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A study of the use of a neurological motor exercise program with learning disabled students

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A STUDY OF THE USE OF A
NEUROLOGICAL MOTOR EXERCISE PROGRAM
WITH LEARNING DISABLED STUDENTS

MASTER'S PROJECT

Submitted to the School of Education
University of Dayton, in Partial Fulfillment
Of the Requirements for the Degree
Master of Science in Education

By

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UNIVERSITY OF DAYTON

May, 2000

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Reader

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The author wishes to thank Dr. Beverly Tillman for her time and guidance provided throughout this project. Her suggestions and patience were essential to the completion of this paper.

To my two daughters, Kelly Marie Brown and Alana Rose Ann Brown, I give special thanks for your encouragement and understanding. You understood the importance of the many trips to Dayton for classes and long hours of study. I love you both with all my heart.

DEDICATION

I dedicate this project in loving memory to my late husband, David Lowell Brown.

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CHAPTER I

Introduction

Today the role of reading and its importance have extended beyond the world of education. The Federal Government has set national education goals. The President of the United States and the state governors established national education goals for the year 2000. The goals that pertain to teaching of reading are the following: # 1. All children in America will start school ready to learn. #2. American students will leave grades four, eight, and twelve having demonstrated competency in basic subject matter, including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy. # 3. Every adult will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship (National Governors Association, 1990; Lerner, 1993).

Research has shown that reading is a lifelong process, not merely a word recognition routine. Reading involves the whole person. It can be the cause of success or failure. Mercer & Mercer (1993) state that reading experiences strongly influence a student's self-image and feeling of competency; and in fact, reading failure can lead to misbehavior, anxiety, and a lack of motivation. Moreover, Mercer & Mercer (1993) tell us that in American culture, learning to read is important in maintaining self-respect and for obtaining the respect of others.

Historically all of the approaches used for the diagnosis of remediation of reading problems have been peripheral in nature. We assess students with their reading skills and prescribe a certain technique to develop their skills hoping that this will fix their problem. There have been many programs prescribed for children to help correct or improve reading deficiencies such as Reading Recovery, Success for All, and Head Start which has been funded and supported by the Federal Government. Even with all these programs students still struggle with reading even as they enter their later years of schooling.

Background

The high dropout rate of students who are in Learning Disability programs suggests that we are failing to serve these students appropriately. This researcher has chosen to use the capitalized form of Learning Disability or Learning Disabled in this thesis. Many students with Learning Disabilities who drop out of school face an uncertain and grim future in the streets (Zigmond, 1990; Lerner, 1993). Without the ability to read efficiently they will find it harder to be productive citizens.

As we consider these Learning Disability students and their treatment, it is preferable to treat and correct the cause of the symptoms rather than to treat only the symptoms (Owens, 1976). The neurological development and organization of the human organism is the key to language and reading development and to language and reading difficulties (Delacato, 1956).

In reviewing the literature, it is evident that Delacato (1956) and Doman (1974) are strong proponents of using motor neurological exercises to help meet the needs of children learning to read and to improve their reading. They have worked with all types

of children with brain injuries and have been very productive in helping the children to improve their reading. They used a total-body sensorimotor program, which involved exercises dealing with all the senses and motor movements of a person. Hannaford (1995) tells us that the more closely we consider the elaborate interplay of brain and body, the more clearly one compelling theme emerges: movement is essential to learning. Movement awakens and activates many of our mental capacities. Movement integrates and anchors new information and experience into our neural networks. And movement is vital to all the actions by which we embody and express our learning, our understanding and our selves.

Sister M. Vivian Skluzacek (1972) conducted an experimental research project utilizing Delacato's (1956) methods of the total-body sensorimotor program. The project had a time span of seven months. She used 90 first graders for her subjects. The Experimental Group consisted of 45 first graders enrolled in a school. Then she selected children matched in age, sex, I.Q. and reading readiness achievement from two other first grade classrooms for her control group. The results showed up with greater than normal reading improvements. These students were tested for the next four years and it was found that the experimental group retained its lead in reading scores over the control group. She also reported other individual changes as they occurred to the students (Gold, 1986).

Statement of the Problem

The problem is the low reading achievement of Learning Disabled students. The purpose of this study was to investigate the effect of neurological motor exercises on achievement of reading with Learning Disabled high school students. The students will

be both freshmen and sophomores at a suburban high school in the Southwest region of Ohio. It was anticipated that vocabulary, comprehension, and total grade level would all improve. As a result of the improved skills, the students would feel better about themselves and their ability to read and desire to continue reading.

Statement of the Hypothesis

Even with increased knowledge of the brain and its function and new reading intervention programs, Learning Disabled students struggle. Learning Disabilities represent a subtle malfunction in the most complex element of the human body, the central nervous system that is stated by Lerner (1993). Owens tells us that adequate neurological organization has been recognized to be the basis for success in reading (1976). Therefore, it was hypothesized that high school Learning Disabled students who participate in a neurological motor exercise program will exhibit a higher achievement score in reading than high school Learning Disabled students who do not participate in the neurological motor exercise program.

Limitations of the Study

There are some limitations of this study that should be considered. One area is the limited number of students participating, due to the researcher utilizing only the Learning Disabled English classes at her place of employment. There were only two classes scheduled for the year and each class had approximately fifteen students. Another area of concern is the short period of time of six weeks to conduct this experimental study. The time period of the school year chosen consisted of a week after proficiencies were given and ended just prior to Christmas break.

List of Terms

This project employed the following definitions offered here for better reader understanding.

Learning Disabilities – Lerner (1993) gives the definition of Learning Disabilities as those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculation. Such disorders include conditions like visual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such terms do not include children who have learning problems, which are primarily the result of visual, hearing, motor handicaps, or mental retardation. Emotional disturbance, environmental, cultural, or economic disadvantage are also not considered.

Neurological Dysfunction– Lerner (1993) states that neurological dysfunction is considered a dysfunction in the central nervous system.

Plasticity– Ramey (1999) tells us that plasticity describes the brain ability to undergo physical and chemical changes – growing new connections of neurons in enriched environments and losing many connections when the stimulation isn't there.

Summary

This chapter introduced the problem and gave a brief background of information that was relevant to the problem. Then a statement of the problem with a hypothesis was given. Included was a list of terms and a summary of the chapter. The next chapter gives a review of related literature in reference to the problem.

CHAPTER II

Review of Related Literature

The United States Department of Education reports that 3.6 percent of children in the United States were classified as having a Learning Disability in 1990. The percentage of children, ages 6-21, classified as having learning disabilities has increased over the past twenty years (Lerner, 1993). Fifty-seven percent of these children receive a high school diploma and the other forty-three percent either drop out of school or their status is unknown (U.S. Dept. of Ed., 1991; Lerner, 1993). Mercer (1993) suggests that reading difficulties are the principal cause of failure in school.

Learning Disabilities

Mercer (1993) has assessed and found that about ten to fifteen percent of the general school population experiences difficulty in reading. If this is the case, then the average child is not functioning half as well as he ought to be, and everybody who has thought about it knows it (Doman, 1974). Reading failure is usually the first symptom which shows that the child is having a learning problem (Gold, 1986). According to statistics compiled by Skin (1998) there were 2,513,977 students, ages 6-21, served during the 1994-95 school year categorized as Specific Learning Disabilities. Mercer (1992) writes that 85% to 90% of all students with Learning Disabilities have reading problems.

A common observation is that more boys than girls seem to be identified as having Learning Disabilities. Sternberg (1999) states that the most obvious characteristic of children with Learning Disabilities is that boys appear to be affected at a much higher rate than girls. There is a familiar pattern of a greater prevalence of reading disabilities for boys. In studies that compare sex ratios, boys do outnumber girls, ranging from twice as many to eight times as many boys (Shaywitz & Shaywitz, 1988). Delacato (1956) has

found with his research that boys have reading problems in a four to one ratio to girls. Owens (1976) has found that girls, though not totally exempt from poor neurological organization, have a milder neurological learning disability compared to the boys which might account for fewer number of girls with reading difficulties than boys. Delacato (1956) suggests that birth statistics indicate that boy's heads are larger at birth than are the heads of girls. It would possibly follow that with boys, the birth process would be more difficult or that the period between leaving the dependence of the mother and beginning breathing would be longer with boys than with girls. If there were some anoxia present, the highest level cells would be damaged first. The other cells might not be affected at all. Delacato (1956) believes that the child with a severe reading problem might have suffered some anoxia and hence brain damage either during birth or subsequent to it. In a series of articles Geschwind and Galaburda (1985a, 1985b, 1985c) have presented a unified hypothesis about the biological mechanisms that lead to the unusual lateralization of cerebral functions. These authors have proposed that lateralization of brain functions is influenced by neurochemicals such as sex hormones present in the maternal uterine environment. Because males are more likely to have above-average amounts of fetal testosterone, atypical cerebral lateralization is likely to be seen in more males than females.

Reading Deficiencies

Gold (1986) found with her research that Learning Disabled students who struggled with reading had one or more of these characteristics. These characteristics included a lack of coordination, lack of a dominance, left handedness, loved music, reversal of letters, poor speller, no consistent slant of their handwriting, and difficulty with vision

even though their eyes tested normal. She also found that everyone who struggled with reading had better language understanding through their ears than through their eyes.

Gold (1986), in addition, found through her research that the problems that had been isolated in the poor readers all indicated that the child's nervous system was not well organized. The work with brain injured children had shown that the brain does not develop normally if a stage of development is missed. EEG tests were not able to show any abnormality in the brains of Learning Disabled students; therefore, it seemed as if the child might have missed a certain stage in the normal development. Hannaford (1995) states that we have known for years that children who miss the vitally important crawling stage may exhibit learning difficulties later on. Crawling, a cross-lateral movement, activates development of the corpus callosum.

Neurological Development of the Brain

What is the normal development of the brain? Sinatra (1984) tells us that the first pound of the adult three-pound brain forms by birth. This means that during pregnancy, there is a rapid development of neurons or brain cells, so at birth the neurons that regulate vital life functions like breathing and blood circulation are functioning. These neurons are generally complete in cell body, but they lack connective bridges with other neurons. The second pound of brain weight develops from birth until about the child's first birthday. This is the time the youngster is laying the neurological foundation for consciousness and language. The third pound of brain weight extends roughly between ages 2 to 16. The increased weight is due to a greater network of branched axons and dendrites which form among the neural cells and the formation of the insulating sheath – the myelin – around the axon fibers.

We are born with all of these neurons and at birth only a very few of them are wired in and functioning. As various experiences and activities stimulate the brain, more and more of these neurons come into functional actions, and the capability for more complex performance tends to increase (Owens, 1976). Owens also states that with 10 to 30 billion neurons in our brain only 5 to 10% of them are wired into the circuitry and are actually being used, while the other 90% are just being carried around. So the possibilities are astronomical regarding what we can achieve with our brain if we could use more than the normal 5 to 10%.

Vitale (1982) has stated that the brain is composed of two hemispheres, left and right which are connected by the corpus callosum. The corpus callosum, actually a bundle of nerve tissues, integrates the operations of the two hemispheres. It provides communication between them and allows the transmission of memory and learning. Herrold (1989) has also discovered the same facts of the function of the corpus callosum in his research. Sinatra (1983) states that the transmission through the neuron is electrical. The development of myelin or the myelin sheath is an important process in electrical transmission to enable the neuron to function effectively. The myelin acts as an insulating layer around the axons in particular to ensure that messages reach other neurons in the circuit without the degradation of message.

The popular belief holds that the brain functions metaphorically like a computer and that by evaluating the actions of electrical and neurochemical energy transmissions within a specific, localized area such as the left or right hemisphere, one can understand and potentially control certain functions, including learning. Most contemporary neuroscientists, however, suggest a much more holistic metaphor for brain functioning

that is far more complex and difficult to measure (Gatewood, 1989; Restak 1985).

Herrold (1989) states that anytime we consider the brain we must bear in mind that it has no truly separate parts – every part is elaborately interconnected with all other parts, and the brain always operates as an intricate system. Caine & Caine (1997) tells that perhaps most important is the growing evidence that our brains are whole and interconnected.

Even though there are a multitude of specific modules with specific functions, thought and emotions, physical health, the nature of our interactions with others, even the time and environment in which we learn, are not separated in the brain. They are not dealt with one thing at a time. A whole event is registered and colors or influences how and what we learn. Areas of the brain interact like an interdependent web. Levy (1985) stated that it is quite impossible to educate one hemisphere at a time in a normal brain.

The right hemisphere is educated as much as the left in a literature class, and the left hemisphere is educated as much as the right in music and painting classes. Sunbeck (1996) tells us that the two hemispheres of our brains have the ability to operate somewhat independently of each other. They also communicate with each other across the corpus callosum, a rather complicated bunch of nerve fibers that runs across the middle of our brain, attaching the left and right hemispheres.

Neurological Organization

Dr. Richard Restak (1979) points out that the immature brain is dependent upon sensory stimulation for normal growth, development, and function. In fact, he compares sensory stimulation to a “nutrient.” The sensory stimulation refers to information that reaches the developing brain through the senses – vision, hearing, touching, tasting, smelling, and sensation. Posner (1994) states that there is evidence that even the maps in

the primary sensory cortex can be altered if an animal is deprived of sensory input. A child must go through different stages of development using these senses in order for the brain to become fully developed. Haywood (1986) shares in her research that the emergence of rudimentary motor skills is related to the ongoing development of other body systems, such as the neurologic and muscular systems. Doman and Delcato (1974) described the stages that a child must go through by creating the Doman – Delacato Developmental Profile. It refers to the stages of development that a child goes through from birth to the age of three. They list eight different brain stages and their corresponding time frames. The areas of concern include Visual Competence, Auditory Competence, Tactile Competence, Mobility, Language, and Manual Competence. Sunbeck (1996) titles her neurological development exercise program Infinity Walk. She states that it is her name for a sequence of progressively more complex challenges to the sensory and motor nervous system. It starts with the development and refinement of motor coordination across both brain hemispheres, while improving body image and kinesthetic (movement) awareness. This integration of the muscular system is a necessary foundation for the demonstration of all types of learning. Without a hemispherical integrated motor nervous system we are unable to fully express our intelligence and creativity. Gold (1986) stated that when she evaluated children it seemed as if the students who struggled with reading might have missed a certain stage in their normal development. Gold states, this missing stage maybe the creeping stage; but the delays might also have been caused by lack of crawling. Hannaford (1995) tells us the importance of crawling by informing us that cross lateral movements, like a baby's crawling, activate both hemispheres in a balanced way. These activities work both sides

of the body evenly and involve coordinated movements of eyes, both ears, both hands and both feet as well as balanced core muscles. When eyes, both ears, both hands and feet are being used equally, the corpus callosum orchestrating these processes between the two hemispheres becomes more fully developed. Because both hemispheres and all four lobes are activated, cognitive function is heightened and ease of learning increases.

Skluzacek (1972) states, when neurological organization is complete through all levels to total unilaterally, the problems of poor readers vanish. Once neurological organization has been achieved, reading methods are secondary. Sternberg (1999) states in his book that the work of Tallal and colleagues (1996) found evidence to indicate that children with language and reading disabilities suffer from deficits in perceiving temporal – order effects in speech. Using a computer – based intervention program that facilitates a developing sensitivity to the temporal – order perception of speech she has reported significant gains by her students in reading skills. Delacato (1959) reported that two out of five children seen in the country's leading reading clinics have been traumatized or have been deprived environmentally, resulting in a lack of complete neurological organization, which, in turn, creates the reading problem.

We assume that when children enter school they are ready to learn and if they have any difficulties with learning, we generally look at the types of methods used as the cause of the problem. Lerner (1993) states that many different kinds of treatments are prescribed for individuals with learning difficulties, including medication therapy and various forms of diet control. Very seldom do educators look at children in relationship to how they process the information within their brain. Many educators believe that the brain and its function can not be changed beyond pre-school age. Hannaford (1995) tells

us that we must get away from the notion that we simply experience the world until we go to school at the age of five and then we learn. She also informs us that the strongly held misconception in our society is that the mind and body are separate - that movement has nothing to do with intellect. However, Gold (1986) tells us that there is no truth to the belief that nothing can be done about the function of the brain. She also states that the brain is not a static thing. Doman (1974) tells us that the world has regarded brain growth and development as if it were predetermined and unalterable. Instead, brain growth and development is a dynamic and ever – changing process. It is a process that can be stopped, slowed down, and, most significantly, it is a process that can be speeded up. “Plasticity” is the term coined by Ramey (1999) to describe the brain's ability to undergo physical and chemical changes – growing new connections in enriched environments and losing many connections when the stimulation isn't there. He states that windows for development close early in some areas. If cells that develop certain skills are not stimulated they will wither away or move on to other tasks. Hannaford (1995) in her research states that neural plasticity is an intrinsic, beneficial characteristic of the nervous system which gives us both the ability to learn, and the ability to adapt in response to damage – to relearn. Most neural pathways develop through stimulation and experience gained from interaction with the environment. Caine & Caine (1997) further states that although the brain is far more plastic in the early years, plasticity continues for life.

Owens (1976) reported that the neurological development on which reading and learning depend can be accelerated and advanced by appropriate physical stimulation. Owens further states that with knowledge of these principles and their energetic

application, almost anyone can move up the neurological organization scale from the present level to a higher station. He further states that these principles can be applied to benefit "normal" individuals as well as brain - injured. Sunbeck (1996) also makes a statement about her Infinity Walk to help "normal" individuals. She tells us that Infinity Walk can be equally helpful to a child labeled Learning Disabled as it can be to a dancer, a college student, or a housewife trying to get up the courage to take the first step toward joining the professional world.

One experimental research study was done by Sister M. Vivian Skluzacek, S.S.N.D. (1969). This was a longitudinal study involving five years of data. The first year, children in the experimental class were given the developmental program following the design of Delacato. Not only did the final results at the end of the school year show up in greater than normal reading improvement, but Sister Vivian reported other individual changes as they occurred from month to month. Some of these were that hyperactive children calmed down, speech problem children showed improvement, and short attention spans became longer. The scores for the children in the study were reported for each of the next five years. The experimental group retained its lead in reading scores over the control group during the five-year period.

In summary, Lerner (1993) tells us that many of the ills of our society have been related to reading difficulties. Very poor reading skills are often found among the chronically unemployed, school dropouts, and juvenile delinquents. Upon examination, many of the problems of our schools, of poverty, and of the concerns of troubled parents as well as the plight of most students with Learning Disabilities are associated with poor reading. Looking at the Learning Disabled student with poor reading skills, it is

preferable to treat and correct the cause of the symptoms rather than to treat only the symptoms (Owens, 1976). Some researchers believe that the key to correct the cause of the symptoms is to stimulate the brain in order to establish an adequate neurological organization so the brain can function more efficiently. Owens (1976) tells us that adequate neurological organization has been recognized to be the basis for success in reading.

Summary

The second chapter of this project took the related literature to this problem and presented it into four categories. They were Learning Disabilities, Reading Deficiencies, Neurological Development of the Brain, and Neurological Organization. The next chapter provides the research design for the study.

CHAPTER III

Methodology

Purpose

The purpose of this study was to investigate the effect of a neurological motor exercise program on the achievement of the reading ability of high school Learning Disabled students. For this research project the independent variable was the neurological motor exercise program which was administered to the experimental group. The control group did not participate in the program. The dependent variable was the achievement in reading scores measured by the posttests between the experimental and control groups.

The subjects for this study were not randomly selected for a number of reasons. One reason is that there is a small population of Learning Disabled students to choose from at the high school level. Another reason is that not all Learning Disabled students are deficient in just the reading area.

Hypothesis

Learning Disabled students struggle with their reading skills throughout their school years and even into life away from school. Even with increased knowledge of the brain and its function and quick fix programs given to these particular students, they still go through the school system with only a minimal increase in reading abilities. It is well established that a child whose brain is neurologically organized has the foundation for success in reading (Gold 1986). Therefore, it is hypothesized that high school Learning Disabled students, grades nine and ten, who engage in a neurological motor exercise program will exhibit a higher achievement score in reading than their counterpart group who do not engage in the neurological motor exercise program.

Population / Sample

The target population for this study was Learning Disabled students in high school who have a deficiency in reading skills. The researcher's accessible population sample included thirty-one students from a required Learning Disabled English course at a suburban high school in Southwest Ohio. Half of the Learning Disabled students were freshman and the other half were sophomores. Due to the limited number of students labeled Learning Disabled with deficiencies in reading, this researcher chose to use a quasi-experimental design to obtain her subjects. There were two separate Learning Disabled English classes offered within the high school system. One class contained sixteen students, which were designated as the control group. The other class consisted of fifteen students, which became the experimental group.

Design

The researcher used an individual pre-test and post-test score design to test her hypotheses. The independent variable was the treatment of the neurological motor exercise program on the experimental group. The dependent variable was the achievement in reading scores measured by the post-test administered at the end of the program. The post-test group scores were compared to the pre-test group scores to determine the effect of the treatment program.

Instrumentation

The instrumentation utilized in this research project was the TABE (Tests of Adult Basic Education) test. This test is a reprint of the California Achievement Test (CAT), 1970 edition. The test is published by CTB / McGraw – Hill, Del Monte Research Park, Monterey, California 93940. Even though the test was modified for adult basic

education, it was intended for grade school children. All of the interpretive information is based on children's scores.

The TABE, 1976 Edition, includes achievement tests in reading, mathematics, and language – basic skills required to function in a society that demands their constant use. The test items, adapted from the 1970 CAT, reflect language and content appropriate for adults, and measure the understanding and applications of conventions and principles; they are not intended to measure specific knowledge or recall of facts. This researcher chose TABE so she could provide pre-instructional information about a student's level of achievement in the basic skills of reading, and to measure growth in the skills after involvement in the neurological motor exercise program. She chose to use only the reading section of the test.

The CAT – 70 reports a satisfactory high K-R 20 reliability for school children. The alternate form coefficients for the total battery range from .86 to .96 with a median of .93. For the reading they are .80 to .91 with a median reliability of .87. The median reliabilities are lower for the subtests of vocabulary, .84; comprehension, .79. The subtests are suitable for group measurement.

On November 1st, 1999 the reading section of the TABE test form A was administered to all students in the two Learning Disabled English classes in the high school. The other Learning Disabled English teacher followed the directions as stated in the manual of the TABE test. On the same date this researcher also administered the same test to her Learning Disabled English class at the high school.

Starting on the following day of testing the treatment program began. The Experimental group followed the neurological motor exercise program that was

designated. The program consisted of four specific exercises, which were done each day at the beginning of the class. It took approximately ten minutes per day for the subjects to complete. The four specific neurological motor exercises for this program were orange x, cross – lateral marches, in – position crawling, and lazy 8's. The orange x and in – position crawling are from a book by Carl Delacato (1982). The other two exercises, cross – lateral marches and lazy 8's, are illustrated in Paul Dennison's Book, Brain Gym. (1986)

Exercise 1: Orange X

The first of the four exercises called orange x involves an orange x approximately 6 inches in size on white paper. This is mounted on a wall at eye level of the student. The student faces the x and follows the instructions of the teacher. The teacher reads the following instructions and the students perform the movements. The number of times read by the teacher is also listed.

The teacher first says hand and the student's eyes look at his hand as his right hand moves up next to the x. Then the teacher says x and the student looks at the x and his right hand returns to his side. She says this 6 times. When she continues, the student will move his left hand up to the x and back down 6 times.

Next, the teacher will say foot and the student will move his right foot forward and return it to it's original position when she says x. This is done 6 times. When she continues this, the student will move his left foot forward and return it 6 times also.

Then when the teacher says hand again, the student will move his right hand and foot at the same time forward to the x and back again when the letter x is stated. The student will look at the hand as it moves. The left hand and left foot will alternate with the right

hand and right foot every other time. This is done 10 times. After these ten times, the teacher will say foot and the student will move both his same- sided foot and hand and alternate each time. This is also done 10 times.

The last section of this particular exercise involves the student moving the opposite hand and foot each time the instructor calls out either foot or hand. When the instructor says foot or hand the student looks at their right or left hand or their left or right foot. These exercises are having the student alternate the hand and foot each time. Each time the instructor says x, the student looks at the orange x in front of them. These are done 10 times for each side.

Exercise 2: Cross - Lateral Marches

The second exercise is called cross – lateral marches. The subjects stand in a balanced position with feet directly over each shoulder. The instructor reads numbers from one to fifty. The students raise one arm simultaneously with the opposite leg as the instructor says each number. The hand of the arm that is raised touches the opposing knee that is raised at the same time. With alternating numbers the opposite arm and leg is moved in a cross – lateral pattern. The student stays in one location while doing this exercise.

Exercise 3: In – Position Crawling

The third exercise is called in – position crawling. It is similar to cross – lateral marches. As the knee is brought up the opposing arm is stretched out in front of the student and the head is titled to the side of the outstretched arm and rests on the student's shoulder. As the instructor calls out the numbers one to twenty the student alternates from side to side. This exercise is also done in a stationary position.

Exercise 4: Lazy 8's

The last exercise is called lazy 8's. The student makes a fist with the thumb on the outside of the fingers. The hand is held approximately eight inches in front of the student's nose. The hand rotates in the air in a clockwise motion circling around the right eye viewing area first and then comes back to the center of the nose. Then the hand rotates in a counter clockwise motion around the left eye and returns to the nose in space. This exercise is done three times with the right hand, three times with the left hand, and finally three times with both hands which are interlocked with both thumbs out. The eyes are fixated on the thumbs as the hands go through the movements.

Duration of the Intervention

The experimental research project was designed to last six weeks. The pre-testing was initiated the first day of November. This test was administered to all students in the two classes of Learning Disabled English. The neurological motor exercise program began the following day with only the experimental group. The program continued for the entire six weeks. At the beginning of week seven, tests were administered to both the control and experimental groups.

Data Analysis

This researcher chose to use ANCOVA, analysis of covariance, described in Educational Research, (Gay, 1996) to interpret the data collected by this research project. This inferential statistical technique was chosen as it adjusted post-test scores for initial differences and compared adjusted scores of the subjects. Since my study involved

existing groups, this method was best suited for my project, but results must be interpreted with caution.

The researcher's null hypothesis states: There is no significant difference between the reading levels of Learning Disabled high school students who received the neurological motor exercise program and Learning Disabled high school students who do not receive the neurological motor exercise program.

Summary of the Study

If the results of this research project reject the null hypothesis then the treatment would show benefit to not only older Learning Disabled students who are deficient in reading skills, but could be implemented with all ages of Learning Disabled students. In fact, if it helps Learning Disabled students, it could very well help the average student become more proficient in their reading skills also.

There could be further research done to see if this treatment would not only affect the Learning Disabled student's reading level, but also have a proficient impact on other areas of learning. This experimental research project could be implemented with average ability level students in high school to improve their achievement level in reading scores. By doing the four exercises, it is possible that this exercise program could improve reading skills with average ability level students and could be adopted for universal usage.

Summary

This chapter presented the detailed information of the research project. The sections included were: the purpose of the project, the hypothesis, the population / sample used,

design, instrumentation, time factors, data analysis, and a summary of the project. The next chapter will describe the results of the study.

CHAPTER IV

Results

The purpose of this study was to determine the effect of a neurological motor exercise program on the achievement of the reading ability of high school Learning Disabled students. Half of the students in the study were freshmen and the other half were sophomores at a suburban high school. The experimental group participated in a specific neurological exercise program on a daily basis for a period of six weeks. Both groups were given a pre and post- test. Students were administered the same testing instruments at the same time. This researcher sought to determine if there would be a significant difference in the reading ability level of the experimental group as compared to the control group.

The results of the testing showed that there was no significant difference in the performance of these two groups. This supports the null hypothesis and, therefore, the null hypothesis can not be rejected. The researcher's null hypothesis states that there is no significant difference between the reading levels of Learning Disabled high school students who participated in the neurological motor exercise program and Learning Disabled high school students who did not participate in the neurological motor exercise program.

In order to determine whether or not there was a significant difference between the scores of the experimental group and the control group, an ANCOVA, analysis of covariance was used. Gay (1996) recommended using this method. The evidence in this sample does not conclude that the population means of the post-test scores across the control and experimental groups support the hypothesis. This analysis does not control

for differences in the pre-test scores. Statistically, the students' pre-test scores indicated how well they would perform on their post-test scores.

The student's individual scores on the pre-test and post-test can be found in Appendix A, Table One. The table lists the students in either the control or experimental group with their pre and post-test scores with a score to show a gain or loss. Table Two shows a graph with data collected from the experimental group. It lists the pre and post – test scores of each student with a linear line to designate the average of all the students' scores. Table Three shows a graph of the control group with the students' pre and post-test scores and a linear line designating the average of all the students' scores.

As these graphs and chart show, there are no significant gains in the experimental group compared to the control group, substantiating the null hypothesis.

Limitations of the Study

There are several factors that may have influenced the results of the study. The testing instrument itself had several limitations. The test used (TABE) was modified for adults, but was intended for grade school children. It might have been more advantageous to use a test created just for children testing their reading ability levels. Another possible factor of using this test was that it was very lengthy. There were two sections, one vocabulary and the other comprehension. It took the students an entire fifty-five minutes to complete it. Many students kept eyeing the clock as they answered the questions on the test. This researcher noted that some students lacked patience and rushed through the test just to complete it before the end of the period. It would have been better to divide the test into sections and administer each section over a period of days.

Another significant factor to note is the accessibility of the target population, which was very limited since the researcher restricted the population to include only Learning Disabled students in this suburban high school. There were only thirty-one students enrolled in the two Learning Disabled English classes. The students were composed of freshman and sophomores. The ideal population would have been a group of Learning Disabled students chosen randomly. These students could then be matched according to their IQ, sex, and reading ability level into the control and experimental groups. Sister Skluzacek (1972) matched her students up according to IQ, sex, age, and reading readiness achievement. Her results showed greater than normal reading improvements. Using younger Learning Disabled students would have been an advantage compared to using high school students in this experimental project. Younger students might be more cooperative as they would be less self-conscious of doing the exercises in front of their peers. Besides, younger children generally enjoy being very physically active compared to staying still. With Sister Skluzacek's (1972) research project, she targeted her population for first graders and the results from her research project showed significant reading improvement as stated in Chapter II.

The chosen time for the research project could have been another factor that influenced the results of the study. The time of the day that the exercises were done could have been an influence also. This researcher had the students perform them in the morning. Maybe the afternoon would have been better as the students seem to be more awake and have more energy after lunchtime. Choosing this time of the year was not an advantage as the students had just completed taking the ninth grade proficiency test the week prior to the pre-test that was given. They might have been feeling stress with taking tests every day

the week before. When the post-test was given, it was just a couple of weeks before Christmas break. Students were definitely inattentive as shown by their actions; they would ask to get drinks, sharpen their pencils, visit the office, etc. Their concentration and interest in doing well was not observed. This researcher feels that a year long study would not only benefit the project, but also prevent student stress in taking the pre and post-tests in such a short period of time with all other testing that students are involved in.

Another area of concern that this researcher perceived was a lack of motivation of the Learning Disabled high school students to participate in this research project. Students agreed to participate as a favor to this researcher. After about two weeks into the project, the students began to question how much longer they would have to do the exercises. Some students began to make excuses about participating in the exercises. But, at one point, a student encouraged the others to continue as he enjoyed the exercises. Other students then continued in the program until the end of the six weeks. As Mercer & Mercer (1993) told us in Chapter I, reading experiences strongly influence a student's self-image and feeling of competency; furthermore, reading failure can lead to misbehavior, anxiety, and a lack of motivation. This researcher believes that by the time the Learning Disabled student reaches high school, he has had many failures. These failures would create a lack of motivation on the part of the student to try any new techniques.

This researcher also noted that the students in the experimental group became self-conscious in participating with their peers in performing the exercises. Since students used in this study were both freshmen and sophomores, the freshmen were probably a

little more self-conscious. Transitioning into a high school setting can cause students to be more sensitive of what others think. They definitely did not want students outside the classroom to see them; they requested that the classroom door be closed. Maybe if the students were given the exercises on an individual basis or in a tutoring setting, they might have been more motivated to do well.

This researcher can not reject the null hypothesis which states that there is no significant difference between the reading levels of Learning Disabled high school students who participated in the neurological motor exercise program and Learning Disabled high school students who did not participate in the neurological motor exercise program. The analysis of covariance supports the null hypothesis.

Summary

This chapter gave the results of the project; included were graphs and a chart giving explanations of the results. The limitations of the study with the researcher's comments were also included in this chapter. The next chapter will give a comprehensive report of the project's summary, conclusion, and recommendations.

CHAPTER V

Summary, Conclusion, Recommendations

Summary

The purpose of this study was to investigate the effects of a neurological motor exercise program on the achievement of the reading abilities of high school Learning Disabled students.

It has been noted that a child must go through stages of physical development in order to develop and stimulate their associated sections of the brain. Some researchers believe that students who struggle with reading might have missed a certain stage in their normal development (Hannaford, 1995 ; Gold, 1986). By taking the students back to that developmental stage and having them perform the exercises associated for stimulation of brain, this researcher hypothesized that the students would increase their reading ability level. With neurological organization, the researcher believed the poor reading ability of these Learning Disabled high school students would improve.

So it was hypothesized that high school Learning Disabled students who participated in a neurological motor exercise program would exhibit a higher achievement score in reading than high school Learning Disabled students who did not participate in the neurological motor exercise program.

The researcher chose four exercises that were described as neurologically stimulating motor exercises used to help the brain function more efficiently. Sister Skluzacek (1969) utilized the exercises in the past to help develop an adequate neurological organization with her students in her research. The four specific neurological motor exercises for this project were: orange X, cross-lateral marches, in-position crawling, and lazy 8's. The

students performed these exercises at the beginning of each day for approximately ten minutes.

The population that this researcher used in her project were not chosen at random for a number of reasons. One was a limited number of Learning Disabled English classes offered in the high school. Another was the time frame to complete this project. The population consisted of thirty-one Learning Disabled freshmen and sophomores at a suburban high school located in Southwest Ohio. They were enrolled in a Learning Disabled English class at the high school. One class was designated as the control group and the other the experimental group. The control group consisted of sixteen Learning Disabled high school students who participated by taking a pre-test and post-test. The instrument used for the pre-test and post-test was the TABE Test. The experimental group was fifteen students enrolled in the researcher's Learning Disabled English class. These students were given both the pre-test and post-test; but they also participated in the neurological exercise program defined in the project for a period of six weeks.

An ANCOVA (Gay, 1996), was used to interpret the data collected by this research project. This inferential statistical technique was chosen as it adjusted post-test scores for initial differences and compared adjusted scores of the subjects. The ANCOVA showed that the experimental group made no significant gains compared to the control group. In fact, the means across the control and experimental groups had the same results.

The null hypothesis has to be accepted; this states that there are no significant differences between the reading levels of Learning Disabled high school students who participated in the neurological motor exercise program and those Learning Disabled high school students who did not participate in the neurological motor exercise program.

Conclusions

This experimental project showed that Learning Disabled high school students who engaged in a neurological motor exercise program did not exhibit higher achievement scores in reading than their counterpart group who did not engage in the neurological motor exercise program.

There were many contributing factors that may have influenced the results of this project. The testing instrument itself, the TABE Test, had several limitations. It was originally a test for adults, but was modified for children. It was also a very lengthy test.

Another factor was the technique used to choose the population for this study. Instead of using a random sampling, this researcher chose to use the students from a suburban high school where she is a Learning Disabled instructor.

Another factor could be that the time of the year and day put limitations on the results of the project. The students were involved in other tests prior to when this study started. Also, the study concluded just a couple of weeks before the Christmas break. Students shared their disinterest in participating in the study after a couple of weeks and complained about having to do the exercises each morning.

Another area of concern was that many of the students seemed to lack motivation to perform well. They seemed to rush through the testing and they created excuses to eliminate their involvement in the program. In conclusion, there were many factors that put limitations on the results of the study.

Recommendations

The review of the literature suggested that the neurological motor exercise program should show a significant difference between the control and experimental groups with reading achievement levels.

An ideal study that this researcher would like to propose would be a study performed with younger students over a longer period of time. The students would be selected on the basis of their IQ, reading ability level, sex, and age. The control group according to these requirements would be matched to an experimental group. Extending this study to an entire year would eliminate some of the limitations that were shared in Chapter IV in this research project.

I would recommend that someone who desires to conduct this same research project again with high school Learning Disabled students would need to give the students the exercises on an individual basis or in a tutoring setting. Also, consideration should be given to the students' preferred time of day to participate in the neurological motor exercise program. Some students are more alert in the morning and others in the afternoon. If they could choose when to participate, they would naturally be more alert and might be more willing to engage in the exercises. This would prevent the students from creating excuses for not doing them. This would also help the students become less self-conscious by doing the exercises with only one other person present. This researcher would also suggest that if the TABE Test is used, it should be divided up into sections and given over a period of several days. This would probably give a truer picture of a student's reading ability level.

Another consideration in conducting this research project again would be to give motivational rewards at interim times during the study. Because Learning Disabled students lack motivation and self-esteem according to Mercer and Mercer (1993), they need to be compensated by some form of token. Obtaining a token of their choice, which would be mutually agreed upon before the start of the study, could stimulate better performance of the students.

A final consideration for conducting this program with high school students would be to have the students sign a contract. By signing it, they might be more committed to doing well as their signature shows an agreement to the conditions stated in the contract.

This researcher recommends that this project should be repeated, but with modifications to support her hypothesis. Enormous amounts of research studies listed in Chapter II support the hypothesis. The authors cited in the related literature and this researcher believes that Learning Disabled students who participate in a neurological motor exercise program will exhibit a higher achievement score in reading than students who do not participate in the neurological motor exercise program. This study could be further validated with a longer period of study and with modifications as elucidated previously in this paper.

This last chapter consists of a summary, conclusion, and recommendations of this research paper.

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APPENDIX TABLES

Table 1
Scores of Pre and Post Tests

Control	Pretest	Posttest	Post-Pre	Exp	Pretest	Posttest	Post-Pre
c1	4.7	4.6	-0.1	e1	6.6	5.6	-1
c2	5.5	4.3	-1.2	e2	6	5.9	-0.1
c3	5.1	4.2	-0.9	e3	9.2	7.8	-1.4
c4	5.3	5.3	0	e4	4.3	3.7	-0.6
c5	5.0	6.1	1.1	e5	6.6	6.3	-0.3
c6	4.0	5.9	1.9	e6	4.6	3.1	-1.5
c7	5.5	5.8	0.3	e7	5.5	5.2	-0.3
c8	7.6	7.6	0	e8	4.3	4.6	0.3
c9	5.2	4.9	-0.3	e9	5.3	5.6	0.3
c10	6.1	6.6	0.5	e10	8.3	6.7	-1.6
c11	6.0	5.1	-0.9	e11	5.2	5.4	0.2
c12	7.4	6.0	-1.4	e12	5.8	5.4	-0.4
c13	6.6	6.1	-0.5	e13	4.5	5.1	0.6
c14	6.0	6.0	0	e14	4.3	4.7	0.4
c15	6.5	6.6	0.1	e15	7.1	7.3	0.2
c16	7.3	5.0	-2.3				
avg	5.8625	5.63125	-0.23125	avg	5.84	5.493333	-0.346667

Table 2
Experimental Group

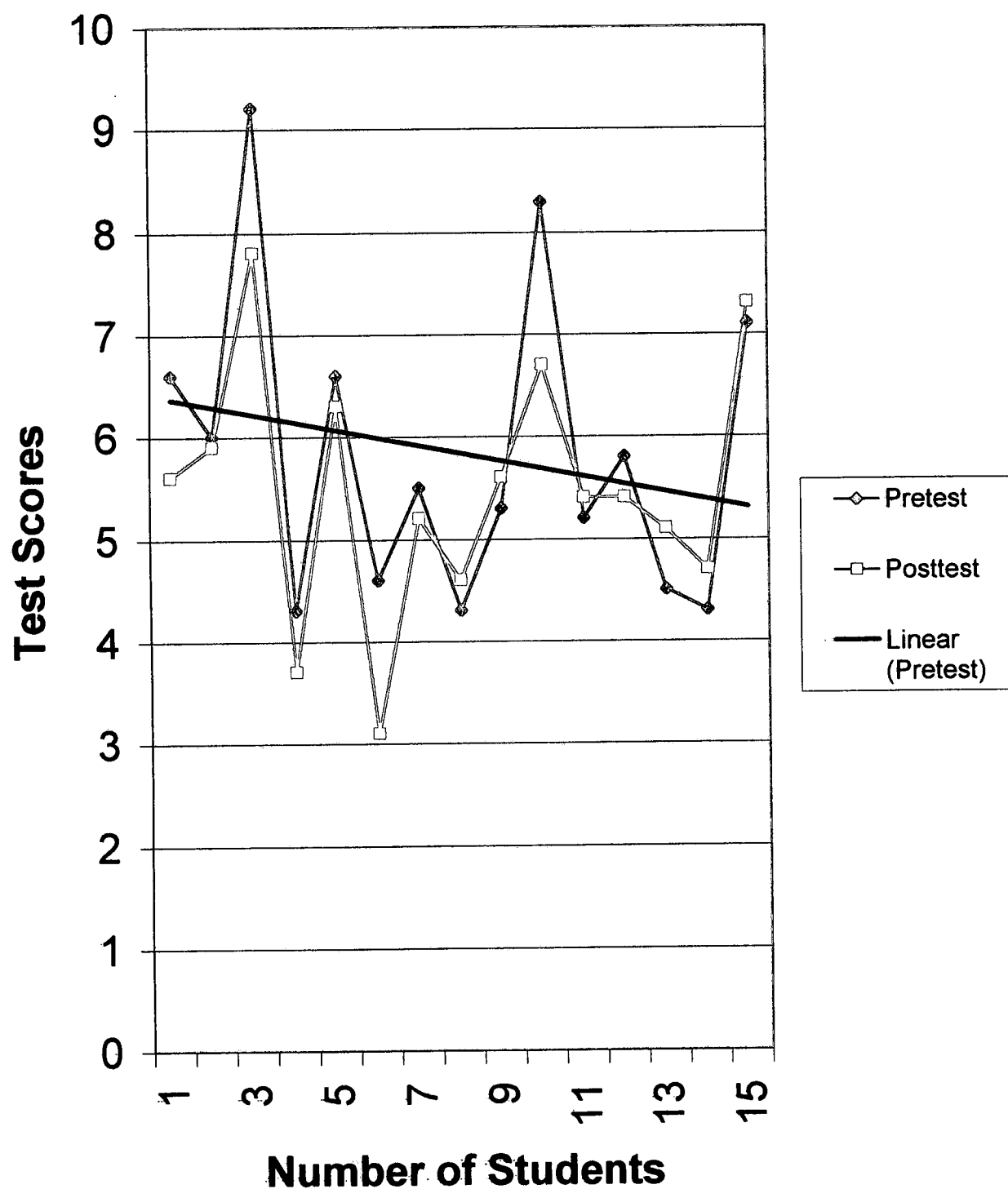
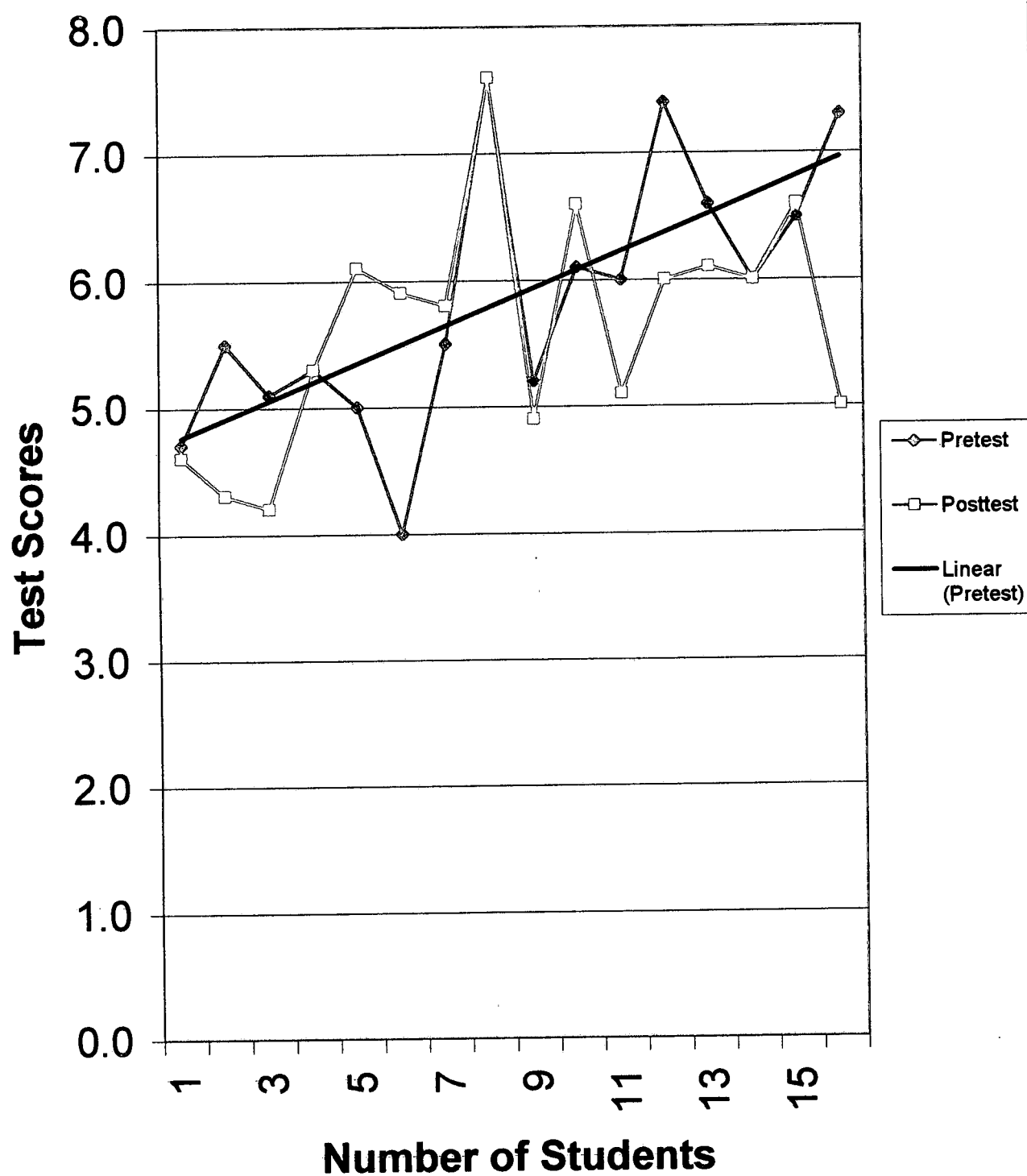


Table 3
Control Group



R002586030