMG) is recommended for any experimenter considering the utilization of this equipment in their study. This experience should include practice with 10 or 12 children on the EMG machine.

2. A soundproof room should be used for the EMG testing.

3. Training and testing should be conducted in a neutral environment to eliminate any anxiety that may be produced owing to the actual place in which the testing is conducted.

4. Testing should be continuous if possible, providing the children with copies of the relaxation tapes to practice with on the weekends on their own. If this cannot be done, the training period should possibly be extended to run approximately three full weeks, or three, five day consecutive training periods, interrupted only by two weekends. This increased training period might offset the detrimental effects of the breaks in training.

5. The experimenter believes that children under seven years of age can best be trained on an individual basis. This training should probably be done by the experi-

menter in person without the use of taped relaxation training. In this way, sections can be repeated, when it is apparent that the child is having difficulty.

6. The time of day that training takes place appears from this study to be an important variable. The children who received training at one o'clock every afternoon were more restless than those who received training in any of the groups during the morning sessions, regardless of age. Morning or perhaps late afternoon sessions would probably be the best times, avoiding the usual nap time in the younger children.

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