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REDUCTION OF HYPERACTIVITY USING PROGRESSIVE MUSCLE RELAXATION IMAGERY AND AUTGENIC EXERCISES WITH ELECTROMYOGRAPHIC BIOFEEDBACK

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Gail D. R. Krieger, B.A., M,...

* * * * *

The Ohio State University

1985

Reading Committee:

John Gibbs, Ph.D.
Dale Blyth, Ph.D.
Philip Clark, Ph.D.

Approved by

[Signature]
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Finally, I am proud to acknowledge my two children, for all the support and patience they exhibited throughout this research project.
1967. . . . . . . . . . Bachelor of Science in Education, Syracuse, New York.


1969–1971 . . . . . . . Postbaccalaureate Studies, Science and Physics, University of Maryland, College Park, Maryland

1980. . . . . . . . . . Master of Arts, Department of Psychology, Ohio State University, Columbus, Ohio

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The hyperactive child with an attention deficit disorder has been accorded a great deal of attention due to the fact that this child is difficult to manage at home, school and in his general environment. Such children already evidence behavioral problems prior to the school years; most of the research, however, has dealt with the child in the school setting. Researchers as early as 1947 attempted to alter the child's external environment so that problems of hyperactivity could be controlled. It was hoped that the external manipulation of the environment (e.g., classroom arrangement, structured material etc.) would facilitate a change in school performance.

Another approach to the problem was stimulant medication. This approach called for another type of externally imposed manipulation of the child. The physician would prescribe medication so as to alter the behavior of the child on a schedule determined by the physician.

Both types of environmentally imposed manipulation were successful. Classroom environment alterations did prove to enhance the child's performance. Drug therapy also allowed the child to perform better in school. However, both types of intervention involved many problems. Classroom manipulation was dependent on availability of special materials, class size, room shape, as well as
a specially trained teacher. A lack in any area would mean failure. Drug therapy had positive short term results but there were many side effects associated with drugs. These problems encouraged researchers to keep looking for alternative programs in dealing with hyperactivity of short attention span.

The next area to be investigated dealt with processes utilizing internal control. An integral part of child development has to do with the child slowly gaining control over his behavior, i.e., acting appropriately even when the teacher or parent is not with him. This ability is reinforced by teacher and parent as the child progresses in his development. The hyperactive child has an extremely difficult time sticking to tasks in the best of circumstances even with the presence of the teacher. His failure in this area is constantly reinforced as he feels that he cannot attain control of his behavior under any circumstance. Because most children seem to attain the ability to accomplish intrinsic control of behavior and the hyperactive child does not evidence this type of intrinsic control, it would seem that an intervention strategy could be developed to help in this area.

It is necessary for a child to grow in the direction of internal self-control. Without this ability, he will function at a level that is unacceptable at home, in school, and in his environment. Each child needs to feel that he can call on himself to handle most situations successfully. Therefore it is felt that the hyperactive child needs to be able to call on that same degree of internal control. For him to do this, he needs training in the area.
This study will attempt to utilize EMG biofeedback to increase attention span, and thereby decrease hyperactivity. By utilizing specific exercises in a specific order, the child will be given a method by which to slow down his body and increase his ability to pay attention to the task at hand. Learning this skill will enable the child to call forth the skill when it is needed. As a result, the child should show a decrease in hyperactive behavior. Further, an associated improvement in self concept should be evidenced.

Reduction of hyperactivity is a complex process. Through controlled research, however, effective techniques may be identified that can help the hyperactive child not only to benefit from his school experience, fit in better at home and in his general environment, regard himself favorably, but also require, in achieving these goals, the least amount of physical and environmental support.
Chapter II

Literature Review

This study focuses on the child who is hyperactive with an attention deficit disorder. Examination of the literature for the purpose of drawing conclusions has been difficult due to diversity of research design, procedure, intervention and dependent measures. Terms utilized were not defined and used in a systematic fashion. Some studies employed control groups and others did not. However, some preliminary research suggests that biofeedback and associated mental and physical exercises can be used to decrease hyperactivity and improve self concept.

Background

The hyperactive child has been accorded a great deal of attention in the literature. Strauss and Lehtinen (1947) and Cruickshank (1963), along with many others attempted not only to classify these children as to the cause of their hyperactivity but also to provide educational programs to overcome their problems. Within the last ten years, special programs have been developed so that this population is able to be educated in the public school system. Special programs were needed to deal with hyperactivity, short attention span, inability to refrain from reacting to extraneous stimuli, as well as other learning problems that frequently appeared with hyperactivity.
Intervention was external in that the environment was altered in order to facilitate a change in the child's school performance.

Stimulant medication has been one of the most common approaches employed in the management of the hyperactive child. Many studies (Barkley, 1977; Cantwell & Carlson, 1978; Dole, 1975; Taylor, 1979) have been done depicting the positive short term effects of medication on behavior problems, control of impulsivity, and attention span.

However, a number of side effects have been noted. Some of the side effects are insomnia, eating problems, growth problems, headache, and dry mouth (Laufer & Shetty, 1980). These side effects are associated with Benzedrene and Dexedrine. Ritalin has been shown to cause loss of appetite, insomnia, tension, tachycardia (Cole, 1975), and increase in blood pressure (Cohen, Douglas, & Morganstern, 1971; Rapaport et al., 1974). Height and weight suppression have also been reported by Safer and Allen (1975) and Safer, Allen, and Barr (1972).

Psychological side effects such as irritability (Epstein et al., 1968), reduced social interaction with peers (Barkley & Cunningham, 1979), and psychotic episodes (Weinsberg et al., 1972; Klein et al., 1980) have also been reported. Klein et al. (1980) also reported a "rebound" phenomenon showing deterioration of behavior following medication and then ending up with behavior that was worse than it was before the administration of the medication.

The problems with medication have encouraged the examination and development of alternative programs in dealing with problems of hyperactivity and short attention span. Educational programs utilized external control imposed on the child. Medication programs also
utilized control that is the result of medication imposed on the child. Research then moved to the examination of processes utilizing internalized self control.

Kratter and Hogan (1982) did a study with 24 hyperactive children with attention deficit disorders. In this study he used meditation as his intervention strategy. These children were divided into 3 groups. The first was a meditation group. The second was a muscle relaxation group, and the last was a waiting list control group. The children were seen individually for 20 minutes two times a week for four weeks. The meditation group sat with eyes closed and repeated a word first out loud and then silently for periods of time that gradually increased in duration from two to eight minutes. The relaxation group tensed and relaxed muscles in periods of time increasing in length from two to eight minutes (Wolpe & Lazarus, 1966). Results indicated that groups one and two showed decreased levels of impulsivity. There was a significant reduction relative to the control group. Parent rating scales showed significant improvement in the behavior of the children in groups one and two (Conners, 1973); however, in the areas of attention span and freedom from distractibility, only the meditation group showed significant improvement.

Marlene Schneider (1974) developed a program of relaxation training and incorporated it in her "Turtle" Manual. The "turtle" image characterized the position and thought process the child was taught to assume while under stress. This program called for the child breaking the cycle of disruptive behavior by pulling himself in, relaxing, and then solving the problem. It was found that the
"turtle" procedure increased his ability to cope with frustration, and control impulsive acts. Schneider found that the increased self control led to taking responsibility for the self and fulfilling needs in an appropriate manner. The turtle approach was found to be effective in dealing with emotionally disturbed, disruptive children.

The meditation and turtle programs were indicative of the developing interest in the process of internalized control. These methods call on the child to take responsibility for controlling his behavior.

Teaching direct control over "autonomic" fight or flight has been reported in the literature for the last ten years. Hunter et al. (1977) assessed the effects of thermal feedback in learning disabled children. His control group was composed of children that did not have learning disabilities. He found learning disabled children learned the visual figure-ground task skills presented to them faster than the normal children learned them. Braud et al. in 1973 obtained decreases in hyperactivity and increases in talk behavior while Haight (1976) demonstrated increases in auditory and visual attention span.

Sulybacher (1975) worked with hyperactive children so that they could learn to control internal physiological processes as a means of increasing control over self. Anderson (1976), Braud (1975-1978), Dunn and Howell (1982), Rivera (1978) and Walton (1979) combined biofeedback with relaxation training using either tapes or instructions in progressive muscle relaxation.

Carter et al. (1978) worked with the application of relaxation to biofeedback training in Special Education. A study was conducted to
determine the effects of EMG feedback and relaxation training and achievement, cognitive and motor test results and observed behavior. The groups utilized were learning disabled, mentally retarded, undiagnosed, and a control. All the children were of elementary school age. The subjects consisted of fifteen boys and girls in the experimental group and twelve boys and two girls in the control group. Electrode leads were attached externally to flexor muscles of the preferred writing forearm. The treatment consisted of ten minute EMG feedback, fifty minutes of handwriting training and home relaxation practice, using audio cassettes. Training occurred three days a week for five weeks. The results indicated significant gains by all experimental groups over the control group on all variables including reading, spelling, math, auditory memory, hand-eye coordination I.Q., and observed behavior. Carter's results indicated biofeedback and relaxation appeared to be a new tool to teach children so that they could control the cycle of increased tension and decreased performance.

Carter reported that biofeedback and relaxation permitted better access to current and previously learned information with dramatic increases in performance and achievement tests. The children did best when physically relaxed and able to attend to presented material. Arousal due to failure got in the way of a child trying to attend to academic material. Continued school failure in school was psychophysiological stressful to the child. Furthermore, 5 to 15 percent of all children with normal intelligence also function poorly at academic tasks. Combs and Taylor (1952) indicated that many
behaviors such as impulsivity, disorganization and distractability which are attributed to a child with learning disabilities are also reactions any child might have to threatening situations dealing with learning in school. When threatened, a child cannot run or fight; and the arousal stays "inside" the child. Sheer (1976) has reported that learning-disabled children show much more autonomic lability and reduced ability to attend to relevant stimuli. Due to the continuing threat of stress accompanying failure, a chronically high and fluctuating internal activity level will be maintained along with high levels of anxiety.

Carter (ED 169739) (1979) did a similar study using twenty learning disabled children, fifteen educable retarded, and five nondiagnosed elementary school children with learning problems. Parents and teachers reported improved behavior. Increased self acceptance was found using the Tennessee Self Concept Scale.

In a single-case study, Braud, Lupin and Braud (1975) reported dramatic behavioral and academic improvements after EMG relaxation training. Gains were maintained at seven month follow up. Braud (1977) compared EMG feedback and progressive relaxation in hyperactivity and found both modalities were successful in reducing general muscle tension in hyperactivity.

McFarland and Edmonson (1947) conducted an investigation of whether electromyographic biofeedback would help hyperactive children to recognize and control behavior as well as improve academic achievements. Biofeedback was seen as a viable alternative to drug treatment. McFarland and Edmonson's study involved fifteen students
in the experimental group and fifteen students in the control group. All were identified as hyperactive and placed in a learning-disabled class (according to criteria developed by the State Florida Bureau of Exceptional Child Education). The experimental group received the biofeedback and the control group had no treatment except for a rest period once a week. The intervention lasted eight weeks. The results of the study indicated that the experimental group showed a significant reduction of undesirable behavior. Teachers and parents reported improvements by the children in peer relationships, better understanding of self, and better self image. The experimental group subjects also managed stressful daily situations better and showed increases in performance on the Wide Range Achievement Test relative to the control group (whose gains were minimal or non-existent). The improvements were based on an eight-week period of time.

Tansey and Bruner (1983) conducted a study utilizing EMG and EEG biofeedback training with a ten year old boy with an attention deficit disorder, hyperactivity developmental reading disorder, and ocular instability. This boy was classified by a child study team as perceptually impaired and hyperactive while in the second grade. He was started on Ritalin at that time. At the end of the fourth grade this child began biofeedback. He had three, forty minute, once-weekly, biofeedback training sessions to reduce muscle tension levels as monitored using the frontalis muscle with an EMG feedback machine. His instructions were to let the needle on the machine come down, the lights go out, and become hollow and heavy. The child was also given a visual image of a hollow, heavy rock. He was trained with his eyes
open. After the three EMG sessions, he began EEG biofeedback training for twenty once-weekly, forty-minute sessions. The signals were transmitted to the electroencephalograph for signal processing and auditory feedback. He was instructed to keep the heavy hollow rock image, this time with eyes closed.

Results showed specific and positive response to both EMG and EEG biofeedback training. The reduction of the EMG levels was accompanied by a reduction in hyperactivity lower than had been achieved. The reduction of the EMG levels was accompanied by a reduction in hyperactivity significantly lower than had been achieved with Ritalin. The attention deficit disorder with hyperactivity was no longer diagnosable following EMG biofeedback. The learned increase in the amplitude of monitored sensorimotor rhythm was accompanied by remediation of the reading disorder and ocular instability. The results were unchanged after two year follow-up.

Omizo and Williams (1981) conducted a study with biofeedback-induced relaxation training. They hypothesized that because a child's hyperactivity might be due to tension (Braud, 1975), tension reduction through relaxation training might reduce excessive activity. They used a portable Cyborg EMG unit and children's relaxation tapes, Peace, Harmony and Awareness (Lupin, 1977). The series consists of twelve tapes (each seventeen minutes long), designed to teach relaxation and increase self confidence. The four tapes selected included two child relaxation and two guided fantasy tapes emphasizing self control, coping with stress and relating well with others. Three hyperactive boys were chosen (two were six and one was seven). They
were diagnosed as hyperactive by medical and clinical tests. The sessions occurred two times a week and the children heard two tapes each week. Each session lasted 20-25 minutes. The total intervention lasted one month with a total of eight sessions.

After two sessions, teachers observed a decrease in disruptive behavior. The boys reported that they felt calm and good about themselves in school. Omizo and Williams felt that biofeedback-induced relaxation training was a promising intervention technique that could be used by teachers, school psychologists, counselors and others working with hyperactive children with no negative effects.

Omizo and Michael (1980) also conducted another study involving thirty-two hyperactive boys with I.Q.'s over 90, concerned with the effects of biofeedback-induced relaxation training on impulsivity, attention to tasks and locus of control. Subjects were randomly assigned to experimental and control groups. The experimental treatment consisted of four sessions, twenty to twenty-five minutes long, spread two weeks apart. They listened to a tape and tried to show low activity on EMG. The tapes used, again, were Peace, Harmony and Awareness (Lupin, 1977). Each control was connected to an inoperative biofeedback unit. He was given no instructions about the unit. He sat in a chair and listened to a neutral, pre-recorded story. Each session lasted twenty to twenty-five minutes. Results showed a significant difference between experimental and control groups in impulsivity and attention to tasks. There were no significant differences with regard to locus of control.
Rivera and Omizo (1980) studied thirty-six hyperactive male children between the ages of seven to eleven. No drugs were used by the population. They examined the effects of relaxation training and biofeedback on attention to tasks and impulsivity as measured by the Matching Familiar Figures Test. Subjects were identified by use of teacher ratings and the abbreviated Conners Behavior Rating Scale and randomly assigned to treatment and control groups. The experimental group had three sessions. Each session was divided into two parts: relaxation and biofeedback. Subjects were seen in pairs so that controls were exposed to the same conditions except for the treatment. Relaxation tapes, again, were Peace, Harmony and Awareness. Each session consisted of three sessions spaced three or four days apart and each session was divided into two parts. Posttesting was done with both experimental and control groups hooked up to the EMG machine. Again it was found that relaxation training and biofeedback warranted inclusion in the educational curriculum: The program decreased impulsivity and improved attention to tasks.

Schulman, Jerome et al. (1978) conducted a study using a biomotometer. This is an electronic device that measures activity and provides auditory feedback to the subject. The biomotometer, a box attached to the waist that emits a beep related to activity level, was used in combination with material reinforcers in two experiments which attempted to modify activity levels in children. In the first experiment, the activity level of an eleven year old highly active boy was decreased by use of training with the biomotometer and reward. In the second experiment, a ten year old who was a runaway and exhibited
school problems was used. He was passive and lethargic and would withdraw from unpleasant occurrences. By use of the biomotometer and rewards, activity level in this child was increased. However, the results did not generalize during the extinction phase.

Results indicate that activity level can be modified successfully by use of feedback and reinforcement. However, the sample size in both studies was small and a control group was not utilized. It would seem that this preliminary study should be expanded in light of its promising results.

Hamstead (1979) did a study on "The Effects of EMG-Assisted Relaxation Training with Hyperkinetic Children." He used six developmentally hyperkinetic children ages six to nine. All received EMG feedback. One group got continuous auditory feedback from an EMG machine. The children were instructed to be still and to keep the eyes down. The other group received the same instructions. They also received descriptive verbal feedback regarding subject performance with no specific relaxation procedure. Four five-minute home sessions were included. All six subjects significantly decreased EMG activity across the 15 sessions and at follow-up 5 out of 6 maintained this decreased level of EMG activity. Five out of six made significant behavioral improvements at home, and maintained this at follow-up. One out of four made significant improvements in school behavior at the time of the study with five out of the six exhibiting improvements at follow-up during the next school year. It was found that the benefit of verbal feedback was not demonstrated. Two subjects were maintained on stimulant medication and one was able to effect a slight dose
reduction. The four subjects judged by parents and teachers to need medication before the study did not need it after the study.

The results of the study pointed to the fact that the use of EMG relaxation training is an effective method of behavioral intervention in treating preadolescent hyperactive children. Again the sample size was small and there were no specific instructions on relaxation and no control group was utilized.

Bhatara et al. (1979) did a literature survey on muscle relaxation therapy and concluded that there was insufficient evidence to support the clinical utility of EMG feedback in reducing hyperactivity. The following studies were reviewed. Haight et al. (1976) worked with eight male hyperkinetic students between the ages of 11-15. Four children received 9 30-minute EMG biofeedback sessions. The four children in the control group attended regular classroom activities. Both groups received pretest and posttest measures and a session with relaxation tapes. There were no physiological differences in the groups in EMG levels at pre and posttest. There was no difference in the behavioral outcome. Both groups showed reduced hyperactivity and lability and increased auditory attention span on the hyperactivity portion of the Operational Assessment Tool (OAT) and Conners Parent and Teacher Ratings.

Jeffrey (1978) worked with 27 children between the ages of 6 and 11. The 15 children in the experimental group received ten 30-minute sessions in which 15 minutes were spent on EMG biofeedback. The children were also given EMG relaxation exercises. The 12 children in
the control group received no formal relaxation training. Jeffrey found that the physiological outcome showed the experimental group was superior to the control group in reducing muscle tension defined by EMG posttest levels; there was no significant difference between the two groups over time at the ten month follow-up. The parents of both groups noted improvement, although no formal behavior measures were used.

Baldwin et al. (1978) worked with 4 males from ages 8-12. All subjects received 20-to-30-minute sessions twice a week. A base level was established for the first two weeks, EMG biofeedback for weeks 3, 4 and 5, false feedback for one or 2 weeks and EMG biofeedback was used for the last two weeks. The physiological outcome showed the children reduced levels of EMG-defined tension during the EMG feedback sessions. The children then returned to baseline in three out of the four subjects. The behavioral outcome showed significant worsening of classroom behavior using the Lubar and Shouse classroom behavior observation system. There was no significant change on the Conners Parent Teacher Ratings.

Patmon and Murphy (1978) studied 23 male and 5 female "adolescents." Twenty-one children in the experimental group were assigned to three conditions of biofeedback. They were increased EEG frequency, decreased EEG frequency, and EMG reduction. The seven children in the control group received no biofeedback. The physiological outcome showed the group that increased EEG frequency showed the most reliable reduction on EMG. However, the behavioral outcome showed significantly improved behavior ratings on the teacher
behavior observation checklist in the EMG group. There were no changes in the EEG groups.

Bhatara and Arnold (1979) studied 9 hyperkinetic boys from ages 6 to 10. Five children in the experimental group received EMG biofeedback, along with relaxation tapes for eight 30-minute sessions. The four children in the control group were attached to the EMG machine but received no biofeedback. The physiological outcome depicted reduced EMG defined muscle tension in the experimental group at the four-week posttest. The behavioral outcome indicated no significant difference in teacher completed Davids' ratings. There were improvements noted on the Davids' rating scales filled out by the parents of the experimental group. The parents of the experimental group reported that their children slept better as well. At the 12 week follow-up four of the children in the experimental group regressed to pretreatment values on the parent ratings.

Bhatara et al. also reviewed two of Braud's studies. In the first, Braud (1975) used one male subject and gave him 11 EMG biofeedback sessions. His physiological outcome showed decrease in muscle tension in sessions and at a seven-month follow-up. The behavioral outcome showed reduced psychophysiological symptoms, improved self concept on parent ratings and clinical observations. Braud's second study (1978) utilized 18 males and 12 females from ages 6 to 15. Fifteen hyperkinetic children were divided into an EMG biofeedback group, a relaxation tape group, and a control. Fifteen non-hyperkinetic children were also studied. The experimental group received 12 almost 30-minute sessions of tapes on EMG biofeedback for
over 6 weeks. The physiological outcome showed EMG biofeedback was superior to the tapes in reducing EMG muscle tension but the tape group also reduced muscle tension levels. Both groups showed behavioral improvement on parent rating scales of Conners, Davids, Lupin and Cogwill et al.

Lupin studied 13 males from ages 6 to 10. All children listened to relaxation tapes 20-68 times over a 3-month period. There was no control group. There were no EMG levels measured. The behavioral outcome showed improvement in task attention, reduced fidgeting and improvements in Lupin's parent rating.

As a result of their literature review Bhatara et al. found that progressive muscle relaxation was not only more useful but also EMG biofeedback training was not justifiable. They did conclude that the muscle relaxation had a place in the treatment of hyperactivity. It is felt that this conclusion was reached because the studies reviewed by Bhatara et al. did not utilize the same procedures, intervention techniques, dependent measures, number of subjects or similar age of subjects.

This presents a problem not only in the studies reviewed by Bhatara et al. but also the other studies reviewed in the literature. It is impossible to examine the literature in order to conclude that biofeedback is not effective in the treatment of hyperactive children when there is no single program to follow and duplicate. When different procedures, interventions, dependent measures, and definitions are used, direct comparisons cannot be called forth.
Denkowski and Denkowski (1984) examined 45 hyperactive elementary school children from 3rd, 4th and 5th grades to determine whether group progressive relaxation training was as effective as EMG biofeedback training in the areas of academic achievement and self control. Academic achievement was examined by the Gates-MacGinities Reading Tests. Self control was measured by the Nowicki-Strickland and the Conners Teacher Rating Scales. The 45 children were divided into three groups. The first listened to relaxation tapes. The second group heard the tapes along with EMG biofeedback. The placebo group listened to taped children's stories. Each group had 8 sessions, scheduled at weekly intervals.

Multivariate analysis of variance indicated no significant differences among the three groups. However, although the results were not statistically significant there were changes in the direction of progressive muscle relaxation alone. The authors felt the data were sufficiently positive to warrant further investigation of this type of intervention due to the fact that group progressive relaxation was cost effective and easier to employ than EMG biofeedback. This study goes along with the feeling of Bhatara et al. concerning the utility of EMG biofeedback.

Hyperactivity and short attention span have been examined in the literature from a medical as well as from an educational point of view. The biofeedback approach utilized in this study will attempt to demonstrate that EMG biofeedback can be used to develop internal control, through attention span increase and hyperactivity reduction in the elementary school age child.
The literature reviewed depicted many procedures stemming from different hypotheses about the hyperactive child. Since hyperactivity is multifaceted and probably multidetermined, it is probable that different techniques and programs might be necessary to accommodate to diverse individuals; i.e., a given individual with a certain etiology might respond better to a certain kind of program as opposed to another program.

The studies examined in the literature utilized biofeedback on the arm muscles, and on the frontalis muscle. They used tension-relaxation exercises, muscle relaxation, EMG hookup with no relaxation training and other concentration techniques. The proposed study, as indicated above, will entail an eclectic approach to treatment. EMG reduction will take place by incorporating three types of relaxation. These will be passive, progressive muscle relaxation; imagery; and autogenic exercises.

**Hypotheses**

The present study will investigate the hypotheses that relaxation exercises and EMG feedback will reduce the elementary school child's hyperactivity and enhance his self esteem. In specific form, the hypotheses are as follows:

1. Is there a significant difference in the hyperactivity level between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners parent Hyperkinesis Index (after covariance adjustment using pretest Index scores as the covariate).
2. Is there a significant difference in the hyperactivity level between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners Teacher Hyperkinesis Index?

3. Is there a significant difference in self esteem between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Piers-Harris Self Concept scale?

4. Is there a significant relationship between parents' expectations of benefits of biofeedback as reported during debriefing and the degree of reduction in their children's hyperactivity (in terms of the decline on Parent Hyperkinesis Index).

5. Is there a significant relationship between teacher expectations and benefits of biofeedback as reported during debriefing and the degree of reduction of hyperactivity (in terms of the decline on the Teacher Hyperkinesis Index).

6. Is there a correlation between hyperkinesis reduction (as measured by the Parent Hyperkinesis Index and the Teacher Hyperkinesis Index) and the Piers-Harris Child Self Concept Scale?
Subjects

A total of fifty-five children ranging in age from 7 to 11 were asked to participate in this study. These children were to have "normal" intelligence in that they were not in classes for the retarded. Twelve children were on medication to help control hyperactivity. The racial background of the participants was almost exclusively white with only one black child participating. The socioeconomic levels of the families were from lower middle class to middle, middle class. This was determined by examining the neighborhoods from which the children came.

The children in this study were referred from two places. The first and largest group came from North Central Ohio public and parochial schools. This group consisted of fifty-three children. Twenty-nine children attended public schools and twenty-four attended parochial schools.

The second group was referred by a medical doctor. He referred two children from his private practice. These children both attended public school in north-central Ohio.
Design and Procedure

Design. The population of elementary school children was divided into an experimental and a control group. Children were divided so that there was an equal distribution of age and children on medication in each group.

The control group was a passage of time control group. Some of the studies discussed in the literature review have utilized control groups in which the children were hooked up to a biofeedback machine for a period of time. No instruction was given as to how to operate the equipment. It is felt that this is not appropriate due to moral and ethical reservations: The children who participate in the study are generally of elementary school age and are also part of a population that experiences a great deal of failure at school and in the home. These young children should not be placed in a position to construe their participation in this study as another failure experience. Also, the child would not derive any benefit from being hooked up to a biofeedback machine for one hour a week with no instruction. It would only reinforce the fact that he was unable to sit still and be successful at controlling his behavior. Hence, in the present study, a waiting list procedure was used instead: As part of a passage of time control group, the children were told that they would have an opportunity to learn about biofeedback when the first group finished.

Procedure. Fifty-five children were chosen to participate in this study. This population was gathered by contacting school
superintendents in North Central Ohio along with administrators of parochial schools. It was explained that a study was to be done utilizing children that had attention deficit disorders with hyperactivity. It was not the purpose of the study to label any child in a medical or diagnostic sense but to gain access to this group so that an intervention could be utilized to change and attain control over behavior. If there was interest, the administrator was sent a letter stating what was conveyed on the phone along with the proposal of the study. Another contact was then made. Various administrators handled the information in different ways. Some were not interested because they did not see the need for additional programming for this population. One administrator explained that his school did not have any students such as were described. Other administrators contacted teachers directly and called for names of students. The teachers then contacted parents to ascertain their interest in a program of intervention for the son or daughter. If the parent indicated an interest, a note was sent home stating that the parent would like to be contacted by the author of this study. When the permission slips were picked up, a letter was sent to each parent explaining what would be done in the program. A call to the parent was then made to determine whether the parent would like to have his child participate in the study.

Another administrator of a large school system sent out notes to parents inviting them to a meeting. Parents gathered from a number of schools to listen to what would be done with the children if the parents wanted to include their children in the study. A sheet of
paper was circulated to get the names of the children the parents wanted included.

It was explained to all the administrators at the time of the initial contact that names would be accepted on a first come-first serve basis and that not everybody would be able to be included. Within three weeks, eighty names were collected. Fifty-five were chosen and the rest were kept on a waiting list.

After the names were gathered, all parents were contacted a second time to inform them that the teacher of their children would be contacted to help determine eligibility of their children in this program. The teachers were given a letter briefly outlining the program and a copy of the DSM III description of attention deficit disorder with hyperactivity. Each teacher was asked to fill one out for each child that wanted to be included in the program. If the child did not meet the qualifications, the parent was called and told that his child really did not fit in the group that was being put together. When this happened, additional names were selected from the waiting list. At the end of this procedure, there were 55 children chosen to participate. All parents were called and informed that their children were chosen to be part of the study and that the children would be divided into two groups. The groups were divided as follows:

1) All children listed according to age;

2) All children checked as to medication and those taking medication randomly divided so that both groups had children on medication to reduce hyperactivity.
3) All children were asked if they would like to participate in the program and they were told that if they did not wish to participate, that was fine.

All children, parents and teachers completed the pretests, i.e., the Conners Parent Questionnaire (by parents), the Conners Teacher Questionnaire (by teachers), and the Piers-Harris Child Self Concept Questionnaire. At that point, group one began its ten biofeedback sessions. At the conclusion, all children, parents, and teachers completed the posttests, which meant repeating all the previous questionnaires. At the conclusion, an additional form was filled out by parent and teacher eliciting feelings about biofeedback, possible change that might occur and, for the experimental group, final comments.

When the procedure was clear to all parents and teachers, the teachers were given the Conners Teacher Checklist with the following instructions:

1) If you are the only teacher to work with the child, fill it out alone.

2) If you share the child in terms of major subjects, you can ask the other teacher to help fill out the form. However, when it comes time to fill it out a second time, please elicit the same help.

Upon completion of the forms, they were collected and scored.

The parent forms were also delivered with instructions:

1) If the mother is to fill out the form without assistance from her spouse, then she must fill it out individually the second
time as well.

2) If mother and father fill out the form together, then they are required to fill out the second form together.

Table 1
Age and Medication by Control and Experimental Group

<table>
<thead>
<tr>
<th>Age</th>
<th>Experimental Group</th>
<th>Medication</th>
<th>Control Group</th>
<th>Medication</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>4</td>
<td>4(+1)</td>
<td>5</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>4(+1)</td>
<td>3(+1)</td>
<td>6</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>3</td>
<td>3(+2)</td>
<td>1(+1)</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

This table represents the control and experimental groups divided by age. The children taking medication are also divided according to age. The numbers in parentheses indicate the children that began the study but did not finish.

Parents and teachers were notified as to whether their children were in group one or group two. The parents and teachers were given the starting date of group one. Each school principal was notified and given the option to have the biofeedback done at the school providing that there were at least five children participating in the program from that school and that an appropriate room and chair was available to use. A schedule was set up to accommodate twenty-seven children in group one.
Before group one began, the intervention, the Piers-Harris Self Concept Questionnaire was administered to the children in group two. The questionnaires were administered individually so that each child understood the vocabulary and meaning of each question. Each child was encouraged to ask questions if necessary. When this was completed, all questionnaires were scored and examined as to the presented factors. Each group two child was told that his biofeedback would start in approximately 12 weeks.

At that point group one began its ten intervention sessions. Again, at the beginning of the first session the Piers-Harris Questionnaire was individually administered so that the examiner was sure that the child understood each question.

When the child and therapist finished the Piers-Harris Self Concept Scales, the child was prepared to begin the first biofeedback session. The child's forehead was cleaned with an alcohol pad. The electrode placement was approximately two inches on either side of the center of the forehead. The electrodes were placed about 1/2 inch above each eyebrow. The ground electrode was placed halfway between the two electrodes. The muscle activity at the frontalis was used because tensing at that site seems to be a reliable index of overall systematic relaxation (Shandler & Grengs, 1976; Stoyva & Budzenski, 1974).

When the hook-up was complete the machine was tested for proper function and the session began according to session one as described in the appendix.
The ten biofeedback sessions were designed to include three types of relaxation exercises. These exercises were utilized in a special order for certain periods of time. Each session built on the previous session. The child worked with the therapist and also worked by himself for a certain period of time in each session. In the beginning, the child was not asked to attend to the therapist for long periods of time. As the sessions progressed, the child was asked to attend to the therapist for longer periods of time. The child was expected to do homework and exercise in the classroom to help him relax his body and focus his mind on the task at hand. It was hypothesized that his increased control would increase self esteem.

At the end of the tenth session, the Piers-Harris Self Concept Questionnaire was administered again and scored. One child did not complete the sessions because his parents had removed him from the school.

The control group had the Piers-Harris Self Concept Questionnaire administered that same week and these questionnaires were scored as well. All teachers and parents were given the Conners parent and Teacher Checklists, along with a questionnaire as part of a debriefing procedure. The questions for the parents and teachers group were:

1) Did you treat your child/student differently during the period of the biofeedback sessions?
2) Did you expect a change in the child's behavior, self concept?
3) What do you think now about biofeedback. Question 3 was omitted for parents and teachers of the control group.
The posttesting was then complete. Two children in the control group moved and were dropped from the study. Fifty-two children completed the program.

**Measures**

The measures employed in this study were:

1) Conners Teacher Hyperkinesis Index
2) Conners Parent Hyperkinesis Index
3) Piers-Harris Children's Self Concept Scale
4) Parent Subjective Narrative
5) Teacher Subjective Narrative

The Teacher Hyperkinesis Index is distributed by Abbott laboratories and was developed by Eisenberg and Conners (1971). The 28-item teacher questionnaire is a modification of the original 39 item questionnaire. Sandoval (1977) stated that this index is the most extensively used instrument for identifying and ascertaining change in this population. Pre-drug questionnaires were subjected to factor analysis and as a result five factors were identified. They were:

1) aggressive conduct disorder
2) day dreaming—inattentive dimension
3) anxious—fearful
4) hyperactivity
5) health factor—child without symptoms

Reliability of measurement is shown by correlations between pre- and posttest treatment scores of placebo groups. Test-retest correlations are lower in drug as opposed to placebo groups. The range of
correlations from .71 to .91 in the placebo group suggests quite satisfactory stability during a one-month period of evaluation (Conners, 1969). Before treatment the two groups did not differ on any factors. Results showed highly significant changes after treatment for all five factors. The Conners scales appear to be highly sensitive to change and have been shown to be useful as a dependent variable measure and examined for psychometric characteristics such as replicability of factor structure (Sprague, Christensen, & Werry, 1974; Conners, 1969; Eisenberg, 1973; Conners, 1973).

The 48 item Conners Parent Questionnaire is a modification of a 93-item questionnaire. This was accomplished by factor analysis. Items with low factor loadings were discarded. This questionnaire also is shown to be quite sensitive to change and useful as a dependent variable measure (Conners, 1973; Conners, 1970; Conners, 1969; Conners & Eisenberg, 1971).

The Piers-Harris Self Concept Scale consists of 80 questions to be circled yes or no. The scale is standardized on more than 1,100 children and provides a percentile and stamina score of the child's self concept compared with the normative group. The Piers-Harris Scale appears to be a highly reliable instrument. Test-retest reliability coefficients range from .42 (period of two years) to .96 (short time span). Internal consistency estimates for the total score range from .88 to .93. The reliability figures compare favorably with other measures used to assess personality traits in children. The Piers-Harris is judged to have adequate temporal stability and good
internal consistency (Piers-Harris, 1984).

Some investigators questioned the stability of self concept of the young child. From results reported, it seems clear that self attitudes are reasonably stable by age 7 or 8 (Wilson, 1973; Brown, 1970). The Piers-Harris has been examined in terms of content, criterion related and construct validity and has been shown to have validity in these areas. The instrument has been shown to correlate with other self concept scales.

The parent interview questions were constructed to ascertain the relationship between parent attitudes about biofeedback and how those attitudes might have influenced the parent in filling out the parent hyperkinesis index at the end of the study.

The teacher subjective narrative questions were constructed to ascertain the relationship between teacher attitudes about biofeedback and how those attitudes might have influenced the teacher in filling out the teacher hyperkinesis index.
CHAPTER IV

Findings

This chapter will first present the analysis of data germane to the hypothesis: relaxation exercises and EMG biofeedback will reduce hyperactivity in the elementary school child. Enhanced self control will contribute to an improved self concept. The research questions are as follows:

1. Is there a significant difference between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners Parent Hyperkinesis Index?

2. Is there a significant difference between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners Teacher Hyperkinesis Index?

3. Is there a significant difference between control and experimental groups of elementary school children following biofeedback intervention as measured by the Piers-Harris Child Self Concept Scale?

4. Is there a significant relationship between parents' expectations of benefits of biofeedback and their child's performance as scored on the Parent Hyperkinesis Index on 33
the posttest?

5. Is there a significant relationship between teacher expectations of benefits of biofeedback and their students' performance as scored on the Teacher Hyperkinesis Index at the completion of this study?

6. Is there a correlation between hyperkinesis reduction (as measured by the Parent Hyperkinesis Index and the Teacher Hyperkinesis Index) and the Piers-Harris Child Self Concept Scale?

**Research Question 1**

Is there a significant difference between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners Parent Hyperkinesis Index?

This research hypothesis tested the assumption that there was a significant difference between the control and experimental groups following biofeedback intervention as measured by the Conners Parent Hyperkinesis Index. Table 2 presents the means and standard deviations for pretest and posttest Parent Hyperkinesis Index.
Table 2
Means and Standard Deviations for Conners Parent Hyperkinesis Index for Experimental and Control Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest Mean</th>
<th>Pretest SD</th>
<th>Posttest Mean</th>
<th>Posttest SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>26</td>
<td>19.61</td>
<td>5.62</td>
<td>11.62</td>
<td>6.02</td>
</tr>
<tr>
<td>Control</td>
<td>26</td>
<td>18.11</td>
<td>4.67</td>
<td>19.84</td>
<td>4.39</td>
</tr>
</tbody>
</table>

Inspection of this table shows the experimental group obtained larger mean values than the control group on pretest (19.61 vs. 18.11). When the groups were examined for change in behavior as rated by the parents, the experimental group mean ranged from 19.61 on the pretest to 11.62 on the posttest indicating improved behavior as rated by the parents. The control group mean ranged from 18.11 on pretest to 19.84 on posttest, indicating a slight decline in behavior as rated by the parents.

A one factor analysis of covariance (ANCOVA) was performed to determine if there were significant differences between the posttest mean values of the experimental and control groups. The ANCOVA procedure adjusts the posttest means of the experimental and control groups using the pretest as a covariate.
Table 3 shows the results of the ANCOVA.

Table 3
ANCOVA of Experimental and Control Groups of Parent Hyperkinesis Index with Control Pretest Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
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</thead>
<tbody>
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<td>922.3269</td>
<td>922.3269</td>
<td>63.28*</td>
</tr>
<tr>
<td>Covariate</td>
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<td>677.5232</td>
<td>677.5232</td>
<td>46.48*</td>
</tr>
<tr>
<td>Error</td>
<td>49</td>
<td>714.2075</td>
<td>714.2075</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>2314.0576</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .0001

Inspection of this table shows there are significant differences (p < .001) between the parent posttest means for the experimental group (Mean = 11.62) and the control (Mean = 19.84) groups. The parent pretest (covariate) is significantly related (p < .001) to the parent posttest dependent variable.

The ANCOVA shows that there is a significant difference between the control and experimental groups of elementary school children following biofeedback intervention.

**Research Question 2**

Is there a significant difference between the control and experimental groups of elementary school children following biofeedback intervention as measured by the Conners Teacher Hyperkinesis Index?
This research hypothesis tested the assumption that there was a significant difference between the control and experimental groups following biofeedback intervention as measured by the Conners Teacher Hyperkinesis Index. Table 4 presents the mean and standard deviations for pretest and posttest Teacher Hyperkinesis Index.

Table 4

Means and Standard Deviations for Conners Teacher Hyperkinesis Index for Experimental and Control Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest Mean</th>
<th>Pretest SD</th>
<th>Posttest Mean</th>
<th>Posttest SD</th>
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<tr>
<td>Experimental</td>
<td>26</td>
<td>19.65</td>
<td>3.97</td>
<td>13.69</td>
<td>6.50</td>
</tr>
<tr>
<td>Control</td>
<td>26</td>
<td>20.30</td>
<td>3.68</td>
<td>20.57</td>
<td>4.65</td>
</tr>
</tbody>
</table>

Inspection of this table shows that when the groups were examined, the experimental group mean went from 19.65 on the pretest to 13.69 on the posttest. The control group mean went from 20.30 on the pretest to 20.57 on the posttest. This indicates that the teachers rated the experimental group as displaying better behavior from pretest to posttest. Teachers rated the control group as displaying a slight decline in behavior from pretest to posttest.

A one-factor analysis of covariance (ANCOVA) was performed to determine if there were significant differences between the posttest mean values of the experimental and control groups. Table 5 shows the results of the one factor ANCOVA.
Table 5
ANCOVA of Experimental and Control Groups of Parent Hyperkinesis Index with Control of Teacher Pretest Scores

<table>
<thead>
<tr>
<th>Source</th>
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<td>616.1730</td>
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<td>Covariate</td>
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<td>441.1905</td>
<td>18.66*</td>
</tr>
<tr>
<td>Error</td>
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<td>2216.0575</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .0001

Inspection of this table indicates that there are significant differences (p < .0001) between the teacher posttest means for the experimental group (Mean = 13.69) and the control (Mean = 20.57). The teacher pretest (covariate) is significantly related (p < .0001) to the teacher posttest dependent variable.

The ANCOVA shows that there is a significant difference between the control and experimental groups of elementary school children following biofeedback intervention.

Research Question 3
Is there a significant difference between control and experimental groups of elementary school children following biofeedback intervention as measured by the Piers-Harris Self Concept Scale?

This research hypothesis tested the assumption that there was a significant difference between the control and experimental groups following biofeedback intervention as measured by the Piers-Harris
Self Concept Scale. Table 6 presents the mean and standard deviations for pretest and posttest Piers Harris Child Self Concept Scale.

Table 6
Means and Standard Deviations for the Piers-Harris Child Self Concept Scale for Experimental and Control Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest Mean</th>
<th>SD</th>
<th>Posttest Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>26</td>
<td>54.19</td>
<td>9.58</td>
<td>68.69</td>
<td>8.84</td>
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<tr>
<td>Control</td>
<td>26</td>
<td>56.46</td>
<td>12.20</td>
<td>59.53</td>
<td>11.61</td>
</tr>
</tbody>
</table>

Inspection of this table shows the fact that when the groups were examined, the experimental group mean went from 54.19 on the pretest to 68.69 on the posttest. The control group mean went from 56.46 on the pretest to 59.53 on the posttest. This indicates that the experimental group children rated themselves higher in terms of how they saw themselves from pretest to posttest than the children of the control group.

A one-factor analysis of covariance (ANCOVA) was performed to determine if there were significant differences between the posttest mean values of the experimental and control groups. Table 7 shows the results of the one factor ANCOVA.
Table 7

ANOVA of Experimental and Control Groups of Piers-Harris Child Self Concept Scale with Control of Child Pretest Scores

<table>
<thead>
<tr>
<th>Source</th>
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</thead>
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<td>1089.3076</td>
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<td>2682.1053</td>
<td>49.60*</td>
</tr>
<tr>
<td>Error</td>
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<td>2649.8946</td>
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</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>6421.3075</td>
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<td></td>
</tr>
</tbody>
</table>

*p < .0001

Inspection of this table indicates that there are significant differences (p < .0001) between child posttest means for the experimental group (Mean = 68.69) and the child control group (Mean = 59.53). The child pretest (covariate) is significantly related to the child posttest dependent variable (p < .0001).

The ANCOVA analysis shows that there is a significant difference between the control and experimental groups of elementary school children following biofeedback intervention.

Research Question 4

Is there a significant relationship between parents' expectations of benefits of biofeedback (Narrative 2) and their child's performance as scored on the Parent Hyperkinesis Index at the completion of the study?

This research question examined the relationship between parent expectations of the benefits of biofeedback and how they rated their
children on the Parent Hyperkinesis Index. A parent narrative consisting of three questions was given to the parents of the children in the experimental group. The questions were:

1) Was there any difference in the way you treated your child?
2) Did you feel it would help the child's behavior, school work, self concept?
3) How did you feel about biofeedback after the study was completed?

The control-group parents received questions one and two. Question three did not pertain to the control group.

Table 8 presents the mean and standard deviations for parent narrative questions one, two and three.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Parent Narrative One</th>
<th>Parent Narrative Two</th>
<th>Parent Narrative Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>26</td>
<td>1.65 .48</td>
<td>1.84 .54</td>
<td>1.07 .27</td>
</tr>
<tr>
<td>Control</td>
<td>26</td>
<td>1.88 .32</td>
<td>1.76 .42</td>
<td>*</td>
</tr>
</tbody>
</table>

*not applicable

The interpretation of this table shows the means and standard deviations for both the experimental and control groups appear to be similar. For the parent narratives one and two, the control groups
tend to be more similar (smaller standard deviations) when compared to the respective experimental groups (larger standard deviations). A Pearson Coefficient of correlations was performed to determine whether parents' feelings with regard to biofeedback (Narrative 2) correlated with parent ratings of posttest hyperkinesis index scores. Results indicated that there was no significant relationship between parent expectations of the benefits of biofeedback and the way they viewed their child's posttest performance on the Parent Hyperkinesis Index (Experimental Group, r = -.24, p = .220; Control group, r = -.27, p = .1762).

The Pearson Coefficient of Correlation shows that there is no significant relationship between parent expectations of the benefits of biofeedback (Narrative 2) and parent perceptions of children's behavior as measured by the Parent Hyperkinesis Index.

**Research Question 5**

Is there a significant relationship between teacher expectations of the benefits of biofeedback (Narrative 2) and their students' performance as scored on the Teacher Hyperkinesis Index at the completion of the study?

This research question examined the relationship between teacher expectations of the benefits of biofeedback and how they rated their students on the Teacher Posttest Hyperkinesis Index. A teacher narrative consisting of three questions was given to the teachers of the children in the experimental group. The questions were:

1) How do you feel about biofeedback?

2) Did you feel it will help the student's behavior, school
work, self concept?

3) How did you feel about biofeedback after the study was completed?

The control-group teachers received questions one and two. Question three was not applicable to the control group. Table 9 presents the means and standard deviations for the Teacher Narrative questions one, two, and three.

Table 9

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Teacher Narrative One</th>
<th>Teacher Narrative Two</th>
<th>Teacher Narrative Three</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Experimental</td>
<td>26</td>
<td>1.88</td>
<td>.32</td>
<td>1.85</td>
</tr>
<tr>
<td>Control</td>
<td>26</td>
<td>1.96</td>
<td>.19</td>
<td>1.57</td>
</tr>
</tbody>
</table>

The interpretation of this table shows the means and standard deviations for both the experimental and control groups appear to be similar. For the teacher narrative one and two, the control groups tend to be more similar (smaller standard deviations) when compared to the respective experimental groups (larger standard deviations).

A Pearson Coefficient of Correlation was performed to determine whether teachers' feelings about biofeedback correlated with teacher ratings of the child at the end of the biofeedback intervention.
Results indicated that there was no significant relationship between teachers' expectations of the benefits of biofeedback (Narrative 2) and teacher posttest ratings of students' behavior on the Teacher Hyperkinesis Index (Experimental Group, \( r = .04, p = .8361 \); Control Group, \( r = .11, p = .5812 \)). The Pearson Coefficient of Correlation shows that there is no significant relationship between teacher expectations of the benefits of biofeedback (Narrative 2) and the way the teacher views the child's behavior as scored on the Posttest-Parent Hyperkinesis Index.

Research Question 6

Is there a correlation between hyperkinesis reduction (as measured by the Parent Hyperkinesis Index and the Teacher Hyperkinesis Index) and the Piers-Harris Child Self Concept Scale.

This research hypothesis examined the relationship between the teacher and parent hyperkinesis indexes and the Piers-Harris Child Self Concept Scale. The correlation between the reduction in hyperactivity in the Parent Hyperkinesis Index and the Self Concept Scale was \( r(51) = -.50, p < .0005 \). The correlation between the reduction in hyperactivity in the Teacher Hyperkinesis Index and the Self Concept Scale was \( r(51) = -.48, p < .0005 \). The data shows that there is a significant correlation between the Parent Hyperkinesis Index and the Piers-Harris Child Self Concept form. There is also a significant correlation between the Teacher Hyperkinesis Index and the Piers-Harris Child Self Concept Form.
Data Not Represented in the Research Questions

Table 10 represents the observed behavior as scored by the parents on the Conners Hyperkinesis Index. The table examines behavior change from pretest to posttest.

Table 10

Observed Behavior as Scored on the Parent Hyperkinesis Index—Control and Experimental Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Observed Behavior from Pretest to Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved</td>
</tr>
<tr>
<td>Experimental</td>
<td>25</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
</tr>
</tbody>
</table>

This table represents the children's behavior as observed by the parents. The experimental group parents reported that 25 children improved and one stayed the same. The control group parents reported that six children improved behavior. However, the improvement was small (none greater than 4 points). Six children remained the same and 14 children got worse.

Table 11 represents the observed behavior as scored by the teachers on the Conners Hyperkinesis Index. This table examines behavior change from pretest to posttest.
Table 11

Observed Behavior as Scored on the Teacher Hyperkinesis Index
Control and Experimental Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Observed Behavior from Pretest to Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved</td>
</tr>
<tr>
<td>Experimental</td>
<td>24</td>
</tr>
<tr>
<td>Control</td>
<td>8</td>
</tr>
</tbody>
</table>

This table represents the children's behaviors as observed by the teachers. The experimental group teachers reported improvement in 24 children. Control group teachers reported that 8 children improved, 5 stayed the same and 11 children got worse.

Table 12 represents how the children saw their behavior. This table represents the children's perceived changes in behavior from pretest to posttest.

Table 12

How Children in the Control and Experimental Groups Saw Themselves from Pretest to Posttest—Control and Experimental Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Perceived Behavior Pretest to Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved</td>
</tr>
<tr>
<td>Experimental</td>
<td>26</td>
</tr>
<tr>
<td>Control</td>
<td>17</td>
</tr>
</tbody>
</table>
This table represents how the children saw themselves. The experimental group children saw themselves as having an improved self concept as measured by the Piers-Harris Child Self Concept Scale. Seventeen of the control group children saw themselves in a better light. Two stayed the same and seven saw themselves as worse.

Table 13 represents the experimental group answers to parent narrative questions.

Table 13

Experimental Group Answers to Parent Narrative Questions

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Narrative 1</td>
<td>9</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Parent Narrative 2</td>
<td>6</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Parent Narrative 3</td>
<td>23</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

This table represents parental response to questions about biofeedback. Seventeen parents reported that they did not treat their children differently during the 10 week intervention. Eighteen parents reported that they did not know if the intervention would help. Twenty-three parents felt that the program had a positive influence on their children after the program was over.

Table 14 represents the control group answers to the parent narrative questions.
Table 14
Control Group Answers to Parent Narrative Questions

<table>
<thead>
<tr>
<th>Parent Narrative 1</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Parent Narrative 2</td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Parent Narrative 3</td>
<td></td>
<td></td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

This table represents parental responses to questions about biofeedback. Twenty-three parents of control group children reported that they did not treat their children differently during the 10-week intervention. Twenty parents reported that they did not know if the intervention would help their children.

Table 15 represents the experimental group answers to teacher narrative questions.

Table 15
Experimental Group Answers to Teacher Narrative Questions

<table>
<thead>
<tr>
<th>Teacher Narrative 1</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Teacher Narrative 2</td>
<td>7</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Teacher Narrative 3</td>
<td>21</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
This table represents teacher responses to questions about biofeedback. Twenty-three teachers reported that they did not treat their students differently during the intervention. Seventeen teachers reported that they did not know if the intervention would be helpful. Two teachers reported that biofeedback would not help and seven felt that it would help. Twenty-one teachers felt biofeedback did help the students after 10 weeks.

Table 16 represents the control group answers to the teacher narrative questions.

Table 16
Control Group Answers to Teacher Narrative Questions

<table>
<thead>
<tr>
<th>Teacher Narrative</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Narrative 1</td>
<td>1</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Teacher Narrative 2</td>
<td>11</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Teacher Narrative 3</td>
<td></td>
<td></td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

This table represents teacher responses to questions about biofeedback. Twenty-five teachers reported that they did not treat children differently during the 10-week intervention. Fifteen teachers reported that they did not know if biofeedback would help their students, and 11 felt biofeedback would be beneficial.
Summary of Findings

In Chapter 4 an analysis was made of the results of the Conners Parent Hyperkinesis Index, the Conners Teacher Hyperkinesis Index and the Piers-Harris Children's Self Concept Scale.

1. A significant difference was found between experimental and control groups on the Parent Hyperkinesis Scale following biofeedback intervention.

2. A significant difference was found between experimental and control groups on the Teacher Hyperkinesis Scale following biofeedback intervention.

3. A significant difference was found between the experimental and control groups on the Piers-Harris Self Concept Scale following biofeedback intervention.

4. No significant relationship was found between parent narrative and the way parents scored their children on the Parent Posttest Hyperkinesis Scale.

5. No significant relationship was found between teacher narrative and the way teachers scored their students on the Teacher Posttest Hyperkinesis Scale.

6. A significant internal correlation was found between gain scores (pretest-posttest changes) on the hyperkinesis scales and increases in the Piers-Harris Self Concept Scale.
Summary

These findings support the hypothesis that relaxation exercises and EMG biofeedback will reduce hyperactivity in the elementary school child. Enhanced self control is associated with an improved self concept.
CHAPTER V

Discussion

It is the purpose of this chapter to discuss the findings that were presented in Chapter 4. The premise of the study was that a group of hyperactive children with attention deficit disorders could be given ten sessions of biofeedback and at the end of the intervention there would be changes in behavior that could be observed as well as positive changes in the way the children felt about themselves. It was believed that all children would gain from the program regardless of age (from 7th-12th birthday), grade, sex, type of classroom (regular or learning disabled), or medication. The children were divided into experimental and control groups taking into account the type of school attended, age, grade, sex, medication, type of class placement. An analysis of covariance (ANCOVA) was chosen to allow the pretest to adjust the means so that the results would validly indicate if there was a significant difference between the experimental and control groups at the end of the study.

Research Question one deals with significant differences between experimental and control groups following biofeedback intervention as measured by the Conners Parent Hyperkinesis Index. The initial means of both experimental group (X = 19.61) and control group (X = 18.11)
were similar at the onset of the study. After 10 weeks of biofeedback, parents noted a significant drop in annoying, disruptive behavior. The experimental group posttest mean dropped to 11.62 (the lower the score, the better the behavior). The control group parents noted that their children's behavior not only did not improve, but also got slightly worse (Mean = 19.84) (a rise in score indicates that behavior is getting worse). Parents of the experimental group also indicated that their children were more helpful around the house and more likely to initiate helping with jobs around the house. They fought less with siblings and got along better with friends. They were generally more pleasant to be around. Many parents of the children in the control group indicated that their children's behavior had gotten worse.

The parents of the experimental group definitely felt that their children's behavior had improved. The parents felt better about being around their children and that they could deal with the children in a more positive way. When a child got to be a problem, the parents had a tool to use to bring the child back into control. When the child became hard to handle, the parent could now suggest that the child go to his room and practice biofeedback, not as a punishment but as a tool to help the child gain control. When out in public, the parent could suggest that the child do the short breathing exercises to help the child feel better. Both the parent and the child now had a tool to help with feeling in control in a positive way.
The parents of the control group continued to feel frustrated and a continuing sense of failure. The parents felt that they were screaming all the time. They did not like themselves and were at a loss as to how to deal with their children. The children felt that they could not do anything right and that they were always in trouble.

Research question two deals with a significant difference between the experimental and control groups following biofeedback intervention as measured by the Conners Teacher Hyperkinesis Index. The two groups started out with similar means (experimental mean = 19.65, control mean = 20.30) and after the posttest the means were quite different (experimental mean = 13.69, control mean = 20.57) (the lower the score, the better the behavior).

The teachers of the experimental group felt that there was a positive change in the children's observed behavior. Sixteen children showed substantial improvement. A score of 18 on the Conners Teacher Index indicates substantial school problems. These 16 children dropped from 5 to 15 points on the scale. A few of the teachers stated that there was no improvement in the children participating in the study. However, they scored the children as having improved on the posttest. Teacher expectancy was a problem in that the teacher had to realize that Child A would not be transformed into Child B at the end of the intervention and that all progress, no matter how slight, needed to be positively reinforced. In the experimental group, there were 2 children that teachers felt got worse. Subsequently, one child was placed in a severe behavior
disorder class. The other child had severe family problems. The mother was creating a chaotic home environment. She experienced an emotional crisis and this adversely affected all the children in the family.

The teachers of the children in the experimental group also had a tool to use when a child was not attending to the task at hand. It was to remind him to do his breathing exercises. The teacher could do this at any time. At the same time, the child could utilize the same tool. He could use the breathing exercises any time and any place. This gave the child a degree of control over his behavior which helped him cope better in the classroom.

Research question three deals with a significant difference between the experimental and control groups following biofeedback intervention as measured by the Piers-Harris Self Concept Scale. In this situation the experimental group began with a mean of 54.19 and the control group began with a mean of 56.46. The posttest means (experimental mean = 68.69, control mean = 59.53) depicted quite a change (improved score depicts improved self concept). The experimental group children felt significantly better about themselves than did the children of the control group.

Children that are hyperactive with attention deficit disorders have a difficult time feeling good about themselves because they are always in trouble. At home, they are disruptive, fight with siblings and do not carry out their share of responsibilities. As a result, parents cannot deal with them on a positive basis. The child senses this and reacts in a negative way setting up a circular reaction that
is negative. The child feels that he is not loved or dealt with fairly. He begins to wonder what is wrong with him. The parent wonders why he is such a poor parent that the child will not comply with his demands. Both parties feel a lack of control over themselves and the situation. These feelings grow over the years of interaction between parent and child.

The teacher experiences similar frustrations. In the classroom, the child will not sit still and do his work. As a result he does not learn as well as he should even if he has above average intelligence. The teacher feels threatened as an educator and at the same time is angry at the child. The child feels that the teacher picks on him but at the same time wonders why he is always in trouble. He wonders why he cannot sit and get his work done like the other children. He realizes that he is not doing as well as he should. Both child and teacher lack control over themselves and the school situation.

As a result the child feels negative about himself and his capabilities. At pretest with the Piers-Harris Self Concept Scale, the experimental group mean was 54.19 and the control group mean was 56.46. The control group mean was slightly higher than that of the experimental group. At the end of the 10 weeks, the experimental group mean was 68.69 and the control group mean was 59.53. Both groups showed a gain but the experimental group really made a great improvement in terms of improved feelings about self.

This might be due to success with biofeedback as well as a feeling that the child now has a means by which to help control
himself and the situation.

Success is very important in making a child feel that he is capable. With biofeedback, success is immediately evident. The machine will let a student know if he is on the right track within 1.5 seconds of his action. The word of the therapist could be biased but not the machine. All children in the experimental group reduced their microvolt levels during 10-week intervention. They increased their ability to concentrate from periods of 5 minutes to periods of 45 minutes with the machine monitoring frontalis muscle activity.

As the children progressed, they found that not only could they use the exercises to help them in school and at home but also in any situation they chose to apply the exercises to. They found that they could attain control of themselves anywhere. The more they practiced, the easier it became. This encouraged them to keep practicing. They found that people began to interact with them in a different way and that encouraged them to practice more. Work in school improved and the children began to have more positive experiences. The teachers praised them for improved work and behavior.

Therefore success from biofeedback intervention increased attention span along with the ability to relax the body and concentrate the mind on the task at hand contributed to a better feeling about self.

Research question four seeks to determine whether there is a relationship between the attitude of the parent and how he rated his child on the Parent Posttest Hyperkinesis Index. Would parents who
felt that their children would benefit from biofeedback rate the children as showing improved behavior because of parent expectations? A high correlation between positive parental expectations and improvement in the posttest scores could cast some doubt on the research findings. There was no significant relationship found between the parent attitudes and how the parent scored the child on the Posttest Parent Hyperkinesis Index.

Research question five seeks to determine whether there is a relationship between the attitude of the teacher and how she rated her student on the Teacher Posttest Hyperkinesis Index. The great majority of teachers reported that they did not know if the intervention would benefit the children. Most of the teachers felt positively about the program after it was over. In this case as with the parents, a correlation between teacher expectations and improvement in teacher ratings of behavior would cast some doubt on the research findings. However, there was no significant relationship found.

Research question six seeks to determine whether there is a relationship between the hyperkinesis scales and the Piers-Harris Child Self Concept Scale. In order to associate decline in the hyperkinesis indexes and an increase in self concept the relationship had to be examined by means of an internal correlation. There was a significant correlation between the hyperkinesis scales and the Piers-Harris Child Self Concept Scale indicating that the decline in the hyperkinesis index is associated with improved self concept.
Summary

The purpose of this study was to determine whether relaxation exercises and EMG biofeedback will reduce hyperactivity in the elementary school child and whether enhanced self control will be associated with an improved self concept. Five research questions were derived from the hypothesis and were subjected to statistical analysis. The first three questions were analyzed with the ANCOVA. The ANCOVA was selected so that the posttest scores between the experimental group and control group would be adjusted for differences using the pretest performance as the covariate.

Questions 4 and 5 were analyzed using the Pearson Coefficient of Correlation. This procedure was selected to determine (a) whether a significant relationship exists between parent feeling as to outcome and parent posttest ratings of children's behavior, and (b) teacher feelings as to outcome and teachers' posttest ratings of students' behavior.

This study has demonstrated that there was a significant difference between the experimental and control groups of elementary school children following biofeedback intervention as measured by the Conners Parent Hyperkinesis Index.

There was a significant difference between experimental and control groups of elementary school children following biofeedback intervention as measured by the Conners Teachers Hyperkinesis Index.

There was a significant difference between experimental and control groups of elementary school children following biofeedback intervention as measured by the Piers-Harris Child Self Concept
Scale.

There was no significant relationship between parents' expectations of benefits of biofeedback and their child's posttest performance as rated on the Parent Hyperkinesis Index.

There was no significant relationship between teacher expectations of benefits of biofeedback and their students' posttest performance as rated on the Teacher Hyperkinesis Index.

Conclusions

The research questions support the hypothesis that relaxation exercises and EMG biofeedback reduce hyperactivity and enhanced self control will be associated with an improved self concept in the elementary school child. Using a controlled sampling method, the variables, type of class, use of medication, age and type of school attended did not appear to affect the child's achievements in the study.

Biofeedback intervention gave the child a means by which to control himself. The control was an internal control that could be called on at any time or place. This internal control would increase with increased practice. In time the child could use the skills he learned in many different kinds of situations. The internal control that did not develop naturally with increased age or school grade began to develop within a ten week biofeedback intervention. Increased control brought a new self confidence which resulted in a better feeling about one's self. Increased self confidence resulted in a child who perceived himself as worthwhile. Examining the child at home, in the laboratory setting as well as in school supported the
conclusion that improvement had occurred in (a) reducing hyperactivity and (b) improving self concept.

At home the parent rated the child's behavior at the end of the biofeedback intervention. Parents of the experimental group reported significant improvement in child behavior. At school, the teacher rated the child's behavior at the end of the biofeedback intervention and reported significant improvement in the child's behavior.

In the laboratory setting all children in the experimental group demonstrated a reduction in microvolt levels demonstrating a more relaxed body and alert mind.

Improvement in one area could have been due to a situation unique to that setting. Therefore, it is important to examine the child in at least three different settings. Improvement was seen in three areas giving the study ecological validity.

Recommendations

1. It is recommended that this study be replicated following the same procedures utilized here. It is important to determine whether the results would be replicated with different therapists doing the biofeedback intervention.

2. It is recommended that the study be replicated utilizing a population over the age of 13. This population would require a modification in the relaxation exercises. More imagery could be employed with less time spent on the exercises that are more concrete.

3. It is recommended that this study be replicated utilizing a population between the ages of 5 and 6 years of age.
this case, the exercises would need to be modified to remove the imagery and include more concrete exercises. The length of sessions might need to be shortened as well.

4. It is recommended that this study be reproduced with increased feedback from extended family and community members. It would be important to determine whether the children's improvement extended to other kinds of interactions in the community.

5. It is recommended that in future studies more careful monitoring is done in terms of clinical progress.
REFERENCES


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Laufer, M., & Shetty, T. In H. Kaplan, A. Friedman, and B. Sadlols (Eds.), *Attention deficit disorders.*


Matthews, D. *Biofeedback: Its uses in education.* *ERIC Microfiche, ED 217338*


Sulzbacher. The learning disabled or hyperactive child. Diagnosis and treatment. *Journal of the American Medical Association, 234*, 239.


Appendix A

Material Used in Study
Appendix A includes the following materials:

- Consent for participation in Social and Behavioral Sciences Research
- Letter to Physician, Superintendent or Principal
- Letter to Teacher
- Letter to Child
- Letter to Parents
- DSM III Attention Deficit Disorder with Hyperactivity
- Teacher Identification checklist
- Letter to Parents Group One
- Letter to Parents Group Two
- Materials Utilized for Biofeedback
  - Biofeedback Session One
  - Biofeedback Session Two
  - Biofeedback Session Three
  - Biofeedback Session Four
  - Biofeedback Session Five
  - Biofeedback Sessions, Six, Seven, Eight, Nine
- Biofeedback Session Ten
- Parent Questionnaire
- Teacher Questionnaire
- The Piers-Harris Children's Self Concept Scale
- Parent Narrative, Group One
- Parent Narrative, Group Two
- Teacher Narrative, Group One
- Teacher Narrative, Group Two
- Relaxation Exercises A
- Relaxation Exercises B
- Autogenic Training Exercises
- Mini Relaxation
- Home Practice
- School Practice
- Homework Record
CONSENT FOR PARTICIPATION IN
SOCIAL AND BEHAVIORAL RESEARCH

I consent to participating in (or my child's participation in) research entitled:

**Increasing Attention Span and Improved Self Control**

(Principal Investigator)

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Further, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me. The information obtained from me will remain confidential unless I specifically agree otherwise by placing my initials here.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ___________________ Signed: ___________________(Participant)

Signed: ___________________ (Principal Investigator or his/her Authorized Representative)

Signed: ___________________ (Person Authorized to Consent for Participant - If Required)

Witness: ___________________

HS-027 (Rev. 12-81) — To be used only in connection with social and behavioral research.
Dear Doctor/Superintendent, Principal:

I am beginning a study dealing with children that have attention problems coupled with hyperactivity. The ages will be from 7 to 11 years, 11-months. The children need to be of normal intelligence. As a result of working with these children, my study will incorporate three types of muscle relaxation exercises with EMG Biofeedback. My aim is to increase attention span and develop a more positive self concept.

I would like to send you a copy of my proposal so that you can look it over. I will call you back on ______ to answer any questions you might have about it or the biofeedback procedure. I will be happy to come and talk to you or your teachers at your convenience.

Very truly yours,

Gail Krieger, M.A.
Biofeedback Therapist

GK/rjp

Gail Krieger
home phone 7564301
office phone 7561133

Dr. J. Gibbs - office phone
Advisor.
Christian U. 215-3
614-482-7914

ACCREDITED BY THE COMMISSION ON ACCREDITATION OF REHABILITATION FACILITIES
November 1, 1984

Dear Teachers:

Thank you for your help in selecting students to participate in the Biofeedback Program. I have included a list of the characteristics necessary for a child to be included in the program. When we meet to fill out the teacher hyperkinesis index, we will check off what inappropriate description for each child right on the child identification paper.

Very truly yours,

Gail Krieger
Hi,

I would like us to work together for the next ten weeks. We will be doing biofeedback and biofeedback is fun to learn. The important thing about biofeedback is that you are the captain of your ship. The boss. It is up to you to do the learning. No one can do it for you or to you. Biofeedback is a way to learn what is going on inside you—are you relaxed or is your body excited inside—we can find out! This is the biofeedback machine we will use and we will attach these three little disks to your head with some round tape.

When the disks are on your head over your eyes, we will do some different kinds of exercises together. In the beginning, I will talk to you and you will try to follow along with me. As we move along in the program, you will take over more and more and I will not need to do very much at all. You will learn to relax your whole body faster and faster by yourself.

As you learn to relax, the machine will let you know how you are doing and soon you will be able to take what you have learned here and use it at school and at home.

I hope this is something you would like to do with me. I would really like to work with you. What do you think? Would you like to try? If you don't want to, that is OK also.
Dear Parents,

My name is Gail Krieger and I have been a Biofeedback Therapist for four years. I am also working to complete my Ph.D at Ohio State University. I have designed a study involving children that are overactive. These children have a hard time concentrating in school and getting tasks done at home. I will work with your child using biofeedback along with relaxation exercises. Biofeedback is a way to learn what is going on inside you when it is happening—the machine lets you know when your muscles are relaxing and gives you an instant signal. The first two things that will happen is that the teacher and parent will both fill-out a behavior checklist having to do with the behavior of the child in the appropriate setting. Next, the child will fill-out a checklist about how he/she feels about himself/herself. At this point, group one will receive ten (10) biofeedback sessions. When that is done, all parents, teachers, and children will fill out the questionnaires done at the beginning of the study. When the information is gathered, group two will have its ten biofeedback sessions. Results will be compiled and made available to everyone participating in this study. I will be looking at attention span and how your child feels about himself/herself.

All information obtained will be completely confidential. After the information is gathered, your child's name will be removed from all material. There will be no way to connect any information with any child. If, at any time your child wants to withdraw from the study or you want him to withdraw from the study, it will be done without prejudice to your or your child.

Gail Krieger - Home phone 7564301
Office phone 7561133

Dr J Gibbs - Office phone 614 428 7170
Ohio State University
DSM III ATTENTION DEFICIT DISORDER WITH HYPERACTIVITY

The child displays, for his or her mental and chronological age, signs of developmentally inappropriate inattention, impulsivity, and hyperactivity. The signs must be reported by adults in the child's environment, such as parents and teachers. Because the symptoms are typically variable, they may not be observed directly by the clinician. When the reports of teachers and parents conflict, primary consideration should be given to the teacher reports because of greater familiarity with age-appropriate norms. Symptoms typically worsen in situations that require self-application, as in the classroom. Signs of the disorder may be absent when the child is in a new or a one-to-one situation.

The number of symptoms specified is for children between the ages of eight and ten, the peak age range for referral. In younger children, more severe forms of the symptoms and a greater number of symptoms are usually present. The opposite is true of older children.

A. Inattention. At least three of the following:

(1) often fails to finish things he or she starts
(2) often doesn't seem to listen
(3) easily distracted
(4) has difficulty concentrating on schoolwork or other tasks requiring sustained attention
(5) has difficult sticking to a play activity

B. Impulsivity. At least three of the following:

(1) often acts before thinking
(2) shifts excessively from one activity to another
(3) has difficulty organizing work (this not being due to cognitive impairment)
(4) needs a lot of supervision
(5) frequently calls out in class
(6) has difficult awaiting turn in games or group situations

C. Hyperactivity. At least two of the following:

(1) runs about or climbs on things excessively
(2) has difficulty sitting still or fidgets excessively
(3) has difficulty staying seated
(4) moves about excessively during sleep
(5) is always "on the go" or acts as if "driven by a motor"

D. Onset before the age of seven.

E. Duration of at least six months.
F. Not due to Schizophrenia, Affective Disorder, or Severe or Profound Mental Retardation.
Dear Parents:

Your child will be in the group that will have biofeedback first. Your child's teacher will fill out a checklist about some of the things she notices about your child in school. The teacher will give me the checklist. I will ask the teacher to fill out the same checklist at the end of the biofeedback sessions.

Very truly yours,

Gail Krieger, M.A.
Biofeedback Therapist
Dear Parents:

Your child will be in the group to receive his/her biofeedback session second. Your child's teacher will be asked to fill out a checklist about some of the things she notices about your child in school. The teacher will then give me the checklist; I will ask the teacher to fill out the same checklist at the end of 10 weeks.

Your child's biofeedback sessions will begin approximately two weeks after the first group is done.

Very truly yours,

Bail Krieger, M.A.
Biofeedback Therapist
Materials Utilized for Biofeedback

EMG Biofeedback Machine
Autogen 1700 Feedback Myograph
Spectra 360 Electrode Gel
3 surface electrodes attached to the frontalis muscle
Recliner Chair
Biofeedback Sessions
(45 Minutes)

Session One:

1. Introduction to the EMG equipment.

2. Administer child questionnaire.

3. Allow the child three to five minutes to experiment with the equipment. Set threshold at 2.0 microvolts and explain that machine will shut off if head muscle relaxes. Point out only he controls machine.


5. Introduce passive progressive muscle relaxation—use chocolate pudding—to through exercise A with image of pouring warm chocolate pudding on head and following it down body.

6. Stretch

7. Any questions.

8. Do autogenic exercises.

9. Stretch

10. Introduce homework and sheet. Practice 2 times a day and record practice with a check in box. Find chair, breathing, tell body to relax like we did today.

11. Unhook child.

12. Questions
Session Two:

1. Equipment hookup. Threshold set at 2.0 microvolts.

2. Child has time to experiment with the machine with the therapist present.

3. Ask about week at home.

4. Ask about week at school.

5. Practice—how did it go?

6. Modify breathing exercises—in to count of four and out to count of four.

7. Relaxation exercise A. Eyes closed 3 to 5 minutes.

8. Eyes open, expression of feelings.

9. Eyes closed, child goes through exercise alone, 5 minutes.

10. Eyes open, expression of feelings.

11. Discussion of daily routine of child.

12. Teach breathing exercise—in to count of four and out to count of four—to be done before each new activity in school.


14. Home practice, 2 times a day, 5 minutes.

15. Chart to fill out after each practice.

16. Renew breathing exercise to be done in school. To be done before each new subject begins. Breathing in to the count of four and out to the count of four.

17. Ask if there are any questions.
Session Three:

1. Ask about questions, school practice and home practice, see chart.

2. Reaction of parents, friends, teachers.

3. How did week go at home, school.

4. Equipment hook up.

5. Self as an agent of change (internal locus of control).

6. Relaxation exercise A with therapist. At end eyes closed 3 to 5 minutes.

7. Eyes open, expression of feelings.

8. Eyes closed, child goes through the exercises alone, 10 minutes. He is asked to practice like he does at home.

9. Eyes open, expression of feelings.

10. Discussion of daily routine, how does biofeedback fit in.

11. Eyes closed, autogenic exercises—at end eyes closed 3 to 5 minutes.

12. Discuss necessity of home practice. Two times a day, 5 minutes. School practice, 3 breaths to be done before each new subject begins.

13. Review of week.

Session Four:

1. Ask about questions, home practice, chart.

2. Reaction of parents, friends, teacher, self reaction.

3. Equipment hook up.

4. Relaxation exercise A with therapist, stretching out exercise. Eyes closed for 5 minutes after exercise over.

5. Eyes open, expression of feelings.

6. Eyes closed, do it yourself, 10 minutes.

7. Eyes open, expression of feelings.

8. Discussion of daily routine.

9. Breathing exercise, How does it fit into daily life when busy, under stress, when tired, etc.

10. Closed eyes, Autogenic exercises—stretching out exercise—eyes closed for 5 minutes after exercise over.

11. Discussion of home and school practice and self as agent of change.

12. Review of week.
Session Five

1. Ask about questions, home practice, chart.

2. Reaction of parents, friends, teachers, self reaction.

3. Equipment hook up.

4. Relaxation exercise B with therapist. Eyes closed after exercise, 5 minutes.

5. Eyes open, expression of feelings.

6. Relaxation, do it yourself, eyes closed, 10 minutes.

7. Discussion of daily routine, breathing exercises.

8. Eyes closed, Autogenic exercises, eyes closed after exercise 5 minutes.

9. Discussion, home practice, 2 times a day 10 minutes.

10. Self as an agent of change.

11. Review of week.

12. Talk about the importance of school practice and tell child his teacher will draw a small circle with a face in the corner of the blackboard. When he sees the circle, it will remind him to practice the breathing exercises in class.

13. Time student as to how long he can keep the machine quiet.
Sessions Six, Seven, Eight, Nine

1. Ask about questions, home practice, chart.
2. Reaction of parents, teacher, friends, self.
3. Equipment hook up.
4. Relaxation exercise B with therapist.
5. Eyes open, expression of feelings.
6. Eyes closed, do it yourself 15 minutes.
7. Eyes open, expression of feelings.
8. Discussion of daily routine, breathing exercises.
10. Discussion, school practice between subjects and home practice 2 times a day 10 minutes.
11. Discuss Biofeedback as the beginning of a new control—self control. Self as an agent of change.
12. Review of the week.
13. Time student—length of time he can keep the machine quiet.
Session Ten

1. Ask about questions, chart.
2. Reaction of self to program.
3. Equipment hook up.
4. Final interview questionnaire with child.
5. Have parent do final questionnaire.
6. Discuss fact that child is at the beginning of the road to improved self control and needs to keep practicing.
7. Allow the child 20 minutes on the machine.
8. Discuss with child the necessity of doing home exercises.
9. Tell child that he can come back for a practice session if he feels he needs one.
PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

Appendix A, page 88 (Parent's Questionnaire)

89 (Teacher's Questionnaire)

90-95 (Piers-Harris Children's Self Concept Scale)

University Microfilms International
300 N Zeeb Rd., Ann Arbor, MI 48106 (313) 761-4700
Parent Narrative, Group One

Dear Parents,

1. Was there any difference in the way you treated your child? (During the 10 weeks we worked together.)

2. Did you think biofeedback would change your child's self concept, work habits, behavior? (Before we began the program.)

3. How do you feel now?
Parent Narrative, Group 2

To the Parents,

1. Was there any difference in the way you treated your child? (While waiting for biofeedback to begin.)

2. Do you think biofeedback will change your child's self concept, work habits or behavior?
Teacher Narrative, Group 1

To the Teacher,

1. Was there any difference in the way you treated your student? (During the 10 weeks we worked together.)

2. Did you think biofeedback would change your student's work skills, self concept, behavior?

3. How do you feel now?
Teacher Narrative, Group 2

To the Teacher,

1. Was there any difference in the way you treated your student?

2. Do you think biofeedback will help change your student's behavior, work skills, self concept?
RELAXATION EXERCISE A

Modified by Gail Krieger, M.A. (from Fuller, 19 )

Sit on this comfortable chair and let yourself be as comfortable as possible. Let your mind just drift throughout your body and check that everywhere is loose, relaxed and that there is nothing pulling on your body to make you uncomfortable. Again, make any adjustments necessary so that you are comfortable. Then let your attention just drift to the very top of your head. See chocolate pudding dripping on your scalp and forehead—smoothing out all the muscles in your scalp and forehead. Just let them go, relax them. Smooth those muscles out and let your scalp rest very comfortably on the top of your head. Let that (chocolate) relaxation just flow on over your eyebrows, eyelids, even relaxing the back of your eyes, letting your eyes rest quite comfortably. Continue to let the (chocolate) relaxation flow over your cheeks, lips, and chin, letting your whole face become quite comfortably heavy and relaxed. Pay special attention to your jaw, allowing the muscles that hold up your jaw to relax—just let them go. You will notice that your jaw will be tugged down slightly by gravity and as that happens, your lips will part slightly.

As you relax your face and jaw, also let go of your tongue, throat and your vocal chords, letting your vocal chords become quite with your tongue resting very comfortably on the floor of your mouth.

Let the (chocolate) relaxation continue to flow down the back of your head, letting go of all the muscles along your neck and
shoulders. Smooth out all the muscles of your neck and shoulders. Continue to relax your neck and shoulders and let that relaxation flow down into your arms, relaxing all the muscles of your upper arm down to your elbows and your lower arm, smoothing out those muscles and letting them go. Let go of the muscles around your wrists and hands all the way down to your fingertips, and realize as you let go of all the tightness in your arms, your hands will get warmer.

As you continue to relax your head and face, your neck and shoulders and your arms, let your attention now drift to the upper back and smooth out all the muscles along your shoulders and upper back. Continue to relax all the way along your back bone, down your middle back, down to the lower back, all the way down to the waist and the tip of the spine.

Let that relaxation come around the sides of your body letting go of all the muscles around the rib cage, smoothing them out and letting them go. With every out breath, let your chest become more and more relaxed. Just let your breathing be nice and quiet with your chest as still as possible. With every out-breath, let yourself just float down into that chair. Let the relaxation spread down to your stomach, smoothing out the muscles in the stomach to become quite relaxed. Just observe it.

Let go of all the muscles around your waist, hips, and continue to let that relaxation flow down to your upper legs to the knees, lower legs, letting your legs become quite heavy, comfortably heavy and relaxed. Let go of your ankles, heels, feet—even the soles of your feet and toes. As your legs become comfortably heavy, they
become warmer.

Your whole body from the very top of your head, all the way down to the ends of your toes is relaxed, peacefully calm, quite quiet inside. With every breath now, allow your body to let go a little bit more. With every out-breath, let your body just float on down into the chair. As you relax more and more deeply, remain awake and aware but very relaxed. Relaxation allows your body to have a rest while you are awake and aware.

As we relax together you will find that you will be able to relax faster and faster. Practice at home and at school is very important. Again, allow yourself to be awake and aware but very relaxed. (Fourth session and on) take a few minutes with your eyes closed and let yourself relax even more. When you open your eyes, you will feel like you have had a deep rest and you will feel very well.
RELAXATION EXERCISE B


The aim of relaxation is to leave the every day awake world and enter the world of relaxation. Each person does it in his own way but a good place to begin is to concentrate on the relaxed, pleasant feelings of the body. By learning to relax, you feel better and work better.

Rest comfortably. Let your head be comfortable. Start with a deep breath and as you breathe out, let all the air out with a sound that you can hear. Good. Now concentrate on your own quiet easy breathing. You can feel the rhythm of your breathing as if you were rocking in a rocking chair or slowly swinging in a swing. As you relax, keep your mind on nice body feelings like easy breathing. It will help you to keep out the thoughts that belong to the busy active world. Think of every breath in as fresh clean air entering the body and think of every breath out as a chance to get rid of used up air and body tightness. So, let each out-breath get rid of the tightness in your body. Get rid of the tightness with each out-breath as you keep concentrating on gentle, easy breathing.

After the next few out-breaths, turn your thoughts to your chest. With each out-breath, breathe out the tight feelings from the chest and back. Let your ribs sink in. Let your shoulder blades relax. See and feel the increasing relaxation and heaviness of your chest as you let go a little bit more with each out-breath. Feel your chest relaxing more and more. Turn your attention to your stomach area.
On the next few out-breaths, breathe out the tight feeling from
your stomach and low back. Let your stomach be heavy and relaxed a
little bit more with each out-breath.

Let your legs be very heavy and loose. Feel heaviness in your
knees, your lower legs and down into your feet and toes—very heavy
and loose and relaxed—and let each out-breath relax your legs more
and more, breathing out the tight feelings and the used up air.
Begin to feel a good sense of calm and peacefulness. Let these good
feelings grow and increase.

Pay attention to your shoulders now and see if they are as loose
and relaxed as they can be. Concentrate on your shoulders and let
them droop more and more becoming heavier and looser with each out-
breath. Breathe out the tightness in the shoulders. Let your arms
be heavy, down into the hands and fingers—heavy, still and peaceful.
Feel the relaxation moving into your head and neck. Let the parts of
the face be loose and relaxed. Let your jaw hang loose and when the
jaw is relaxed, the lips are almost always apart. Let your tongue
fall back into the bottom of your mouth like a puddle. Feel the
relaxation in the throat. Let your cheeks droop, heavy and loose.
Think about your eyelids resting gently over your closed eyes like a
smooth, heavy blanket. Think about smoothing your eyes out. Just
smooth them out and smooth out the lines in your forehead. Just
continue smoothing out your whole scalp, even down around your ears.

Your face is nice and relaxed now. Now, let your head become
heavy. Relax all the muscles in your neck, around from front to
back, back to front, and let your head get a little bit heavier with
each out-breath.

Now let's work on feeling more relaxed. Picture numbers as if they were being seen inside your eyes. We will start with 1 and go to 10, each number will make you feel more relaxed and quiet. Let's begin with number one. Picture behind your closed eyelids number one. Feeling calmer and more quiet. See number two. Let the heaviness increase. See number three and more and more feelings of relaxation. See the number four now, more and more quiet and calm. Number five loose, still and relaxed. See number six, quiet, heavy, number seven, nice and free, a nice drifting feeling, like a cloud. Number eight. Your body relaxes further and further. See number nine, more relaxed. Number ten. Very relaxed, very peaceful and calm.

It is good to remember these relaxed feelings many times during the day and you can. Pick a word like calm, or quiet. Say it over and over to yourself in your mind for the next minute or so. Say it over and over while you are feeling quiet and relaxed. When you are busy and tired during your day, you can think of your special word and it will help you to relax.

Now that your body has begun to relax, you can continue with relaxation of your mind by following the light patterns behind your closed eyelids. Everyone can see light patterns. Often, they are pretty colors that shift and change. Sometimes, they are black and white. Sometimes, the light patterns change shape, shift and move and sometimes they flicker. When you notice them just follow them, go wherever they take you. If you don't see them yet, you may want
to bring them on by squeezing your eyes tightly together for a few seconds. Then relax them and notice the light patterns. When you follow your light patterns, go where they take you—let your imagination go—just flow and drift.

Sometimes colors can make you think of peaceful places—perhaps blue becomes the ocean or the sky. Sometimes white or pink can be a cloud. See if you can picture the sky or a cloud. See yourself lying on a cloud and just float there.

When we end our relaxation session, I will count from five to one and when we get to one, you will feel like opening your eyes. It is a nice way to go from being very relaxed to alert and active. Let's count, 5, 4, 3, feeling more like opening your eyes, 2, 1. As you open your eyes, take a big stretch.
AUTOGENIC TRAINING EXERCISES

Elmer and Alyce Green (from Fuller, 19)

1. I feel quite quiet.
2. I am beginning to feel quite relaxed.
3. My feet feel heavy and relaxed.
4. My ankles, my knees, and my hips feel heavy, relaxed and comfortable.
5. The whole center of my body feels relaxed and quiet.
6. My hands, my arms and my shoulders feel heavy, relaxed and comfortable.
7. My neck, my jaws and my forehead feel relaxed. They feel comfortable and smooth.
8. My whole body feels quite heavy, comfortable and relaxed.
9. I am quite relaxed.
10. My arms and hands are heavy and warm.
11. I feel quite quiet.
12. My whole body is relaxed and my hands are warm, relaxed and warm.
13. My hands are warm.
14. Warmth is flowing into my hands. They are warm, warm.
15. I can feel the warmth flowing down my arms into my hands.
16. My hands are warm, relaxed and warm.
17. My whole body feels quiet, comfortable and relaxed.
18. My mind is calm and quiet.
19. I withdraw my thoughts from the surroundings and I feel quiet and still.
20. My thoughts are turned inside and I am at ease.
21. Deep within my mind, I can see myself as relaxed, comfortable and still.
22. I am alert, but in an easy, quiet, inward-turned way.
23. My mind is calm and quiet.
24. I feel an inward quietness.
MINI RELAXATION—BREATHING EXERCISES

By Chuck Strobel, M.D., Ph.D.

1. Become aware of self (if clenching teeth, tight neck).
2. Smile at self—sparkle.
3. Take easy, deep breaths counting 4 in and 4 out.
4. With 4 out, let the jaw drop, and let the air slowly flow out all the way through the toes.
1. Find a comfortable spot where you can be quiet and alone.
2. Close eyes.
3. Drop jaw so that lips are apart.
4. Breathe in to the count of 4 and out to the count of 4. Do this three or four times and then allow breathing to be normal.
5. Start with the head and go through the whole body telling each part to relax.
1. Breathe in to the count of four and out to the count of four just three times.

2. Do it with a still chest so that no one knows what you are doing.

3. Do it before you begin each new subject or school paper.
Homework Practice

Day ____________________________

Practice __________________________