1985

Comparative Study of the Physiological Effects of Three Passive Relaxation Techniques Administered to Mentally Retarded Children

Karen Holford
Andrews University, holford@andrews.edu

INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and re: ce this document, the quality of the reproduction is heavily dependent upon .he quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again–beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

University Microfilms International
300 N. Zeeb Road
Ann Arbor, MI 48106

Holford, Karen Sue

COMPARATIVE STUDY OF THE PHYSIOLOGICAL EFFECTS OF THREE PASSIVE RELAXATION TECHNIQUES ADMINISTERED TO MENTALLY RETARDED CHILDREN

Andrews University M.A. 1985

Andrews University

School of Education

COMPARATIVE STUDY OF THE PHYSIOLOGICAL EFFECTS OF THREE PASSIVE RELAXATION TECHNIQUES ADMINISTERED TO MENTALLY RETARDED CHILDREN

A Thesis

Presented in Partial Fulfilment

of the Requirements for the Degree

Master of Arts

By

Karen Holford

May 1985

COMPARATIVE STUDY OF THE PHYSIOLOGICAL EFFECTS OF THREE PASSIVE RELAXATION TECHNIQUES ADMINISTERED TO MENTALLY RETARDED CHILDREN

A thesis

presented in partial fulfilment

of the requirements for the degree

Master of Arts

By

Karen Holford

APPROVAL BY THE COMMITEE:

Donna J. Habenicht, Ed.D., Chairman

Wilfred Futcher, Ph.D.

Keith Gaden, M.A.

May 27, 1985
Date approved

ABSTRACT

COMPARATIVE STUDY OF THE PHYSIOLOGICAL EFFECTS OF THREE PASSIVE RELAXATION TECHNIQUES ADMINISTERED TO MENTALLY RETARDED CHILDREN

By

Karen Holford

Chairman: Donna Habenicht

ABSTRACT OF GRADUATE STUDY RESEARCH

Thesis

Andrews University

Department of Education

Title: COMPARATIVE STUDY OF THE PHYSIOLOGICAL EFFECTS OF THREE PASSIVE RELAXATION TECHNIQUES ADMINISTERED TO MENTALLY RETARDED CHILDREN

Name of researcher: Karen Holford

Name and degree of faculty advisor: Donna Habenicht, Ed.D.

Date completed: May 1985

Problem

Passive relaxation techniques require no intellectual or physical effort from the receiver. This study examined effects of three passive relaxation techniques on galvanic skin resistance (GSR), pulse rate (PR), and peripheral skin temperature (PST) of

profoundly (PMR) and severely (SMR) mentally retarded children.

Method

Twenty-four PMR and SMR children under twelve years were randomly assigned among four groups. The first group received slow stroking of the midline back; the second slow rocking; the third lay quietly; and the fourth was a control group. At the beginning and end of twelve ten-minute sessions, the subjects' GSR, PR, and PST were measured.

Results

Ancova and anova analyses showed significant differences among groups on several days. Stroking and rocking produced similar relaxation levels; lying quietly was less effective; lack of treatment was ineffective.

Conclusions

Passive relaxation techniques with this population seem plausible. Techniques applied directly to the body appear most effective.

CONTENTS

LIST OF TABLES viii

PREFACE xi

Chapter
1. INTRODUCTION 1

Statement of the Problem 3
Purpose of the Study 3
Need for the Study 4
Experimental Hypotheses 4
The Variables 5
Independent Variables 5
Dependent Variables 6
Extraneous Variables 6
Definition of Terms 7
Preview of Study 9

2. LITERATURE REVIEW 10

Introduction 10
Relaxation in Education 11
Improving the Handwriting of the Learning Disabled 11
Creative Relaxation Techniques for Children 13
A Relaxation Project with High School Students 14
Reducing Test Anxiety Using Cue-controlled Relaxation 15
Other Uses of Cue-controlled Relaxation 16
Relaxation and Physical Complaints 17
The Treatment of Insomnia 17
The Treatment of Phantom-Limb Pain 18
The Treatment of Primary Dysmenorrhea . . . 20
Relaxation and the Mentally Retarded 21

Comparison of Different Relaxation Techniques 24
The Potential of Passive Relaxation Techniques 26
The Role of the Autonomic Nervous System in Relaxation and Stress 27
Passive Relaxation Techniques 29
Slow Rocking and Linear Movement 29
Slow Stroking 30
Neutral Warmth 31
Slow Rolling 31
"Pink" Noise 32
Vestibular Stimulation of Seizure-Prone Children 32
The Need for Physiological Measurement . . . 33
Galvanic Skin Resistance 34
Peripheral Skin Temperature 35
Pulse Rate 35
Measurement of Relaxation 36
Summary and Conclusion 36

3. METHODOLOGY 37
Population and Sample 37
Research Tools 38
Procedure 39
Null Hypotheses 42
Statistical Analyses 43

4. RESULTS 45
Hypothesis 1 46
Hypothesis 2 57
Hypothesis 3 69
Summary of Results 78

5. SUMMARY AND CONCLUSION 80
The Results 82
Conclusions 84

SELECTED BIBLIOGRAPHY 87

LIST OF TABLES

1. Pretest and Posttest Pulse Rate Means 48

2. The Change in the Pulse Rate Means from Pretest to Posttest 49

3. The Adjusted Pulse Posttest Mean for Each Group . 50

4. F Values and Probabilities Arising from the Analysis of Covariance--Pulse Rate 51

5. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 5 53

6. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 9 53

7. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 1 54

8. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 6 54

9. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 8 55

10. The Values of t and the Probabilities Comparing Group Means--Pulse Rate Day 10 55

11. Summary of Instances of Significant Differences among Groups--Pulse Rate 56

12. F Test and Probability Levels for the Comparison of All Treatment Groups with the Control with Pulse Rate as Dependent Variable 57

13. Pretest and Posttest Skin Temperature Means . . . 59

14. The Change in the Skin Temperature Means from Pretest to Posttest 60

15. The Adjusted Skin Temperature Posttest Mean for Each Group 61

16. F Values and Probabilities Arising from the Analysis of Covariance--Skin Temperature . . . 62

17. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 3 63

18. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 2 64

19. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 4 64

20. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 8 65

21. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 9 65

22. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 10 66

23. The Values of t and the Probabilities Comparing Group Means--Skin Temperature Day 12 66

24. Summary of Instances of Significant Differences among Groups--Skin Temperature . . 67

25. F Test and Probability Levels for the Comparison of All Treatment Groups with the Control with Temperature Change as Dependent Variable 68

26. The Mean Differences between the GSR Pretest and Posttest Scores 70

27. F Values and Probabilities Arising from the Anaysis of Variance 71

28. The Value of t and the Probabilities Comparing Group Means--GSR Day 1 72

29. The Value of t and the Probabilities Comparing Group Means--GSR Day 4 73

30. The Value of t and the Probabilities Comparing Group Means--GSR Day 6 73

31. The Value of t and the Probabilities Comparing Group Means--GSR Day 9 74

32. The Value of t and the Probabilities Comparing Group Means--GSR Day 5 74

33. The Value of t and the Probabilities Comparing Group Means--GSR Day 7 75

34. The Value of t and the Probabilities Comparing Group Means--GSR Day 8 75

35. Summary of Instances of Significant Differences among Groups--GSR 76

36. F Test and Probability Levels for the Comparison of All Treatment Groups with the Control with GSR Change as Dependent Variable 77

37. Summary of Effectiveness of Treatments Compared to Control--All Dependent Variables 79

PREFACE

Before commencing on graduate study I spent a few months working as an occupational therapist in a residential-care setting for the mentally retarded, the Slade Hospital, Oxford, England. There I worked with both the multihandicapped and those with severe behavioral problems. In my work with this group I could see many ways in which they could benefit from relaxation, but I found it difficult to know how to provide them with this experience because of their physical and intellectual limitations. It was then that I realized how useful it would be if there were some passive relaxation techniques, methods of inducing relaxation without the individual having to actively participate.

Therefore I was glad of the opportunity to investigate the possibilities and effectiveness of passive relaxation techniques for this study. I discovered that there are techniques that can be used for

this purpose, and I had the opportunity to work with two of these methods as part of this study.

I would like to thank Blossomland Learning Center in Berrien County, Michigan, for all their support and cooperation, especially the students involved, and their teachers, and those who made rooms and equipment available. I would also like to thank Dr. Donna Habenicht, Dr. Wilfred Futcher, and Keith Gaden, M.A. for their support, advice, suggestions and patience as the committee for this thesis. And finally I thank my husband for all of his love and encouragement, and for putting up with sandwiches, dusty furniture, and rooms strewn with papers while this study was in progress!

CHAPTER 1

INTRODUCTION

Relaxation has been shown to be beneficial in a wide variety of circumstances--from the premature infant who is gently rocked in its incubator, the disruptive child in the classroom, the college student anticipating a final exam, and the overworked housewife to the high-powered executive. People of any age can benefit from the state of being relaxed.

Mentally retarded individuals can also benefit from relaxation training. Studies have shown that relaxation may be responsible for reducing the number of epileptic seizures (Ince, 1976). Relaxation can help reduce the amount of aggressive/disruptive behavior an individual may exhibit (Webster & Azrin, 1973), and may also lead to a reduction in self-injurious behavior (Schroeder, Peterson, Solomon, & Artley, 1977).

A variety of techniques to induce relaxation have been used and studied. These include suggestive methods, the tension and relaxation of muscle groups, hypnotism,

and massage. The first two methods require the participants to be aware with a moderate level of understanding and to have control of their own bodies. The latter two require specialist skills and are time-consuming as they can only be administered on a one-to-one basis.

There are many people who are profoundly and severely mentally retarded who could not benefit from the techniques of suggestion or the tension/relaxation of muscle groups, especially since many are also physically impaired. Hypnosis and massage may also be impractical methods to use because they require skilled people to administer them, can only be done individually, and often are not readily available to be used with the mentally retarded.

These individuals may be able to benefit from passive relaxation techniques, that is, those techniques which can be applied without requiring any intellectual or physical effort on the part of the receiver. These passive techniques can also be easily administered to an individual by a teacher, without disturbing the rest of the class or distracting him/her from the class for lengthy periods of time.

Statement of the Problem

Conducting an investigation into the effect of passive relaxation techniques on severely and profoundly mentally retarded children means investigating a relatively uncharted area. While many studies have been conducted on relaxation and its effects, their effects on this type of individual have not been investigated. The concept of this study arose from practical experience: being presented with a group of severely and profoundly mentally retarded children for whom relaxation had been prescribed. Finding that the traditional means of inducing relaxation in normal people were ineffective and inappropriate for this group, more passive means had to be sought. Also, as this group was not always able to give reliable feedback on their experience of relaxation, it was decided that objective measures of their physical state, which have been shown to be reliable indicators of the degree of relaxation a person is experiencing, would be very useful in evaluating the degree of relaxation of the group members.

Purpose of the Study

The purpose of this study was:

(1) to compare three different types of passive relaxation, by measuring their effectiveness in an

objective manner, using

(a) skin temperature

(b) the galvanic skin response (GSR)

(c) the pulse rate of the individuals involved

(2) to ascertain whether there is a difference in the degree of effectiveness of these three types of relaxation

(3) to identify the technique that seems to elicit the most relaxed physical state of the subjects.

This study was conducted only with mentally retarded individuals who are either profoundly or severely mentally retarded.

Need for the Study

There are situations in which it would be very beneficial to know of techniques, other than those traditionally used, that can induce relaxation. Teachers, therapists, and parents could all use these very simple techniques quite safely, without any prior experience, and would benefit from knowing which techniques might be more effective.

Experimental Hypotheses

1. There is a significant difference in the degree of relaxation, as measured by the pulse rate

change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

2. There is a significant difference in the degree of relaxation, as measured by the skin temperature change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

3. There is a significant difference in the degree of relaxation, as measured by the GSR change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

The Variables

Independent Variables

The independent variables are the different types of passive relaxation techniques used:

1. subject lying on a mat in a room with dim light and soft music for ten minutes.
2. subject lying on a mat in a room with dim light and soft music, and experiencing slow stroking of the skin receiving its sensory nerve supply from the posterior primary rami, for two minutes and

thirty seconds, and then lying quietly for seven minutes and thirty seconds.

3. subject being rocked slowly from side to side on a rocker, in a room with dim light and soft music for two minutes and thirty seconds, and then lying quietly for seven minutes and thirty seconds.

Dependent Variables

The dependent variables for this study are the different objective, physiological measures that are being used to assess the effectiveness of the independent variables. These are:

1. the galvanic skin response
2. the pulse rate
3. the skin temperature of the subjects.

Extraneous Variables

The extraneous variables are such things as

1. the effects of any medication that the subjects may be receiving at the time of the experiment
2. the presence of physical or psychological conditions that may predispose the individual to more or less relaxed states, such as hypoactivity or hyperactivity

3. the personality traits of the subjects, as individuals may vary in their degree of anxiety or relaxation.

Definition of Terms

Passive relaxation is any type of relaxation method which does not require any intellectual or physical effort on the part of those experiencing relaxation.

Profound mental retardation is the diagnosis given to those individuals whose intelligence quotient is 25 and below (Rapoport, 1984, p.55).

Severe mental retardation is the diagnosis given to those individuals whose IQ is between 25 and 34 (Rapoport, 1984,p.55).

Physical impairment, for the purpose of this study, is defined as any physical deformity, sensory deficit, or other handicap that is considered permanent.

Galvanic skin response is a measure of the electrical conductivity of the skin. The electrical conductivity of the skin is strongly affected by the emotions and the degree of arousal of the body. This electrical activity of the skin increases greatly with intense emotions and subsides with the presence of relaxation (GSR-2 Manual).

Skin temperature is a measure of the external temperature of the body. It is a useful measure of relaxation because, as the body increases in arousal and anxiety, the peripheral blood vessels constrict to divert the blood to the muscles in readiness for action. With this response the skin becomes cooler, as less blood is present to bring it warmth. As the body returns to a state of relaxation, the blood vessels dilate, allowing more blood to flow through the skin, thus warming it (Brown, 1974).

Pulse rate is a count of the number of times an individual's heart beats during a sixty-second period.

Slow stroking is an inhibitory procedure for general relaxation described by Margaret Rood. It is achieved by alternate hand stroking of the skin area supplied by the posterior primary rami along each side of the spine. One hand commences at the cervical region and makes a long stroke down to the lumbar region with a light but firm pressure. Before the first hand has finished its stroke, the second begins the movement, commencing in the cervical region, maintaining continuous contact with the subject. This process is a powerful inhibitor of the autonomic system response (Huss, 1980).

Slow rocking is a technique used to induce total body inhibition. Any movement that is performed in a slow,

continuous, even pattern facilitates relaxation by producing an inhibitory response. This concept is used by Brunnstrom (1970) in her rocking patterns for recovering hemiplegics, and also by Huss (1980) in neurophysiological treatment workshops. For the purpose of this experiment the subject was laid down on a flat surface that was mounted on shallow rockers, and was then rocked from side to side to an angle of 20 degrees from the horizontal at a rate of ten complete cycles per minute.

Preview of Study

In chapter 2, the literature pertaining to the use and potential of relaxation, relaxation with the mentally retarded, passive relaxation techniques, and objective physiological measurements are examined.

Chapter 3 describes the study carried out to compare the effects of three passive relaxation techiniques on the GSR, peripheral skin temperature, and pulse rate of profoundly and severely mentally retarded children.

The results of the study are found in chapter 4, with a summary, conclusion, and recommendations in chapter 5.

CHAPTER 2

LITERATURE REVIEW

Introduction

Life in the 1980s is said to be more stressful than it has ever been before. Technology has increased the pace of life, and the pressure of keeping up with this speed has caused an increase in stress-related problems. These problems appear in one's physical health, mental well-being, and the quality of relationships with others. The recent recognition of the results of leading a stress-filled life has caused an increase in the attention given to relaxation, and the advantage of taking time to stop for a while and allow one's body to slow down.

There is strong agreement that relaxation is beneficial and should be a regular part of a healthy lifestyle, just as much as exercise or a balanced, nutritious diet. The benefits of regular relaxation have been shown to be numerous.

Relaxation has been used to improve handwriting (Corter & Synolds, 1974). Test anxiety has been reduced

by relaxation training (Russel & Sipich, 1973; Koeppen, 1974). Relaxation has been used to reduce insomnia in college students (Gershman & Clouser, 1974) and to reduce phantom limb pain (McKechnie, 1975). Relaxation may also be useful in reducing the incidence of epileptic seizures (Ince, 1976).

Relaxation in Education

Improving the Handwriting of the Learning Disabled

Corter and Synolds (1974) worked with learning disabled children for fifteen years and observed that many had major problems with writing. They were seen to "squeeze the pencil, press on the paper, purse their lips," and appeared to require great concentration to write. Their bodies became tense and rigid, and the writing task was slow and laborious. The energy they were using to write seemed to be excessive and often did not produce legible results.

Corter and Synolds developed a program of relaxation training for these children to overcome the tension they seemed to be experiencing when they were involved in a writing task.

Thirty-two minimally brain-damaged boys were selected from four special education classes and age-matched with an equal number of boys from regular

classes, in order to provide a control group. One sample of handwriting was taken from each boy in the control group.

All the children from the four special education classes were involved in the experimental procedure, but only the data provided by the thirty-two selected subjects were analyzed.

In a room with dim lights the children were asked to close their eyes and listen to approximately seven minutes of taped instructions on how to relax, and to follow the directions given on the tape. When the tape was finished, the lights were turned up again, and the children were requested to copy a short passage from the blackboard. This took place three times per week for four weeks.

The rating of the papers was done by two elementary teachers who were unaware of the experiment. They rated each paper on a 1-5 scale for each of the variables: space, size-constancy, line quality, letter formation, neatness, and overall legibility.

Papers written in a different class period on the last day of the experiment and during a class period four months later were also rated to evaluate the transfer of learning and long-term effects. During the four months

following the experiment no specific handwriting training or practice was given.

The conclusions were that relaxation training resulted in improved efficiency in handwriting. There was transfer to other situations and stability over time. Subjectively, the experimenters also noticed that writing speed increased in response to the relaxation sessions, that less muscular tension was present, and that the pressure of the pencil on the paper was reduced.

However, there are some flaws in the experimental design, as only one sample was taken from the control group. It would have been interesting to know whether the handwriting of the boys in the control group also improved over time, and whether some improvement would have occurred naturally. Nevertheless, it would appear that the handwriting quality of learning-disabled boys can be improved through relaxation training.

Creative Relaxation Techniques for Children

Koeppen (1974) also suggested that relaxation training can help children to be less tense and anxious. She noticed many situations in a school setting that were likely to trigger anxiety in a child. Beginning new tasks, giving an unprepared oral report, being disciplined, or watching other children receive

discipline can all be causes of anxiety. In a creative attempt to overcome the tension provoked by such situations, Koeppen (1974) designed a script that makes use of fantasy in encouraging children to relax using the tension and relaxation of different muscle groups. For example, to encourage children to tense and relax their shoulder and neck muscles they are told to pretend that they were turtles, and whenever danger approaches they were to try to pull their heads inside their shells. When the danger passed, they could relax again. Using such an imaginative script can add fun to the relaxation session and make it seem more attractive to children.

A Relaxation Project with High-School Students

Hiebert and Eby (1985) investigated the effect of relaxation practice with nineteen grade twelve students. The students had a class to teach them self-monitoring procedures, which was followed by a relaxation session. The students then relaxed at home each day, using a progressive muscle-relaxation technique, guided by a tape. At the end of two weeks the students could either switch to a tape that taught autogenic relaxation or make their own relaxation tape from a number of provided scripts. They recorded their own physiological responses before and after the relaxation sessions on a log sheet, where they also noted their own subjective perceptions of

the session. Each student also completed both forms of the State-Trait Anxiety Inventory (Spielberger, 1968) and a Symptoms of Stress Inventory (Lecknie & Thompson, 1979) at the beginning of the experiment and at the end.

As a result of this procedure the students learned to relax and experienced significant reductions in state anxiety, trait anxiety, and a number of stress-related symptoms.

Reducing Test Anxiety Using Cue-Controlled Relaxation

Russel and Sipich (1973) used relaxation training to reduce test anxiety. Using a single subject experiment, they administered one of the Interpersonal Anxiety Scales (Final Course Examination) from the S.R. Inventory of Anxiousness to a 21-year-old college junior complaining of test anxiety. Fourteen items on this scale represented symptoms of anxiety that could be experienced in taking a final course examination. On a five-point scale the student rated the degree to which each symptom would be present for her prior to an important test. Six items on the scale were present to a great or very great degree. An interview with her was made to examine whether the anxiety she felt before tests was specific to that situation alone or was generalized

to other areas of her life. It was concluded that her anxiety was not generalized.

She was trained in conditioned or cue-controlled relaxation, a process whereby she learned to relax in response to a self-produced cue word "calm." She found that her anxiety was reduced or even eliminated through this relaxation procedure. She remained free from anxiety throughout the mid-term examinations and her finals, and found that she was not anxious or upset prior to the tests, and did not suffer from insomnia, as she had done previously. The Final Course Examination Scale from the S.R. Inventory of Anxiousness was readministered, and the average of her scores dropped from 3.0 down to 1.8, where 5 indicated high anxiety levels, and the average of the six symptoms that previously were present to a great or very great degree dropped from 4.3 down to 2.7. This suggested that there was a decrease in her perceived physiological arousal.

Other Uses of Cue-Controlled Relaxation

Russel and Sipich have also used this technique successfully to treat public-speaking anxiety and impotence, and Ince (1976) used similar conditioning, together with a desensitization program, to reduce anxiety and to eliminate seizures in a twelve-year-old

boy, training him to repeat the cue word to himself whenever he felt the aura of an approaching seizure. Both grand mal and petit mal seizures, that had had a four-year history, were eliminated, with a long-term follow-up showing no recurrence of seizures. All these cases were single-subject investigations, and though they indicate that relaxation training does reduce specific anxiety problems, a more carefully controlled experiment using larger numbers of subjects would add further credence to their claims.

Relaxation and the Treatment of Physical Complaints

The Treatment of Insomnia

Gershman and Clouser (1974) used relaxation training to reduce insomnia in college students. Using twenty volunteer subjects who stated they took at least 45 minutes to get to sleep each night, Gershman and Clouser divided them between two groups: a muscular-relaxation group and a desensitization group. The groups received two sessions of relaxation per week for four weeks. The sessions were held in the evening, and the subjects made themselves comfortable before listening to taped instructions on how to relax.

For the first two weeks, both groups were played the same tape, which taught them how to relax using the

tension and relaxation of different muscle groups. Then the desensitization group began a modified desensitization routine, while the other group continued with muscular relaxation. The desensitization hierarchy was based on the findings of a Sleep Survey Questionnaire designed by the authors. It dealt with the pre-sleep preparation and was comprised of a variety of short and long items ranging from 30-120 seconds, describing the pre-sleep process. Between each presentation the subjects had 20 seconds of relaxation.

As a result of this training the average time taken to fall asleep was decreased from 75 to 30 minutes in the desensitization group, and that of the muscular relaxation group fell from 55 to 37 minutes. Twelve-month follow up showed that the amount of time taken to fall asleep had fallen further for each group, down to 17.5 minutes for the desensitization group and 15 minutes for the muscular-relaxation group. It appears that both methods were equally helpful in reducing the time taken to fall asleep and in helping the subjects feel more rested on rising.

The Treatment of Phantom Limb Pain

McKechnie (1975) also chose to do a single-subject experiment to investigate the use of relaxation in the

treatment of phantom-limb pain. He was presented with the case of a young man who had had a brachial plexus lesion at the age of eighteen. Two years later, when there had been no recovery of function to the arm, it was decided that the limb should be amputated and a prosthesis used in its place. A few weeks after the prosthesis had been received, the young man frequently experienced a dull ache that seemed to be coming from the arm that had been amputated, his phantom limb. Sometimes he would experience a sharp pain that was severe and would last up to an hour, and then give way to the dull ache. He claimed he also had a sensation of feeling in the finger region of the amputated arm, and the distribution of the pain and sensation were different.

Nine and a half years after the prosthesis was fitted, the young man sought therapy, as the frequent experience of pain had caused him to become depressed, anxious, and aggressive. He was taught the Jacobsen relaxation technique by McKechnie, which involves the tension and relaxation of different muscle groups, and he was instructed to include his phantom limb along with the relaxation of the rest of his body by imagining the clenching of the muscles of the arm, and its subsequent relaxation.

After two months of practicing this each time the sensation of pain was felt in the phantom limb, even the severe pain was reduced, and he experienced the complete obliteration of all pain for up to an hour after relaxing. His sleep was no longer disturbed, and his smoking was reduced to 25 percent of the amount he smoked prior to this relaxation training. Again, this experiment is subject to the criticisms previously cited for single-subject research.

The Treatment of Primary Dysmenorrhea

Muscle relaxation was used by Tasto and Chesney (1974) to treat primary dysmenorrhea. Five female students who were not taking oral contraceptives or hormones, and who were not engaging in sexual activity, were treated using progressive muscle relaxation and imagery associated with the reduction of menstrual pain. Two parts of a Symptoms Rating Scale and a Menstrual Activities Scale, designed by the authors, were administered on three separate occasions. No differences were found between the first and second questionnaires, which were administered to see if time alone would relieve symptoms. Between the second and third questionnaires four weeks of treatment took place, involving five group-relaxation sessions and daily relaxation practice at home. This resulted in a

significant reduction of menstrual symptoms. However, not all subjects showed changes.

Again, the small number of subjects would suggest that this be repeated on a larger scale. Also, there would only be one menstruation during the treatment time. Subjects who menstruated early in the treatment time might not have been able to benefit from the full effects of the relaxation, so a repeat of this study should be carried out over a longer length of time.

Relaxation with the Mentally Retarded

The mentally retarded are not excluded from the benefits of relaxation. Although Kusano and Ishiguro (1982) found that mentally retarded children in Japan had a significantly lower ablility to relax than normal children, many positive effects of relaxation with the mentally retarded have been found.

In one study (Webster & Azrin, 1973) relaxation was made compulsory whenever the mentally retarded residents of a hospital exhibited agitated or disturbed behavior. A baseline method of evaluation was used to examine the behavior of the eight mentally retarded subjects prior to administering required relaxation. Once a baseline had been established and the types of disruptive behavior that would result in a required

relaxation response were determined, the program began. Whenever a subject behaved in a manner that had been defined as disruptive, he was immediately put to bed and calmly told that he was upset and needed to rest a while. He was then left in the bed for two hours before he was allowed to get up again. While in bed, no smoking, eating, listening to radios, or playing were allowed. The meals were kept until the subject had completed his full time of relaxation. This program was in effect for six months.

On the last day of the baseline, the subjects averaged about seven disruptions per day. On the first day of relaxation practice, this fell to four disruptions, a reduction of 70 percent. By the fifth day the disruptions had fallen to an average of about 0.2 per day, a reduction of 95 percent from the last day of the baseline. By the twelfth week nearly all the disruptions were being caused by one individual, and after ten months of relaxation practice, she had reduced her disruptions by 95 percent from her baseline rate to about three disruptions per week. The other subjects were averaging almost zero disruptions per day by the eighty-fourth day. The disruptions were of a less severe quality when they did occur--such as loud screaming being replaced with subdued and intermittent yelps.

A questionnaire completed by the attendants, who were administering the required relaxation to these subjects, indicated that four of five of the attendants preferred required relaxation over other procedures, and 81 percent would rather be seen using the required relaxation procedure than any other procedure (such as time-out, Brubakken, Derouin, & Morrison, 1980, p.78). if there were visitors present on the ward. Ninety-six percent stated that the procedure produced obvious behavior changes, and there was total unanimity when recommending the procedure for future use. The subjects also experienced benefits as a response to their less disruptive behavior. Three of the eight were discharged from the hospital because their disruptions had been virtually eliminated. Two of them were able to return to training classes, and two others had an increase in visits from their families.

This demonstrates some of the advantages that can be observed when relaxation time is used in a creative and responsible manner, although from the description of this study it would seem that the required relaxation is being used as a form of time-out.

Wolfzahn (1979) conducted a preliminary investigation, adapting a progressive muscle-relaxation technique for use with nine moderately or severely

mentally retarded adults. She found that the relaxation response was possible, and that it altered the anxiety behavior of the subjects regardless of their functional level or personality traits.

Comparison of Different Relaxation Techniques

Several different ways of facilitating relaxation in an individual have been examined experimentally: biofeedback (Schroeder, Peterson, Solomon, & Artley, 1977; Small, Giganti, & Steinberg, 1978), hypnosis (Miguel Tobal et al., 1980), progressive muscle relaxation (Curtis & Wessberg, 1976; Miguel Tobal et al., 1980), the autogenic method (Miguel Tobal et al., 1980) and meditation techniques (Curtis & Wessberg, 1976).

Using electrodermal conductivity (GSR) to measure the degree of relaxation, Miguel Tobal et al. (1980) found that hypnosis was not as effective as either progressive relaxation or autogenic relaxation.

Transcendental meditation was not found to be a uniquely effective means of reducing anxiety when compared to other types of intervention, in a study by Boswell and Murray (1979). They compared transcendental meditation with an antimeditation control, a progressive muscle-relaxation control, and a no-treatment control. The subjects in the transcendental meditation group were

trained in the technique especially for this experiment and practiced it at home. Each subject used the same mantra word, "shantih." The antimeditation group listened to a tape of a very convincing rationale for something named "Sazeijo Zen." This described a technique of walking actively around a room and concentrating the mind on specific problems; it was designed by the experimenters to produce a state that they considered to be incompatible with any state of transcendental meditation.

After two weeks of practice at home, each group was given a commencing session consisting of a state-trait anxiety self-report, and then measuring of the individual's autonomic response by means of the GSR and heart-rate. The GSR and heart rate measures were used to measure the degree of physiological relaxation attained by the subjects in the different groups. After practicing the relaxation techniques in the laboratory and experiencing a stress manipulation, all groups showed a decrease in autonomic arousal, and none showed superiority.

Similar results were also encountered earlier by Curtis and Wessberg (1976). They examined three groups: transcendental meditators, deep muscle relaxers, and a control group, where the individuals sat quietly in a

darkened room. The members of the first two groups had each had about twenty-four months of experience in using their particular relaxation method. In each case, the individual was to spend the first ten minutes of a laboratory session with their eyes open, to get a baseline. The next twenty minutes were spent with the subjects practicing their kind of relaxation, and the last ten minutes spent with eyes open again and not practicing any kind of method. Heart-rate, respiration rate, and GSR were used to measure the degree of physiological arousal.

As a result of this study, it appears that there are no significant differences among the three types of relaxation investigated. Each group achieved a similar decrease in physiological arousal. The only difference discovered was that the meditators and muscle relaxers enjoyed the experience more than those who sat quietly in the dark. The latter group complained of being bored and expressed relief when the session was ended.

The Potential of Passive Relaxation Techniques

The fact that sitting quietly in a darkened room can elicit a similar decrease in autonomic arousal as a method where the person is actively involved in a specific type of relaxation indicates that there may be a role for passive relaxation techniques. These techniques

could be especially valuable in assisting those who find it difficult or impossible to use the traditional techniques which depend upon active participation. The profoundly or severely mentally retarded child could benefit from these passive techniques. It is the experience of the author that often such children show evidence of tension and anxiety, such as nail-biting and teeth-grinding. They may also display agitated behavior, such as self-injury, tantrums, aggression, and screaming. It is possible that if a passive relaxation technique could be found, one that is effective with this population, that some of these behaviors could be reduced or eliminated, possibly resulting in more manageable, more responsive children.

This researcher witnessed one case of a severely retarded individual who received fifteen minutes of passive relaxation each day. During this time he would speak in sensible sentences about his home life, whereas at other times his speech was clouded by perseveration and echolalia and was usually completely nonsensical.

The Role of the Autonomic Nervous System in Relaxation and Stress

The autonomic nervous system is comprised of two subsystems: the parasympathetic and the sympathetic systems. These are both under hypothalamic control. The

parasympathetic system is cholinergic, releasing acetylcholine. The subsequent neural activity results in a dilation of the blood vessels in the skin, causing a rise in peripheral skin temperature. It slows the heart beat and increases the galvanic skin resistance. It results in a feeling of contentment, pleasure, and relaxation. This system is responsible for keeping the heart rate slowed. When a need arises for an increase in body activity, the parasympathetic system ceases to be in control, allowing the heart rate to increase, and a state of greater excitation to occur. If this is insufficient, then the sympathetic system is activated to cause a further increase in excitation to prepare the body for action (Nathan, 1969).

The sympathetic nervous system works in the opposite manner to the parasympathetic system. It is monoaminergic, releasing adrenalin and noradrenalin when the body is under stress or exercising. Stressful situations cause an increase in the secretion of these chemicals activating the entire sympathetic system. Preparing the body for "fight or flight," the blood vessels of the skin are constricted to divert the blood to the muscles in readiness for action. The heart beat is increased, and the galvanic skin resistance is decreased. The body feels excited or agitated. When the goal is to facilitate a relaxation response, a technique

that directly stimulates the activity of the parasympathetic system rather than merely suppressing the sympathetic system, may be very useful.

Passive Relaxation Techniques

Slow Rocking and Linear Movements

Umphred (1985) suggests several techniques for inhibiting the total body and causing a reduction in autonomic arousal. One of these is slow rocking on a chair or a bed. Slow, linear movements can also facilitate an inhibitory response. These are movements such as being pushed slowly in a stroller or a wheelchair on smooth, even ground. Any technique which is performed slowly in a continuous, even pattern is likely to cause a relaxation reponse. Use has been made of these methods for centuries by mothers who rock their infants or push them slowly around in their carriages in order to encourage them to fall asleep. The technique is not so important as the manner in which it is performed, which should be slow and rhythmical.

Sullivan, Markos, and Minor (1982, p.170) stated that the semi-circular canals of the vestibular system are believed to be affected by angular acceleration of the head, such as would occur in rocking. They also mention that rhythmical rocking soothes the body

regardless of whether the rocking is in the vertical or horizontal plane. The reason for the soothing effect is unknown. It could be due to the repetitive stimulation of the vestibular system which may initiate reflexive autonomic changes, activating the parasympathetic system and resulting in a relaxation response. The complexity of the nervous system and the multiple connections of the vestibular system to the central nervous system, are, in part, responsible for the difficulty in researching the actual mechanisms involved in the facilitation of relaxation by this method (Sullivan, Markos, & Minor, 1982, p.170).

Slow Stroking

Rood (1962) used such procedures as slow stroking, neutral warmth, and slow rolling for total body relaxation. Slow stroking is "an alternate stroking of the posterior primary rami with a firm but light pressure," (Hopkins & Smith, p. 117). This is achieved by drawing a line simultaneously down each side of the vertebral column using the index and middle finger of one hand. This hand should commence in the cervical region, and end in the lower lumbar region. Before the first hand has broken contact with the body, the second hand repeats the procedure. Contact with the body should be maintained until the procedure is terminated. Rood

recommends that this procedure last no longer than three minutes, or the state of the body may change from one of relaxation to one of excitation (Hopkins and Smith, p. 117).

The terminations of the posterior primary rami lie just beneath the skin on either side of the vertebral column. Stimulation of these endings results in a decrease of muscle tone and a general calming effect. Again the exact mechanisms involved are unknown (Sullivan, Markos, & Minor, 1982, p.177), but as these nerves are part of the sympathetic system, the slow stroking may have a direct action on the suppression of this system.

Neutral Warmth

Neutral warmth, not used in this study, for total body relaxation consists of wrapping all of the person to be relaxed in a cotton towel or blanket until an "appropriate amount of relaxation is observed" (Hopkins & Smith, p.117).

Slow rolling

Slow rolling, also not used in this study, is a technique where the body is rolled from lying supine to side-lying and then back again to the other side, in a rocking motion. This should also be continued until the

desired degree of relaxation is achieved (Hopkins & Smith, p. 117).

"Pink" Noise

The "Pink" noise generator is a device which has been found to assist in inducing relaxation. It is a generator of sounds, "producing an auditory signal of which the power per unit bandwidth is greater in the audio spectrum" (Boggs, Fisher, & Flint, 1973). After ten minutes of exposure to the sounds emitted by this device, eleven of twelve subjects in one experiment had a significant reduction in their GSR level, indicating that they had become more relaxed.

Vestibular Stimulation of Seizure-Prone Children

Kantner et al. (1982) investigated the effects of vestibular stimulation, such as would be provided by the rocking and rolling means of inducing relaxation, on seizure-prone children. They found there was a decrease in paroxysmal EEG activity after vestibular stimulation for six of their ten seizure-prone children, and the other four children showed no paroxysmal or nonparoxysmal EEG activity at any time. This would suggest that seizure-prone children are not likely to have a seizure precipitated by the rocking or rolling relaxation technique and may actually benefit from it. However,

seizures have been reported associated with spinning, and it is not impossible that some children may have a seizure response to methods of relaxation that rely on an increase in vestibular stimulation. In the cases of children who have a history of seizures, it may be necessary to investigate any common precipitating factors, and if these suggest that vestibular stimulation may be responsible, then a means of passive relaxation that does not involve such stimulation may be selected instead. Slow stroking, neutral warmth, or the "Pink" noise generator may be preferred.

The Need for Physiological Measurement

Harvey (1979) points out that when using relaxation with the mentally retarded, it is inadequate to depend upon self-report to ascertain whether relaxation has been achieved. Self-report is useful with populations who have average and above average IQs, and even then can be colored by such factors as the subjects wanting to "help" the experimenter and exaggerating their perceptions of the relaxation that they have experienced. However, with the severely and profoundly mentally retarded population, physiological measures need to be taken to give an objective estimate of the level of relaxation attained, as they are often unable to report on their subjective response to relaxation. Harvey cites

pulse rate and respiration rate as two useful physiological measures. The galvanic skin response, peripheral skin temperature, and electromyographical readings would also provide the researcher with objective data that measure relaxation in the following section.

Galvanic Skin Resistance

Galvanic skin resistance (GSR) is a reflection of the pore size and sweat gland activity. As these vary under the control of the sympathetic nervous system, so the GSR varies. The greater the state of relaxation, the greater the resistance in the skin (Brown, 1974). Fear, excitement, or anger can lower the GSR, as these emotions activate chemical and physical changes in the body. Even slight increases in bodily tension provoke changes in the GSR within two to five seconds (GSR-2 Manual).

Psychologists first measured the resistance of the skin as an indication of sympathetic nervous activity over sixty-five years ago. An electric meter, called a galvanometer after Luigi Galvani, an Italian scientist, was used to make these measurements, and it is after him that the galvanic skin resistance was named (GSR-2 Manual).

Peripheral Skin Temperature

An increase in stress diverts the blood flow from the skin of the extremities, hands and feet, to the muscles, heart, and lungs to prepare the body for action. As the blood flow to the peripheral skin decreased, the temperature of the skin likewise decreased. The maximum temperature normally reached by the skin of the hands is between 90°-96°F. Exposure to cold weather, wetting the hands, and impaired circulation can all reduce the peripheral skin temperature to well below this value, even down to 70°F or less. The reaction of the skin temperature is slower than that of the GSR, taking several minutes rather than seconds (Brown, 1974).

Pulse Rate

The heart also responds to stress by increasing its rate (Brown, 1974). Activated by the sympathetic nervous system, it beats faster during times of stress to increase the flow of oxygen carrying blood to the organs of the body where it may be needed, such as the muscles, lungs, and kidneys. As the body relaxes again, the heart rate decreases. This takes several minutes to take effect, but responds quicker than the peripheral skin temperature.

Measurement of Relaxation

From these physiological observations it follows that by measuring certain responses of the body, an increase or decrease in the degree of relaxation being experienced by an individual can be observed and measured objectively. This removes some of the problems faced by those depending on self-report.

Summary and Conclusion

It appears that passive relaxation techniques have not been widely studied and have received little or no attention as a means of inducing relaxation in the severely and profoundly mentally retarded.

It does appear, however, that relaxation may have potential in the treatment of the severely and profoundly mentally retarded. When studying relaxation using the more severely retarded individual, self report is inadequate, and physiological methods, such as skin temperature, pulse rate, and GSR, can be used to provide reliable, objective indicators of relaxation. Also, even though passive relaxation techniques have not been studied in great detail, the author finds there may be a case for using this type of relaxation, especially with a population who may not be able to make use of relaxation techniques demanding active participation.

CHAPTER 3

METHODOLOGY

This study compared the effectiveness of three types of passive relaxation on the mentally retarded, as measured by the GSR, pulse rate, and skin temperature.

Population and Sample

The population for this study was comprised of all profoundly and severely mentally retarded individuals who attend educational institutions for the mentally retarded. They are all twelve years of age or less.

The sample of twenty-four individuals used for this study was taken from among the mentally retarded individuals at Blossomland Learning Center. On investigation, only twenty-five individuals who were suitable to be included in this experiment were found, and one of these was spending the winter months elsewhere, leaving only twenty-four children. Six of these individuals also had physical impairments, but these were such that they were not likely to have an effect on the degree of relaxation that could be

achieved. One subject was paraplegic, two were visually impaired, and three had orthopedic handicaps. Children with diagnoses of emotionally impairment or hyperactivity were not included in the sample, as they could be disruptive to the other subjects and might have found the relaxation experience disturbing or frustrating.

Research Tools

The galvanic skin response, pulse rate, and peripheral skin temperature were selected to provide measures of the physiological responses of the body to the passive relaxation techniques used. All these have been established as reliable and objective measures of the degree of relaxation achieved by an individual and could be utilized with very little disturbance to the subject. The use of three measures, rather than merely one, provided a clearer picture of the degree of relaxation being experienced by the subjects.

The galvanic skin response was measured by using the GSR-2, a small unit designed for measuring the galvanic skin response of individuals, and available from Thought Technology, Ltd. To measure the GSR, the subject placed the index and middle fingers of the left hand on the two sensor plates of the unit. A reading was taken when the needle had stabilized. Second readings were taken leaving the dial of the unit on the same setting.

The double sensitivity option was used for these measurements to provide clearer readings.

The thermometer accompanying the GSR-2, for use with the skin temperature probe, was used to measure the temperature of the skin. Each measurement of temperature was taken from the middle finger of the left hand. The thermometer was held against the finger pad for 30 seconds before being read. Fingers that were damp from being sucked or from any other source were always carefully dried before any readings were taken.

The pulse was taken manually, with the pulse counted over a 30-second period, and then doubled to express the rate per minute. When the wrist pulse was faint, the pulse was taken by feeling the heart pulsing in the chest cavity. By placing a hand over the cardiac region of the chest, the number of beats could be counted.

Procedure

The subjects were randomly assigned to one of four groups, with six members in each group. Three of the four groups were exposed to three sessions of relaxation each week for four weeks. One group served as a control group. Each of the three experimental groups experienced one of the following relaxation techniques:

1. lying on a mat in a room with dim light and soft music for ten minutes.
2. lying on a mat in a room with dim light and soft music, and experiencing slow stroking for two minutes and thirty seconds of the skin receiving its sensory nerve supply from the posterior primary rami and then lying quietly for seven minutes and thirty seconds.
3. being rocked slowly from side to side on a rocker, for two minutes and thirty seconds, in a room with dim light and soft music, and then being left to lie quietly for the remaining seven minutes and thirty seconds.

The fourth group was a control group and did not receive any relaxation treatment. On the three days that the other groups were receiving relaxation treatment, the control subjects' physiological measurements were recorded at the beginning and end of a ten-minute period in the classroom. This took place for four weeks.

For the three experimental groups each of these sessions lasted ten minutes. The sessions took place in a room with narrow windows, and the lights were not turned on. As the windows looked out onto a tiny courtyard, bounded by high walls, the room did not receive much light. The subjects were always placed so

that any light that came through the windows did not fall on their faces. The music that was played softly was a harp solo called "The Atlantis Healing Harp," by Upper Astral. The volume and tone control were kept at the same level for each subject throughout the entire experiment.

The children in the group receiving slow stroking were laid prone on a floor mat. They had one layer of thin clothing over their backs so that they would not get too cold or feel uncomfortable because of nakedness. The slow stroking was done at a steady rate of approximately 48 strokes per minute. Each stroke started in the cervical region and ended in the lumbar region and was made by the index and middle fingers of alternate hands on each side of the vertebral column.

The children in the group receiving rocking were placed on a padded rocker that was four feet square. The rockers were 8 1/2 inches deep at their widest part, narrowing to 4 inches. The rockers ended 4 inches before the edge of the rocking platform. The rocker was the property of the school in which the experiment took place, and had been custom-made for the school. The subjects were laid perpendicular to the rockers so that their bodies were rocked from side to side. They were rocked so that the rocker tilted to twenty degrees from

the horizontal. Each back and forth cycle of the rocking had a duration of six seconds.

The readings of pulse rate, GSR, and skin temperature were taken immediately prior to the relaxation treatment and at the end of the ten-minute session. During the time allotted to "lie quietly," the subjects were encouraged to lie down, but if they resisted this they were allowed to sit quietly instead. At the end of the session, the subject was allowed to get up slowly, as he/she felt ready, so that he/she had time to readjust his/her body and thus reduce the danger of fainting or falling. They were offered one "M & M" candy at the end of the session as a reward. One of the subjects always refused the candy, and two were unable to eat candy because of feeding difficulties. They were rewarded with a cuddle, which was something they enjoyed.

The reason that the rocking and slow stroking were administered to the subject for a period of only two minutes and thirty seconds was that continuation beyond this time produces a stimulatory effect and not the desired inhibitory/relaxation effect (Rood, 1962).

Null Hypotheses

1. There is no significant difference in the degree of relaxation, as measured by the pulse rate

change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

2. There is no significant difference in the degree of relaxation, as measured by the skin temperature change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

3. There is no significant difference in the degree of relaxation, as measured by the GSR change, among three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

Statistical Analyses

Each of the hypotheses was tested for each of the twelve days separately. To test hypotheses 1 and 2, a one-way analysis of covariance was conducted with four levels (one for each treatment group, and the control group). The criterion variable was the posttest measure, and the dependent variable the corresponding pretest measure.

To test hypothesis 3, a one-way analysis of variance, with four levels, was undertaken, with the dependent variable being pretest to posttest change.

Additionally, each hypothesis was tested by means of an a priori test of all treatments (equally weighted) against the control (Winer, 1971). For each test, the alpha level was set at .05.

CHAPTER 4

RESULTS

Throughout the study, the teachers of the subjects involved were extremely cooperative. However, because this experiment took place in a school setting, there were uncontrollable interruptions, such as part-time staff who were not aware of the experiment and occasionally entered the room during relaxation sessions. On occasions electric drills were used in the close proximity of the room, and the sessions had to be postponed until the drilling had ceased.

The experimenter also had no control over the activities the children had been involved in prior to the relaxation session, which could have had an effect on the degree of relaxation achieved. Subjects who had been exercising prior to the session may have had a greater potential for relaxation than subjects who had been resting prior to the session. On day 11, the subjects were practicing for a concert involving the entire school. The usual schedule was disrupted, and all the pupils were in one large room that was noisy and full of

moving people. This could have had an effect on the subjects' ability to relax that day.

It is likely that these uncontrollable events had an effect on the subjects' ability to relax during a session. However, interruptions are often part of a normal school day, so the experiment took place under conditions frequently faced by teachers, therapists, and parents, rather than in a controlled laboratory situation.

At the completion of this study, the data for the twelve days were processed. Initially an analysis of covariance with one covariate was used to examine the data collected on the pulse rate and peripheral skin temperature variables. The covariate was the pre-test measure for the variable under study and the criterion was the corresponding post-test measure. The analysis of covariance compared the adjusted group means as one would predict they would be if the pretest means were all equal. This analysis was undertaken for each day separately.

Hypothesis 1

There is no significant difference in the degree of relaxation, as measured by the pulse rate change, among three types of passive relaxation and a control

group, when administered to severely and profoundly mentally retarded children.

Table 1 shows the pretest and posttest means for the pulse rate for each of the twelve days.

Table 2 shows the change in pulse rate means from pretest to posttest. The asterisk in each row indicates the greatest mean decrease for that day.

From table 2 it can be seen that there is a difference among the groups. The groups showing the greatest increase in relaxation, as measured by a decrease in the pulse rate, were always either the rocking or the stroking groups, followed by the lying quietly group, with the control group most often showing an increase in pulse rate. There does not appear to be an increase in the degree of relaxation over time as measured by the pulse rate.

Table 3 gives, for each day, the adjusted posttest means for each group.

TABLE 1

PRETEST AND POSTTEST PULSE RATE MEANS

Day		Control	Lying	Stroking	Rocking
1	Pre	80.50	78.80	98.00	83.00
	Post	82.00	71.20	82.00	68.00
2	Pre	78.80	91.33	90.40	98.67
	Post	83.20	81.33	83.60	86.66
3	Pre	81.00	88.80	88.80	84.00
	Post	81.00	80.80	80.00	81.50
4	Pre	79.00	82.80	88.00	85.00
	Post	79.00	77.60	77.60	73.00
5	Pre	80.80	88.00	83.00	82.67
	Post	86.40	81.00	77.00	74.67
6	Pre	85.00	89.33	88.50	90.00
	Post	86.00	84.00	76.00	80.00
7	Pre	81.00	84.00	87.00	94.00
	Post	87.00	79.20	79.00	78.00
8	Pre	88.80	91.33	86.40	90.67
	Post	91.20	84.67	78.60	77.33
9	Pre	92.00	85.00	89.00	77.33
	Post	92.80	81.33	79.00	74.00
10	Pre	86.00	82.40	91.00	86.00
	Post	89.00	80.00	78.00	80.67
11	Pre	87.50	85.60	92.40	87.00
	Post	89.00	85.60	87.20	84.00
12	Pre	89.33	88.80	94.80	80.50
	Post	86.67	87.60	81.60	77.00

TABLE 2

THE CHANGE IN THE PULSE RATE MEANS
FROM PRETEST TO POSTTEST

Day	Control	Lying	Stroking	Rocking
1	+2.50	-7.60	-16.00*	-15.00
2	+4.40	-10.00	-6.80	-12.00*
3	0.00	-8.00	-8.80*	-2.50
4	0.00	-5.20	-10.40	-12.00*
5	+5.60	-7.00	-7.00	-8.00*
6	+1.00	-5.33	-12.50*	-10.00
7	+6.00	-4.80	-8.00	-16.00*
8	+2.40	-6.67	-7.80	-13.33*
9	+0.80	-3.67	-10.00*	-3.30
10	+3.00	-2.40	-13.00*	-5.33
11	+1.50	0.00	-5.20*	-3.00
12	-2.67	-1.20	-13.20*	-3.50

TABLE 3

THE ADJUSTED PULSE POSTTEST MEAN FOR EACH GROUP

Day	Control	Lying	Stroking	Rocking
1	87.23586	78.13129	69.78287	65.75601
2	86.99490	80.98251	83.55786	83.89038
3	84.46848	78.85759	78.05759	82.88736
4	80.01823	77.82675	76.74371	72.76855
5	88.80920	76.98456	77.44609	75.41022
6	88.48999	83.04630	75.70854	78.51648
7	87.35855	79.35759	78.95663	77.48775
8	91.27620	84.32585	79.07126	77.10228
9	88.73381	82.49503	77.17433	80.88750
10	89.05852	81.74445	75.71692	80.72517
11	89.56053	87.63525	83.95723	84.94862
12	86.39371	87.55901	78.94930	80.56914

Table 4 shows the F values and probabilities arising from the analysis of covariance of the pulse rate adjusted means. Asterisks indicate significant probabilities.

TABLE 4

F VALUES AND PROBABILITIES ARISING FROM THE ANALYSIS OF COVARIANCE--PULSE RATE

Day	F	df	Probability
1	3.0216	11	.0756
2	0.9080	17	.4578
3	1.2945	13	.3179
4	1.3047	13	.3148
5	5.2980	11	.0167*
6	3.4597	10	.0591
7	1.3738	12	.2967
8	2.5615	14	.0966
9	14.0361	13	.0002*
10	2.7062	11	.0964
11	0.7668	13	.5327
12	1.6244	12	.2357

The F-ratio was significant only for days 5 and 9. Tables 5 and 6 show, for these two days, the value of t and the probability (in parentheses) to compare each pair of group means. The number in any cell relates to the comparison of row group minus column group; for example, in the first table (Pulse day 5) the t of -3.0714 (p = 0.0106) is for the comparison of the stroking group adjusted mean minus the control group adjusted mean.

Hence the stroking, rocking, and lying quietly group means were significantly lower than the control group means. There is no significant difference among the stroking, rocking, and lying quietly group means. The asterisks indicate significant differences among groups.

Although the F ratio for the other days was not significant, the corresponding t tables showed significant differences between some pairs of means. Tables 7-10 show the tables of group contrasts for these days.

TABLE 5

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS--PULSE RATE DAY 5

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-2.9461 (0.0133)*	0.0000 (1.000)		
Stroking	-3.0714 (0.0106)*	0.1146 (0.9108)	0.0000 (1.0000)	
Rocking	-3.3387 (0.0066)*	-0.3623 (0.7240)	-0.4877 (0.6353)	0.0000 (1.0000)

TABLE 6

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS--PULSE RATE DAY 9

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-3.6637 (0.0029)*	0.0000 (1.000)		
Stroking	-6.4287 (0.0000)*	-3.0504 (0.0093)*	0.0000 (1.0000)	
Rocking	-3.4631 (0.0042)*	-0.8137 (0.4305)	1.6634 (0.1201)	0.0000 (1.0000)

TABLE 7

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS--PULSE RATE DAY 1

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-1.4221 (0.1827)	0.0000 (1.000)		
Stroking	-2.2236 (0.0481)*	-1.0744 (0.3056)	0.0000 (1.0000)	
Rocking	-2.8725 (0.0152)*	-1.7017 (0.1169)	-0.5277 (0.6082)	0.0000 (1.0000)

TABLE 8

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS--PULSE RATE DAY 6

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-1.1912 (0.2611)	0.0000 (1.000)		
Stroking	-3.0410 (0.0124)*	-1.6499 (0.1300)	0.0000 (1.0000)	
Rocking	-2.3223 (0.0426)*	-1.0189 (0.3322)	0.6799 (0.5120)	0.0000 (1.0000)

TABLE 9

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS--PULSE RATE DAY 8

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-1.3804 (0.1891)	0.0000 (1.000)		
Stroking	-2.3227 (0.0358)*	-1.0308 (0.3201)	0.0000 (1.0000)	
Rocking	-2.3407 (0.0346)*	-1.2338 (0.2376)	-0.3229 (0.7516)	0.0000 (1.0000)

TABLE 10

THE VALUES OF t AND THE PROBABILITIES COMPARING GROUP MEANS - PULSE RATE DAY 10

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-1.6383 (0.1296)	0.0000 (1.000)		
Stroking	-2.8023 (0.0172)*	-1.2587 (0.2342)	0.0000 (1.0000)	
Rocking	-1.6664 (0.1238)	-0.2107 (0.8373)	0.9777 (0.3492)	0.0000 (1.0000)

Summary of Tables

Table 11 summarizes data from tables 5-10, indicating the amount of times one group was significantly different to another on a variable. All the significant differences were in the direction of an increase in relaxation. This table is to be read in the same manner as the tables 5-10.

TABLE 11

SUMMARY OF INSTANCES OF SIGNIFICANT DIFFERENCES AMONG GROUPS--PULSE RATE

	Control	Lying	Stroking	Rocking
Control	0			
Lying	2	0		
Stroking	6	1	0	
Rocking	5	0	0	0

From table 11 it would seem that rocking and stroking are significantly more able to induce relaxation than lying quietly or no intervention at all, though lying in a room with dim light and soft music is slightly better than receiving no passive relaxation at all.

Hypothesis 1 was also tested by using an a priori test to compare the three treatment groups to the control group (Winer, 1971, pp. 170-175). The three treatments

were equally weighted. Table 12 shows the results of these F tests, together with the probability levels.

TABLE 12

F TEST AND PROBABILITY LEVELS FOR THE COMPARISON OF ALL TREATMENT GROUPS WITH THE CONTROL WITH PULSE RATE AS DEPENDENT VARIABLE

Day	F	df	P
1	8.2014	11	.015*
2	0.8820	17	.363
3	2.3069	13	.150
4	2.2067	13	.159
5	14.4600	11	.003*
6	7.2308	10	.022*
7	4.6780	12	.049*
8	6.0030	14	.027*
9	2.5154	13	.134
10	6.3230	11	.027*
11	5.1900	13	.038*
12	0.9961	12	.339

Thus for days 1, 5, 6, 7, 8, 10, and 11, the treatments yielded significantly greater relaxation than the control as measured by the pulse rate change.

Hypothesis 2

There is no significant difference in the degree of relaxation, as measured by the skin temperature change, between three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

Table 13 shows the pretest and posttest means for the skin temperature for each of the twelve days.

Table 14 shows the change in temperature means from pretest to posttest. The asterisk in each row indicates the greatest mean increase for that day.

From table 14 it can be seen that there is a difference among the groups. Stroking caused a greater increase in skin temperature than the other groups on seven of the twelve days. Rocking caused the greatest change on two days, and lying quietly on three. The control group never achieved the greatest increase in skin temperature, and frequently showed a decrease. An increase in skin temperature is an indicator of an increase in relaxation, therefore there is a difference between the groups in the degree of relaxation as measured by an increase in skin temperature. There does not seem to be an increase in the degree of relaxation over time, as measured by skin temperature.

TABLE 13

PRETEST AND POSTTEST SKIN TEMPERATURE MEANS

Day		Control	Lying	Stroking	Rocking
1	Pre	80.50	77.00	80.00	77.33
	Post	82.00	78.20	84.25	79.33
2	Pre	83.00	75.17	76.10	78.67
	Post	81.60	77.00	83.40	79.33
3	Pre	79.25	77.00	76.40	77.50
	Post	76.50	75.20	80.80	81.50
4	Pre	76.25	76.40	80.00	79.25
	Post	75.25	79.20	83.60	82.00
5	Pre	76.20	72.50	78.00	75.00
	Post	76.60	76.00	80.00	77.33
6	Pre	75.75	74.67	77.75	75.75
	Post	77.50	76.00	80.75	76.25
7	Pre	79.50	75.20	78.50	78.50
	Post	81.00	77.40	81.00	81.50
8	Pre	75.60	76.83	77.00	76.33
	Post	78.00	77.16	81.60	80.33
9	Pre	79.80	75.16	77.50	80.00
	Post	79.60	76.67	80.25	84.33
10	Pre	74.25	76.20	78.00	76.67
	Post	72.75	76.60	81.50	76.25
11	Pre	77.00	75.80	79.80	83.00
	Post	77.25	77.80	80.60	84.75
12	Pre	83.33	76.40	79.20	82.00
	Post	81.33	77.00	81.80	84.00

TABLE 14

THE CHANGE IN THE SKIN TEMPERATURE MEANS FROM PRETEST TO POSTTEST

Day	Control	Lying	Stroking	Rocking
1	+1.50	+1.20	+4.25*	+2.00
2	-1.40	+1.83*	-6.80	+0.46
3	-2.75	-1.80	+4.40*	+4.00
4	-1.00	+2.80	+3.60*	+2.25
5	+0.40	+3.50*	+2.00	+2.33
6	+1.75	+1.33	+3.00*	+0.50
7	+1.50	+2.20	+2.50	+3.00*
8	+2.40	+0.33	+4.60*	+4.00
9	-0.20	+1.50	+2.75	+4.30*
10	-1.50	+0.40	+3.50*	+0.66
11	+0.25	+2.00*	+0.80	+1.75
12	-2.00	+0.60	+2.60*	+0.20

Table 15 gives, for each day, the adjusted posttest means for each group.

TABLE 15

THE ADJUSTED TEMPERATURE POSTTEST MEAN FOR EACH GROUP

Day	Control	Lying	Stroking	Rocking
1	80.49556	79.60057	83.16057	80.45724
2	79.32748	78.45721	84.17479	79.12408
3	75.49915	75.44633	81.37892	81.46918
4	76.72899	80.55980	82.09883	80.69754
5	76.12596	78.03137	78.30713	77.67186
6	77.82957	77.45734	78.99756	76.57956
7	79.82957	79.25511	80.46808	80.96808
8	78.50412	76.95908	81.29625	80.41429
9	77.94736	78.80045	80.47694	82.51726
10	73.97522	76.63057	80.42786	77.07803
11	78.67726	80.19069	79.77924	81.36009
12	78.34679	79.81578	82.27254	82.12929

Table 16 shows the F values and probabilities arising from the analysis of covariance.

TABLE 16

F VALUES AND PROBABILITIES ARISING FROM THE ANALYSIS OF COVARIANCE--SKIN TEMPERATURE

Day	F	df	P
1	0.9082	11	.4683
2	2.5639	17	.0888
3	3.8143	13	.0368*
4	2.4440	13	.1105
5	0.5865	11	.6363
6	0.3447	10	.7938
7	0.1390	12	.9348
8	2.3024	14	.1216
9	2.7371	13	.0861
10	2.9827	11	.0779
11	0.6321	13	.6072
12	2.4709	12	.1118

The F-ratio was significant only for day 3. Table 17 shows, for day 3, the value of t and the probability (in parentheses) to compare each pair of group means. The number in any cell relates to the comparison of row group minus column group. For further explanation, see page 51.

TABLE 17

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 3

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-0.0209 (0.9836)	0.0000 (1.000)		
Stroking	2.3139 (0.0377)*	2.5271 (0.0253)*	0.0000 (1.0000)	
Rocking	2.2604 (0.0416)*	2.4199 (0.0309)*	0.0362 (0.9717)	0.0000 (1.0000)

Although the F ratios for the other days were not significant, the corresponding t tables showed significant differences between some pairs of means. Tables 17-22 show the tables of group contrasts for these days.

TABLE 18

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 2

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-0.3501 (0.7305)	0.0000 (1.000)		
Stroking	1.9328 (0.0701)	2.5193 (0.0221)*	0.0000 (1.0000)	
Rocking	-0.0872 (0.9315)	0.3024 (0.7660)	-2.2172 (0.0405)*	0.0000 (1.0000)

TABLE 19

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 4

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	1.9318 (0.0755)	0.0000 (1.000)		
Stroking	2.6196 (0.0212)*	0.7954 (0.4407)	0.0000 (1.0000)	
Rocking	1.8495 (0.0872)	0.0676 (0.9471)	-0.7066 (0.4923)	0.0000 (1.0000)

TABLE 20

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 8

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-0.8713 (0.3983)	0.0000 (1.000)		
Stroking	1.5058 (0.1543)	2.4608 (0.0275)*	0.0000 (1.0000)	
Rocking	0.8974 (0.3847)	1.6777 (0.1156)	-0.4144 (0.6848)	0.0000 (1.0000)

TABLE 21

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 9

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	0.5626 (0.5883)	0.0000 (1.000)		
Stroking	1.5787 (0.1384)	1.0858 (0.2973)	0.0000 (1.0000)	
Rocking	2.6528 (0.0199)*	2.1234 (0.0535)	1.1196 (0.2831)	0.0000 (1.0000)

TABLE 22

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 10

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	1.3493 (0.2044)	0.0000 (1.000)		
Stroking	2.9698 (0.0128)*	1.9355 (0.0790)	0.0000 (1.0000)	
Rocking	1.3795 (0.1951)	0.2131 (0.8351)	-1.5154 (0.1579)	0.0000 (1.0000)

TABLE 23

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--SKIN TEMPERATURE DAY 12

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	0.7847 (0.4478)	0.0000 (1.000)		
Stroking	2.2164 (0.0467)*	1.6221 (0.1308)	0.0000 (1.0000)	
Rocking	2.1043 (0.0571)	1.3710 (0.1955)	-0.0894 (0.9303)	0.0000 (1.0000)

To summarize tables 17-23, table 24 indicates the amount of times one group was significantly different from another on a variable. All the significant differences were in the direction of an increase in relaxation, except for the one indicated by an asterisk. This table is to be read in the same manner as tables 17-23.

TABLE 24

TABLE TO SUMMARIZE INSTANCES OF SIGNIFICANT DIFFERENCES BETWEEN GROUPS-- SKIN TEMPERATURE

	Control	Lying	Stroking	Rocking
Control	0			
Lying	0	0		
Stroking	5	3	0	
Rocking	3	1	1*	0

From table 24 it would seem that rocking and stroking are more able to induce relaxation than lying quietly or no intervention at all.

Hypothesis 2 was tested further by using an a priori test to compare the three treatment groups to the control group (Winer, 1971, pp. 170-175). The three treatments were equally weighted. Table 25 shows the

results of these F tests, together with the probability levels. The differences were significant on three of the days. Asterisks indicate significance.

TABLE 25

F TEST AND PROBABILITY LEVELS FOR THE COMPARISON OF ALL TREATMENT GROUPS WITH THE CONTROL WITH TEMPERATURE CHANGE AS DEPENDENT VARIABLE

Day	F	df	P
1	0.0899	11	.766
2	0.4462	17	.510
3	3.7489	13	.072
4	7.3500	13	.017*
5	1.3653	11	.267
6	0.0058	10	.939
7	0.0428	12	.833
8	0.4354	14	.526
9	3.9872	13	.065
10	5.8506	11	.033*
11	1.4824	13	.244
12	5.2060	12	.040*

Hypothesis 3

There is no significant difference in the degree of relaxation, as measured by the GSR change, between three types of passive relaxation and a control group, when administered to severely and profoundly mentally retarded children.

Table 26 shows the change in GSR means from pretest to posttest. The asterisk in each row indicates the greatest mean decrease for that day. A decrease in GSR measure indicates an increase in galvanic skin resistance and thus an increase in physical relaxation (see page 35).

There appears to be a difference between the degree of relaxation of each group, as measured by the GSR. The stroking group had the greatest decrease in GSR measures on 50 percent of the days. The control group never achieved the greatest change towards relaxation and showed an increase in GSR on 75 percent of the days. There does not appear to be an increase in the degree of relaxation over time, as measured by the GSR.

Table 27 gives, for each day, the value of F and its significance, arising from the analysis of variance test. Asterisks indicate significant probabilities.

TABLE 26

THE MEAN DIFFERENCES BETWEEN THE GSR PRETEST AND POSTTEST SCORES

Day	Control	Lying	Stroking	Rocking
1	+7.00	-11.20	-11.50*	-4.00
2	-2.40	-2.33	-7.20	-11.00*
3	+0.75	+1.20	-2.00	-4.25*
4	+0.75	+6.00	-6.40*	-6.25
5	-0.20	0.00	-2.50	-9.89*
6	+3.75	+1.33	-11.50	-12.00*
7	+7.00	-2.80	-6.50*	-3.25
8	+3.40	-9.33*	-7.40	-5.33
9	+7.80	0.00	-8.25*	-7.33
10	+10.25	-1.20	-6.75*	-2.33
11	+7.25	0.00*	+0.80	0.00*
12	0.00	+2.00	-11.40	-7.50

TABLE 27

F VALUES AND PROBABILITIES ARISING FROM THE ANALYSIS OF VARIANCE--GSR

Day	F	df	P
1	4.4569	12	.0253*
2	1.6509	18	.2130
3	0.6873	14	.5746
4	3.5789	14	.0414*
5	2.1697	12	.1458
6	9.4723	11	.0022*
7	1.9160	13	.1769
8	2.1073	15	.1422
9	6.5411	14	.0054*
10	3.2393	12	.0604
11	1.2848	14	.3181
12	1.3739	13	.2945

The F-ratios were significant only for days 1, 4, 6, and 9, as indicated by table 27. Tables 28-31 show, for these four days, the values of t and probabilities (in parentheses) to compare each pair of group means. The number in any cell relates to the comparison of row group minus column group (for further explanation, see page 51). Asterisks indicate significant differences between groups.

Although the F ratio for the other days was not significant, the corresponding t tables showed significant differences between some pairs of means. Tables 32-34 show the tables of group contrasts for these groups.

TABLE 28

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 1

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-3.2393 (0.0071)*	0.0000 (1.000)		
Stroking	-3.1237 (0.0088)*	-0.0534 (0.9583)	0.0000 (1.0000)	
Rocking	-1.7196 (0.1112)	1.1771 (0.2620)	1.1724 (0.2638)	0.0000 (1.0000)

TABLE 29

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 4

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	1.1341 (0.2758)	0.0000 (1.000)		
Stroking	-1.5445 (0.1448)	-2.8411 (0.0131)*	0.0000 (1.0000)	
Rocking	-1.4345 (0.1743)	-2.6462 (0.0192)*	0.0324 (0.9746)	0.0000 (1.0000)

TABLE 30

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 6

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-0.5995 (0.5610)	0.0000 (1.000)		
Stroking	-4.0863 (0.0018)*	-3.1836 (0.0087)*	0.0000 (1.0000)	
Rocking	-4.2202 (0.0014)*	-3.3077 (0.0070)*	-1.1340 (0.8958)	0.0000 (1.0000)

TABLE 31

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 9

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-2.1213 (0.0522)	0.0000 (1.000)		
Stroking	-3.9402 (0.0015)*	-2.1048 (0.0539)	0.0000 (1.0000)	
Rocking	-3.4126 (0.0042)*	-1.7079 (0.1079)	0.1977 (0.8462)	0.0000 (1.0000)

TABLE 32

THE VALUE OF t AND THE PROBABIILTIES COMPARING GROUP MEANS--GSR DAY 5

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	0.0549 (0.9572)	0.0000 (1.000)		
Stroking	-0.6308 (0.5400)	-0.6505 (0.5276)	0.0000 (1.0000)	
Rocking	-2.3011 (0.0401)*	-2.2484 (0.0441)*	-1.6462 (0.1256)	0.0000 (1.0000)

TABLE 33

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 7

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-1.7304 (0.1072)	0.0000 (1.000)		
Stroking	-2.2614 (0.0415)*	-0.6533 (0.5249)	0.0000 (1.0000)	
Rocking	-1.7170 (0.1097)	-0.0795 (0.9379)	0.5444 (0.5954)	0.0000 (1.0000)

TABLE 34

THE VALUE OF t AND THE PROBABILITIES COMPARING GROUP MEANS--GSR DAY 8

	Control	Lying	Stroking	Rocking
Control	0.0000 (1.0000)			
Lying	-2.3786 (0.0311)*	0.0000 (1.000)		
Stroking	-1.9315 (0.0725)	0.3611 (0.7230)	0.0000 (1.0000)	
Rocking	-1.3527 (0.1962)	0.6399 (0.5319)	0.3201 (0.7533)	0.0000 (1.0000)

Summary of Tables 28-34

To summarize tables, table 35 indicates the amount of times one group was significantly different from another on a variable. All the significant differences were in the direction of an increase in relaxation. This table is to be read in the same manner as tables 28-34.

TABLE 35

SUMMARY OF INSTANCES OF SIGNIFICANT DIFFERENCES AMONG GROUPS--GSR

	Control	Lying	Stroking	Rocking
Control	0			
Lying	2	0		
Stroking	4	2	0	
Rocking	3	3	0	0

From this table it would seem that rocking and stroking are more able to induce relaxation than lying quietly or no intervention at all, though lying in a room with dim light and soft music is slightly better than receiving no passive relaxation at all.

Hypothesis 3 was also tested by using an a priori test to compare the three treatment groups to the control group (Winer, 1971, pp. 170-175). The three treatments

were equally weighted. Table 36 shows the results of these F tests, together with the probability level.

TABLE 36

F TEST AND PROBABILITY LEVELS FOR THE COMPARISON OF ALL TREATMENT GROUPS WITH THE CONTROL WITH GSR CHANGE AS DEPENDENT VARIABLE

Day	F	df	P
1	10.4662	12	.007*
2	1.3556	18	.259
3	0.4857	14	.503
4	3.6317	14	.075
5	1.5932	12	.229
6	12.3352	11	.005*
7	5.5419	13	.033*
8	4.9300	15	.040*
9	14.4570	14	.002*
10	8.4348	12	.013*
11	4.0925	14	.060
12	0.7333	13	.412

Thus for days 1, 6, 7, 8, 9, and 10, the treatments yielded significantly greater relaxation than the control as measured by the GSR.

Summary of Results

To summarize the results, table 37 indicates whether treatment was significantly better than the control at achieving a more relaxed state for each of the dependent variables and for each of the analyses (ANOVA or combined a priori).

From table 37 it can be seen that the GSR and the pulse rate are more sensitive indicators of the degree of relaxation an individual may be experiencing, as they show significant differences between groups more frequently than does the skin temperature, probably because the temperature of the skin is slower to respond than the pulse rate or the GSR.

TABLE 37

SUMMARY OF EFFECTIVENESS OF TREATMENTS COMPARED TO CONTROL--ALL DEPENDENT VARIABLES

Treatment Significantly Better than Control

Day	Pulse ANOVA	Pulse A Pri.	Temp. ANOVA	Temp. A Pri.	GSR ANOVA	GSR A Pri.
1	no	yes	no	no	yes	yes
2	no	no	no	no	no	no
3	no	no	yes	no	no	no
4	no	no	no	yes	yes	no
5	yes	yes	no	no	no	no
6	no	yes	no	no	yes	yes
7	no	yes	no	no	no	yes
8	no	yes	no	no	no	yes
9	yes	no	no	no	yes	yes
10	no	yes	no	yes	no	yes
11	no	yes	no	no	no	no
12	no	no	no	yes	no	no

CHAPTER 5

SUMMARY AND CONCLUSION

In this study the role of relaxation has been examined. Relaxation has been found to have numerous and diverse applications and benefits in education, medicine, counseling, and everyday life to counteract the effects of stress and anxiety. Different studies comparing various relaxation methods have not found any significant differences between the techniques.

Severely and profoundly mentally retarded children can also benefit from relaxation. However, due to the severity of their handicaps, they often cannot be actively involved in the relaxation process. Passive relaxation techniques are available that can be administered to these children, requiring no active participation on their part. These techniques are:

1. slow stroking of the skin supplied by the posterior primary rami
2. slow, rhythmical rocking, in either the horizontal

or vertical plane

3. neutral warmth
4. the "pink" noise generator
5. slow rolling from side to side
6. slow linear movement.

In an attempt to investigate whether passive relaxation techniques had an effect on the severely and profoundly mentally retarded, and whether one technique might be more effective than another with this population, an experiment was conducted to compare the three methods of slow stroking, slow rocking, and lying quietly with a control group, who received no relaxation intervention.

Twenty-four children were randomly assigned to one of four groups. One group received no relaxation treatment. The physiological measures were taken from these children during classroom time. One group was exposed to slow rocking in a room with dim light and soft music, another to slow stroking in the same environment, and the fourth group to lying quietly on mats in the same environment, but without any active treatment. At the beginning and end of each ten minute session, readings were taken of the subjects' pulse rate, GSR, and peripheral skin temperature.

The experiment was carried out in a school for mentally retarded children, using children selected from classes for the severely and profoundly mentally retarded. One subject was paraplegic, two were visually impaired, and three had orthopedic handicaps. The relaxation sessions were held three times a week for four weeks.

As a result of this experiment data were collected on the three dependent variables of pulse rate, GSR, and peripheral skin temperature. Analysis of covariance was used to investigate the group differences, and an a-priori test comparing all of the treatment groups with the control was made to investigate whether there were any significant differences between the results of the treatment groups as a whole and the control group.

The Results

The slow stroking and slow rocking groups were able to achieve significantly greater relaxation responses on some days than the group not receiving any intervention. This suggests that passive relaxation techniques do have a role in assisting this population to relax. Also, the methods for slow stroking and slow rocking were more effective in inducing a relaxation

response than was the method for the group who were just lying quietly in the same environment.

It was noticed that the "lying quietly" group were quite restless at times. This may have been because they could not fully comprehend what was taking place or because they were bored. Curtis and Wessberg (1976) found that the group they studied who relaxed by sitting and doing nothing were bored. It is easier for an adult who understands what is taking place to cooperate in an experiment than it is for a severely or profoundly mentally retarded child. Curtis and Wessberg's sitting group reached a level of relaxation similar to the groups experiencing the active relaxation techniques of meditation and deep-muscle relaxation. In this experiment the lying quietly group differed from the other treatment groups significantly in the degree of relaxation achieved on some of the days. This suggests that there are differences in the effects of the types of passive relaxation when administered to this population.

The subjects experiencing slow rocking and slow stroking techniques also began to be restless after the two minutes and thirty seconds of rocking or stroking, when they, too, were lying. However, they did not appear to be as restless as the group who lay quietly for the

entire ten minutes. No one ever fell asleep during a session.

The subjects in the slow stroking group seemed to be more eager to come to their sessions, and happier about being involved in the experiment, though none of the subjects in any of the groups appeared to dislike the experience. Some of them indicated that they wanted the experimenter to continue their treatment beyond the allotted time, which could also be interpreted as indicating that they found the experience pleasurable.

Conclusions

These results suggest there is a tendency for stroking and rocking to be more effective than lying quietly, and all the treatments tend to be better than the lack of treatment experienced by the control group in causing an increase in relaxation. Not all days showed significant differences between groups, but nearly 20 percent of the days showed significant differences between groups, and about 40 percent of the days showed that the treatment groups were more effective than no treatment at all.

The pulse rate and GSR measures are more likely to yield significant differences than the skin temperature measure. This is probably because skin temperature is

slower to respond to changes in an individual's arousal state than pulse rate or GSR.

Recommendations for Future Studies

In the future it would be useful to examine the effectiveness of the other passive relaxation techniques mentioned but not investigated in this study, such as rolling, linear movement, and the "pink" noise generator. Other physiological measures could also be used such as electromyographic readings, which indicate the degree of muscle relaxation occurring in an individual. Using larger groups could produce a clearer picture of the effectiveness of different relaxation types and assist one to find techniques that can help this special population experience relaxation.

The collection of data over longer periods of time after the relaxation experience, and for the entire relaxation session, made possible by continuous electronic monitoring, would provide more detailed information on the effects of relaxation over time. It would also indicate the pattern of responses throughout a relaxation session, and may help in determining the optimum amount of time for a relaxation session. The use of a controlled experimental laboratory would eliminate the problems of unexpected interruptions, and provide greater control over the subject's activities prior to

the relaxation session. Careful observation of behavior over a long period of time may indicate whether relaxation sessions have an effect on behavior outside of the relaxation session.

It is possible that passive relaxation techniques may benefit the mentally retarded in such ways as improving behavior, reducing anxiety, and increasing their ability to learn and develop new skills. It may also help professionals and parents in the management of mentally retarded children, and possibly adults with similar handicaps. Passive relaxation techniques may also be found to be useful for children with other problems, such as attention deficit disorders, hyperkinetic disorders, emotional impairment, as well as useful for normal children and adults who need relief from stress and anxiety.

BIBLIOGRAPHY

Boggs, L.J., Fisher, David, & Flint, G. A. (1973). Technical note: the "pink" noise generator - an apparatus for inducing relaxation. Behavior Therapy, 4(2),267-269.

Boswell, Philip C. & Murray, Edward J. (1979). Effects of meditation on psychological and physiological measures of anxiety. Journal of Consulting and Clinical Psychology, 47(3), 606-607.

Brown, Barbara. (1974). New mind, new body. New York: Harper and Row.

Brubbaken, D.M., Derouin, J.A., & Morrison, H.L. (1980). Treatment of psychotic and neurologically impaired children. New York: Van Nostrand Reinhold.

Brunnstrom, S. (1970). Movement therapy in hemiplegia. New York: Harper and Row.

Corter, J., & Synolds, D. (1978). Effects of relaxation training upon handwriting quality. Journal of Learning Disabilities, 7, 236-246.

Curtis, William D., & Wessberg, Harold W. (1975-76). A comparison of heart rate, respiration, and galvanic skin response among meditators, relaxers, and controls. Journal of Altered States of Consciousness. 2(4), 319-324.

Gershman L., & Clouser, R.A. (1974). Treating insomnia with relaxation and desensitization in a group setting by an automated approach. Journal of Behavior Therapy and Experimental Psychiatry, 5, 31-35.

GSR-2 Manual. (1978). (n.p.) Thought Technology.

Harvey, John R. (1979). The potential of relaxation training for the mentally retarded. Mental Retardation, 17, 71-76.

Hiebert, Bryan, & Eby, Ward. (1985). The effects of relaxation training for Grade 12 students. The School Counselor, 32(3), 205-210.

Hopkins, H. L., & Smith, H. D. (1983). Willard and Spackman's occupational therapy, 6th ed., Philadelphia: J. B. Lippincott.

Huss, J. (1980). Workshop, Neurophysiological approaches to treatment. Unpublished class notes.

Ince, Laurence P. (1976). The use of relaxation training and a conditioned stimulus in the elimination of epileptic seizures in a child: a case study. Journal of Behavior Therapy and Experimental Psychiatry, 7, 39-42.

Kantner, R. M., Clark, D.L., Atkinson, J., & Paulson, G. (1982). Effects of vestibular stimulation in seizure prone children. Physical Therapy, 62(1), 16-21.

Koeppen, A. S. (1974). Relaxation training for children. Elementary School Guidance and Counseling, 9, 14-21.

Kusano, Katsuhiko, & Ishiguro, Masatake. (1982). Electromyographic study of the differential relaxation training in mentally retarded children. Japanese Journal of Special Education, 19(3), 1-7. (English Abstract).

Leckie, M.S., & Thompson, E. (1979). Symptoms of stress inventory: a self assessment. Seattle: University of Washington.

McKechnie, R.S. (1975). Relief from phantom limb pain by relaxation exercises. Journal of Behavior Therapy and Experimental Psychiatry, 6, 262-265.

Miguel Tobal, Juan J. et al. (1980). Electrodermal measurements of different relaxation techniques. Informes del Departamento de Psicologia General, U. Madrid, 4(8), 209-220. (English Abstract).

Nathan, P. (1969). The nervous system. New York: J. B. Lippincott.

Rapoport, J.L. (1984). DSM III training guide for diagnosis of childhood disorders. New York: Brunner/Mazel.

Rood, Margaret S. (1962). "The use of sensory receptors to activate, facilitate and inhibit motor response, autonomic and somatic, in developmental sequence." In C. Sattly (Ed.), Approaches to the treatment of patients with neuromuscular dysfunction. Dubuque: W. M. C. Brown.

Russel, R.U., & Sipich, J.F. (1973). Cue controlled relaxation in the treatment of test anxiety. Journal of Behavior Therapy and Experimental Psychology, 4, 47-49.

Schroeder, S. R., Peterson, C. R., Solomon, L. J., & Artley, J. J. (1977). EMG feedback and the contingent restraint of self-injurious behavior among the severely retarded: two case illustrations Behavior Therapy, 8, 738-741.

Small, Maurice M., Giganti, Michael, & Steinberg, Daniel. (1978). A comparison of thermal biofeedback and relaxation training within a behavior management treatment program: a controlled single-subject. experiment. American Journal of Clinical Biofeedback, 1(2), 68-70.

Spielberger, C.D. (1968). The state-trait anxiety inventory. Palo Alto, CA: Consulting Psychologists Press.

Sullivan, P.E., Markos, P.D., & Minor, M.A.D. (1982). An integrated approach to therapeutic exercise. Reston, VA.: Reston.

Tasto, Donald, L., & Chesney, Margaret A. (1974). Muscle relaxation treatment for primary dysmenorrhea. Behavior Therapy, 5(5), 668-672.

Umphred, Darcy A. (1985). Neurological rehabilitation. St. Louis: C.V. Mosby.

Upper Astral. (1982). The Atlantis healing harp. Malibu, CA: Valley of the Sun.

Webster, D.R., & Azrin, N.H. (1973). Required relaxation: a method of inhibiting agitative-disruptive behavior of retardates. Behavioral Research and Therapy, 11, 67-78.

Winer,B. J. (1971). Statistical principles in experimental design (2nd ed.). New York: McGraw Hill.

Wolfzahn, Annabelle F. (1979). Relaxation probe with mentally retarded adults. Unpublished doctoral dissertation, Union Graduate School.