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THE EFFECTS OF GROSS-MOTOR MOVEMENTS ON THE PERCEPTUAL-MOTOR DEVELOPMENT OF PRIMARY AGE MULTIPLY HANDICAPPED CHILDREN

by

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CHAPTER I

INTRODUCTION

The literature on perceptual-motor development in relation to gross motor movements with the primary age multiply handicapped is characterized by the lack of information in this area. Many of the people involved in the above areas such as Ayres (1966), Cratty (1967), Roach and Kephart (1966), Oliver (1967), DeHaven and Mordock (1970) had very few references to this subject in a purely objective light.

For nearly twenty years the brain-injured child has been studied while isolated from any other kind of childhood abnormalities (Strauss and Lehtinen, 1968). It is evidenced in the studies by Ayres (1966), and DeHaven, Mordock, and Loykovich (1969) that in the last ten years interest in the problem of the handicapped child has grown rapidly.

Gross motor activity is an integral part of a child's education which offers more benefits than just increments in strength, endurance and flexibility. Therefore it is imperative that research be conducted and data

compiled to identify physical activity as a dynamic part of the handicapped child's life. Recently subjective research studies in the area of physical activity and the special child has given direction for the expansion of knowledge in the program for exceptional children.

Perceptual-motor development is a very vital part of the "normal" development of the individual (Roach and Kephart, 1966; Piaget, 1966). It is important to note that in discussing perceptual and gross motor movements, the following activities of static balance, imitation of body movements, and identification of body parts were used in the evaluative procedures.

It is concluded that participation in gross motor movements involving perceptual-motor activities have a definite place in the total education program of the primary age multiply handicapped child. This child generally feels and attempts to move before he thinks and acts (Cratty, 1967). It is important to encourage the latter sequence and to structure our programs around this concept.

Many remedial programs for the handicapped are designed without adequate understanding of the reasons for inclusion or exclusion of particular exercises. This would suggest that the rationale for exercises for children with cerebral palsy applies also to youngsters with

minimal cerebral dysfunction.

> In order to meet the needs of children with brain dysfunction, remedial programs should provide active exercise, additional sensory stimulation, and require reciprocal movement. It is suggested that five basic criteria for these exercises should be considered. These criteria are:
> 1. Each exercise should require voluntary reciprocal movement. This means the child must initiate the movement on command without manual assistance from the instructor.
> 2. Each exercise should contain within it different stages of complexity. Each stage should require a greater concentration and neuromuscular control than the previous one.
> 3. The exercises should require movement of more than one extremity or joint at one time. Thus, the training takes place, not just on the dominant side, but also on the non-dominant side.
> 4. Each exercise should contain within its structure provisions for additional sensory stimulation from one or more sources (visual, auditory, or proprioceptive).
> 5. Structure of activities should include sequential muscular involvement from proximal to distal, but with greater emphasis on distal segments [DeHaven, Mordock, and Loykovich, 1969].

Perceptual-motor information should become closely integrated, due to the intricate part that it regulates in a child's activities. If this does not happen, then a child lives in two worlds--a motor world and a perceptual world. Consequently, he becomes confused. Since the motor activity came first, then the perceptual activity must be matched to it. New learning will have to be based upon the body of skills present to the child (Cratty, 1967).

Cratty (1967), has recently indicated that with

improvement in motor skills and fitness the neurologically handicapped will sometimes begin to perform better on tests of intelligence. Some researchers have reported that by achieving competence in motor tasks the child's self image in enhanced. According to Roach and Kephart (1966), it is generally believed that there is commonality among experiences that educate the mind and experiences that train the body.

Purpose of the Study

The purpose of this study was to generate hypotheses producing suppositions treating the effects of gross motor movements on the perceptual-motor development in the multiply handicapped, primary age child. Specifically, this study involved an analysis of data obtained during the summer of 1969 from the activities of a group of multiply handicapped children enrolled in a program for the multiply handicapped directed by the Department of Special Education of the University of Alabama.

Need for the Study

The Purdue Perceptual-Motor Survey Theory (Roach and Kephart, 1966) stresses the importance of movement skills as the foundation upon which all other learning rests. Children must learn to change their posture in space readily, that balance and posture must be flexible

to permit movement, and enable the child to be aware of all positions of body parts in space. Kephart (1960) stresses the complete perceptual-motor education of immature, brain injured, and retarded youngsters.

Cratty (1967) used a battery of specially designed procedures to measure body perception, gross agility, locomotor behavior and agility, balance, throwing and tracking. According to Mordock and DeHaven (1969) educationally retarded youngsters performed best during late childhood and early adolescence and early adulthood, suggesting that remedial programs should be introduced early to be of most benefit. It is further indicated that elucidation of relations between movement exercises and other perceptual or academic tasks is important because institutions that are quick to adopt and drop these new and controversial practices to remediate these skills are not meeting the expectations of the programs as structured. It is therefore important that their expectations not be too high, for fear of "throwing the baby out with the bath" (Mordock and DeHaven, 1969).

Ayres (1966) has identified six general areas of perceptual-motor dysfunction. These six factors are: Body Image Deficit, Perceptual Dysfunction--Lack of Awareness of Form and Position in Two-Dimensional Space, Hyperactivity-Dystractibility, Defective Integration of

the Two Sides of the Body, Figure-Ground Discrimination and Balance.

Johnson and Fretz (1967) indicated that exercises for minimally impaired youngsters should involve the exposure of a number of kinds of movement tasks. Included were those designed to enhance visual-motor ability and balances of various types (static and dynamic balancing).

A study of this nature was justified by the lack of research delving into the basic significance of gross and perceptual motor movements. Ayres (1966) indicates that an organism's skilled motor planning is derived through touch, proprioception, vestibular functions and vision. Since these modalities are also present in other more school related tasks of a perceptual nature, it was felt that case studies would be the most informative due to the individual adaptations that were made for each subject. Van Witsen (1968) indicates that "perception, then, is a learned function, and as a learned function, it is susceptible to teaching." If this idea is to be universally accepted, then more pertinent information is vital to the development of these children in relation to gross-motor, perceptual-motor activities.

Definition of Terms

Primary age range. The chronological ages

five years eleven months through ten years.

Multiply handicapped. Children with more than one handicap or disability involvement.

Gross motor movement. Large muscle activity lacking refinement in movement.

Motor learning. A stable change in the level of skill as the result of repeated activities.

Proprioception. Movement caused by stimuli to the sensory end organs in the muscles and tendons.

Physical education. A structured program of motor skills and social outcomes to enhance economic self-sufficiency.

Visual perception. The ability to recognize and discriminate visual stimuli and to interpret those stimuli by associating them with previous experiences.

Perceptual-motor. The specific function of acquiring and using information or skills that are basic to problem solving. It deals basically with the visual stimuli being transformed into the ability to conceptualize due to the neurological functions.

Trainees. Students enrolled in the internship

program (SPE 207) for crippled children. These students all had previous teaching experience.

Assistants. Students enrolled in the Health, Physical Education, and Recreation Department (HPR 198 Adapted Physical Education).

Brain-injured. Strauss and Lehtinen (1968) defined a brain-injured child as: "a child who before, during or after birth has received an injury to or suffered an infection of the brain [p. 4]."

Minimal brain dysfunction. A child that exhibits the soft signs of neurological impairment.

Athetoid. Involves involuntary motions of parts of the body such as the hands, arms, legs and mouth due to damage to the midbrain or basal ganglia.

Spastic. The cite of injury is the motor cortex which is characterized by stiffness and a stretch reflex interfering with directed movements of parts of the body.

Seizure. According to Cruickshank and Johnson (1967) is " . . . a symptom of disturbance in the electrochemical activity of the discharging cells of the brain, produced by a variety of neurological disorders [p. 515]."

Intelligence quotient. As used in this study is the numerical expression of intelligence based on an individual intelligence test.

Description of Subjects

The subjects in this study consisted of five girls and two boys. All of these children were impaired neurologically to varying degrees. The chronological age range was five years eleven months to ten years. The primary age group was selected because developmentally this is the prime time to discover and teach gross-motor, perceptual-motor activities and expect optimum results (Piaget, 1966; Gesell and Ilg, 1946).

The case history records related the following information: (a) type of crippling condition; (b) corrective devices; (c) convulsions; (d) speech, hearing and/or visual condition; (e) physical therapy; (f) educational background; and (g) excerpts from the 1969 Hackberry Summer Program assessment. A physician's report was included in each child's case history. The reports included post-natal and other significant findings.

Procedures and Program

The methodology employed in this study was descriptive rather than statistical due to the subjective observations of the tests. Another important factor was

the medical diagnosis rendered on each child, which deleted certain skills on the Roach and Kephart (1966) and Cratty (1967) tests administered to these children.

The children described in the case histories participated in a sixty minute physical education program four days a week and in a sixty minute swimming program five days a week for six weeks. During that time, each child was programmed according to his abilities. The activities of the physical education program were structured so as to emphasize gross-motor movements with trainees and assistants correcting perceptual-motor inconsistancies; i.e., accuracy and control in throwing. The activities were set up on a rotation system in which each child was gainfully involved according to his specific need.

A short term in-service conference was conducted by the writer to convey an understanding of the purpose of the program and to allow the trainees ample time to prepare before the first physical education period. The trainees were provided a handbook on skills and activities. (See Appendix B.)

The pre and post test evaluation was a combination of the Purdue Perceptual-Motor Survey (Roach and Kephart, 1966) and Movement Activities for the Neurologically Handicapped and Retarded Children and Youth

(Cratty, 1967). The test evaluation included three sections: (a) Identification of Body Parts, (b) Static Balance on the Mat--Phase I, and (c) Imitation of Movement. The above three tests were selected because of the physical limitations of the children who had very little use of the lower extremities.

The following skills and activities were included in the structured program for the primary age group:

1. Body mechanics: boys and girls were supervised in sit-ups, leg lifts, elevating body on balls of feet, pull-ups and/or chin-ups on bar.
2. Ball and bean bag skills and games: (a) throwing, (b) catching, (c) kicking, (d) batting--using whiffle ball and bat, and (e) rolling. The above skills and games involved rubber utility balls, weighted rubber balls, frizbees and bean bags. The balls and bean bags were of varying size and weight. Special attention was given to directionality and to the weaker extremities.
3. Sand box activities.
4. Swimming--basic arm and leg movements.
5. Tether-ball--designed specifically for the handicapped.

6. Basketball shooting using utility ball.
7. Round bolo bat and whiffle ball attached.
8. Jump rope.
9. Hopscotch.
10. Bait casting.

Limitations

The greatest limitations for this study were: (a) being able to evaluate only seven children; (b) a four day a week program in physical education; (c) paucity of knowledge about each child prior to their arrival in the program; (d) the change in assistants (HPR Department) at the end of the first summer term for the University and the adjustment to new teachers for the children; and (e) the length of the program--six weeks.

CHAPTER II

REVIEW OF RELATED LITERATURE

Gross-Motor Development

The significance of motor activities was realized by Sequin in the mid 1850's in the practice of gymnastics, circuit running and planned recreation (Talbot, 1964). Oliver (1956) emphasized circuit running with sub-normal boys. According to Espenschade and Eckert (1967), diversification in the contractive force of the gross muscle is mediated through the functional unit of muscular contraction comprised of the motor neuron and the muscle fibers activated by that neuron.

The children that participated in this study ranged from five years eleven months to twelve years in age. Major adjustments are required during this period and Espenschade and Eckert (1967) suggested three concepts of these developmental tasks: (a) the ejection from the home environment into the peer group; (b) the ejection or thrust into work and games, each of which requires extensive neuromuscular skills; and (c) the movement into the world of logic, symbolism, and communication.

It is felt that the above mentioned tasks should be carefully considered when structuring gross motor movements in an activity program. Smith (1968) indicates gross motor activity is an important factor in perceptual development. Cratty (1967) has recently stated that with improvement in motor skills and fitness, the neurologically handicapped will sometimes perform better on tests of intelligence and their self-image is somewhat enhanced. It was further indicated by Cratty (1967) that human beings attach symbols to a motor task which usually results in an increased ability to remember and to organize information. It was hypothesized that several facets of movement behavior may be the result of imprinting--including throwing, running, unique gait characteristics and a variety of gesture patterns. Frostig and Horne (1964) reported that manipulative exercises and gross motor coordination help lead children toward mastery of visual-motor coordination which is essential to almost every action they take. Physical exercises such as ball catching prepare children for the many paper-and-crayon exercises that help develop their ability to isolate relevant material on a page.

Ayres (1962, 1966) indicated the most simple, gross, and fundamental motor planning is displayed by the major postures and patterns of motion demonstrated

during the first year of life. It is further suggested by Ayres (1966) that gross motor activities be introduced to the child first and then progress to tasks requiring finer skills. DeHaven and Mordock (1970) related in a report on minimal cerebral dysfunction that postural exercises and movement experiences helped the child to manage body movements more effectively. It was further indicated that therapeutic exercise can have direct implications for motor learning problems. In an experimental exercise program directed by DeHaven and Mordock (1970) basic gross motor work was the foundation for this study.

Hooker (1952) indicated that embryologically, the first neurological system to develop is the motor system. Jersild (1968) reinforced the fact that motor activities play a major part in intellectual development. Chaney and Kephart (1968) stated upon the above knowledge that embryologically and psychologically, the motor system is developed first. Jersild (1968), Gesell (1946) and Gidoni (1965) indicated that according to the general principles of motor development that progression is from gross to specific refined control. Chaney and Kephart (1968) expressed teaching gross motor patterns or movements by injecting the following observation: if a child's development is out of logical order; training

must be reversed in a similar manner. Since we cannot throw out the old and start with the new, we must begin where the child is and work down. Ideas derived from a paper presented by Denhoff (1968) at a Symposium sponsored by the Physical Education Division of the American Association for Health, Physical Education, and Recreation were as follows: The motor bases are important in perceptual development and these motor aspects are inclusive of (a) posture; (b) directionality; (c) laterality; and (d) awareness of body in space. Psychology, special education, and optometry have developed a unified concept in relation to motor bases of achievement.

Chaney and Kephart (1968) stated that motor activity is inherent and constant while depending upon posture, maintenance of balance, contact, locomotion, receipt, and propulsion. Barsch (1968) feels that movement efficiency is a fundamental principle in human design. According to Barsch (1968) gross motor skills in the "normal" child have matured before seven and a half years. Denhoff (1968) related six stages of motor behavior that were implemented at The Meeting Street School for cerebral palsied children. They were basically as follows: (a) reflex activity or unorganized--the therapeutic principle is stimulation; (b) unconditioned

behavior or uncoordinated--the therapeutic principle is promotion; (c) poor coordination--the therapeutic principle is exploring; (d) semi-coordination--the therapeutic principle is experiencing; (e) physical self-sufficiency--the therapeutic principle is advancing; and (f) early skills--the therapeutic principle is repetition.

Many youngsters today reflect varying degrees of apraxia and inadequate coordination and control of body movement as compared to their peers. This is indicative of poor basic gross motor skills. This substandard performance brings to bear related consequences in learning new and more advanced play and recreational activities and deems itself worthy of professional attention and remedial efforts (Denhoff, 1968).

Perceptual Development

During the nineteenth century a group of investigators called sensory physiologists began to examine the mechanisms called receptors. The focus of investigation was primarily on the phenomenon of vision and how man visually perceives space, distance, size, and color. Since this failed to give adequate explanations, the physiologists had to fall back on the empiricist description that sensory experience was the

prime factor in development of size and depth perception. The latter part of the nineteenth century and beginning in the twentieth century, two concepts were debated. One, dealing with the strong empiricist position and the other which argued that man's perceptual functions were innate and had little to do with additive experience. The Gestalt school asserted that perceptions were not composed of many small sensory elements but rather as perceiving objects and events as "wholes." In the late 1940's, a more general theory was constructed in relation to the visual perceptual field--the relationship of total body position to visual perception (Smith, 1968; Katz, 1950).

During the past 25 years emphasis has been placed on developmental psychology. Jean Piaget is a psychologist who believed in a philosophy of developmental psychology. Piaget's observations of his own children led to his theories and studies about the stages of intelligence. He described the first two series of stages as the elementary and intentional sensorimotor adaptations (Piaget, 1966).

Haun (1965), stated that, "Man is so constituted that the normal functioning of his central nervous system is critically dependent upon the maintenance of sensory input." Magdol (1968) stated that, " . . . if

development and experience have followed the usual and expected course through the first ten years, a child learns to use vision as the primary process to guide his own actions."

According to Van Witsen (1968),

> Perception is the interpretation of sensation. It is based upon previous experience of sensations, through interaction with the environment. Perception, then, is a learned function, and as a learned function, it is susceptible to teaching. This teaching can be accomplished through the provision of planned sensory experiences (together with the interpretation of such experiences to the child) in vision, language, gesture, kinesthesis, and touch.

According to Strauss and Lehtinen (1968),

> Through the activity of the brain a sensation gains meaning and becomes a perception, "meaning" indicating that the sensation has organization, significance, and experimental content. We speak of the perceptions arising from various sensations as visual perception, auditory perception, tactile perception, and so on.

Strauss and Lehtinen (1968) further reported the importance of perception in the areas of genetic developments and individual differences of perceptual development. This may aid in the understanding of perceptual functions in a child whose nervous system has been impaired.

Piaget (1966) and Smith (1968) indicated that the most crucial period for sensorimotor activity in promoting perceptual development is during the child's preschool experiences and through the first grade. Chaney and

Kephart (1968), and Frostig and Horne (1964) differed with Piaget by stating that this period extends beyond the first grade level. The major reason for this being the lack of objective evidence. It might be projected that those problems which we have assumed to be motor problems are not motor problems but perceptual problems.

The physiological basis of perception must be functioning properly before an accurate motor response can be made by the organism in his daily environment. If the motor system is functioning in a well-coordinated individual and the sensory information comes to him inaccurately prior to or during the performance of a motor act, then the desired result will not be accomplished (Sloan, Ed., 1969). When a child can match perceptual experience to the motor movement then he is able to isolate one element of a perception and deal with it alone without losing the impression of the whole. He can move from one perception to another and yet maintain a relationship that is orderly between the perceptual and the motor movements. At this stage in the developmental process, the child becomes perceptual (Chaney and Kephart, 1968). Frostig and Horne (1964) found in their studies that visual perception difficulties were by far the primary contributor to learning difficulties. In the final analysis Roach and Kephart (1966) suggested that

perceptual organization was built upon motor movement patterns.

Perceptual-Motor Development

In order to integrate the perceptual and motor development of a child, literature is introduced that accentuates both concepts in totality. Many of the aforementioned researchers' ideas and concepts are presented in relation to perceptual and motor development.

Children normally teach themselves through motor activity; however, children with perceptual problems do not teach themselves readily. The major objective in teaching a perceptual-motor activity is to help the child to master, step by step, each component of the task (Ayres, 1962).

Oliver (1966) indicated that we no longer believe that one experience educates the mind and another kind of experience trains the body. If this is true, then the visual perceptual and gross motor development cannot be separated. Roach and Kephart (1966) believe that perceptual and motor functions are inseparable and that training in motoric functioning will improve the child's ability to structure, order, and judge events to which he is exposed.

Kephart (1964) stressed the importance of

perceptual-motor aspects of learning disabilities as follows:

> . . . consistant and efficient motor patterns permit the child to explore his environment and systematize his relationship to it. Perceptual data are similarly systematized by comparing them with this motoric system. Through such perceptual-motor matching, the perceptual world of the child and his behavioral world come to coincide. It is with this organized system of perceptual input and behavioral output that the child attacks and manipulates symbolic and conceptual material in a vertical fashion [p. 201].

Most motor activities can be classified as perceptual-motor in nature. Thus it is concluded that participation in these activities has a definite place in the total educational program of the neurologically handicapped and/or mentally retarded (Cratty, 1967).

Piaget (1966) suggested that beginning with birth to the year seven was the period most important in sensorimotor adaptations. He further indicated motor as well as sensory experiences of children were extremely important in the development of intelligence.

Painter (1966) did a study on kindergarten children which showed a significant gain in body image, perceptual motor integration, and psycholinguistic competence. Flavell (1963) indicated that Piaget emphasized the significance of early sensory motor learning as a necessary building block for later complex, perceptual, and cognitive development.

Drawing from the above sections on gross motor, perceptual, and perceptual-motor development, two main ideas are derived. First, motor development may be present at birth with perceptual development following or second, perceptual development may be learned entirely and motor development be innate. However, from the studies and research previously presented, there is a firm indication that perceptual-motor adequacy is a must if success is to be the aim of body movements.

CHAPTER III

PRESENTATION OF DATA

This chapter was divided into two sections. The first section offers the reader an opportunity to better understand the type of children in this study and some of their background, abilities and disabilities prior to the presentation of the procedures established and program provided.

The case histories presented in the following pages are indicative of medical and educational cohesiveness. In diagnosis, teaching, and evaluation there are few absolutes; consequently, the case histories and related research were the basis for the program and evaluations. (See Appendix A.)

Case Histories

Subject A

Born--July 11, 1963

Sex--male

I. Type of Crippling Condition:

Subject was diagnosed at the age of approximately six to eight months by a physician as

cerebral palsied with possible mental retardation. The left hand is more involved, i.e., difficulty in wrist extension versus strong finger flexibility. At the age of three years, alternating exotropia and esotropia was diagnosed, i.e., eyes turning inward and outward. (S) needs some assistance in ambulation due to the degree of spasticity.

II. Corrective Devices:

Stiff shank shoes with high tops and derotator cables were fitted in early 1969. (S) toes-in therefore cables were used to keep the feet in alignment.

III. Convulsions:

Report was negative.

IV. Speech, Hearing, and/or Visual Condition:

A. Speech--(S) has deglutition problems and has been receiving therapy for speech and swallowing difficulties.

B. Vision--An operation was done November, 1966, for bilateral medial rectus recession which decreased bilateral eye involvement. Glasses were not prescribed as correction was deemed adequate.

V. Physical Therapy:

In November, 1968, physical therapy began and was continued with the exercises changing as the needs developed.

VI. Educational Background:

Preschool was attended by the (S) during the 1968-1969 school year. Performance was good with few limitations.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

(S) was reading on a pre-primer level and was good at recognizing letters. Mathematic ability was on a high first grade level which displayed an understanding of number concepts and monetary values. (S) was very receptive to puzzles and shape form boards at which success was exhibited. A cooperative attitude accompanied with genuine interest was displayed in relation to peers, teachers, and new experiences, i.e., various field trips. An independence and exactness was observed in art projects and physical activities. (S) appeared well adjusted, neat, responsible, and a zealous participant in musical activities, i.e., music classes in the classroom and during physical education.

Subject B

Born--January 5, 1959

Sex--Female

I. Type of Crippling Condition:

Subject was diagnosed after birth by a physician as hydrocephalic, congenital exotropia, exophthalmos, i.e., abnormal protrusion of the eyes, and severe mental retardation. At six years of age, a ventriculoatrial shunt operation was performed, i.e., surgical creation of a passage permitting drainage of cerebrospinal fluid. A year following the operation the medical source reported: (a) motor point of view was good; (b) appeared to have reasonable intelligence; (c) protrusion of eyes persisted; (d) both fundi--interior of the back of the eyeball--were small and atrophic; and (e) colors are distinguishable.

II. Corrective Devices:

Report was negative.

III. Convulsions:

Report was negative.

IV. Speech, Hearing, and/or Visual Condition:

A. Hearing--(S) had a discharge from the right ear that was contributed to the aforementioned shunt operation.

B. Vision--(S's) vision is very poor and prior to eye surgery could not follow a light. One year and four months later the visual acuity was still extremely poor. Eight months later the (S) could count fingers in front of the left eye if held approximately three to five inches away, but right eye vision was negative.

V. Physical Therapy:

Report was negative.

VI. Educational Background:

(S) did not attend preschool classes due to vision problems, but had been attending an elementary school special education class for two years. Progress appeared to be satisfactory according to anecdotal records.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

(S) was reading on a pre-primer level due to visual problems. Reading or assembling objects was best achieved when placed to the left of the (S's) visual field. In art classes great pride was displayed in finished works, but little creativity was exhibited. Rhythm band was enjoyed and fine motor coordination appeared to be functioning at the appropriate developmental level

for this individual. (S) was afforded opportunities in physical education classes to improve, through participation, her visual kinesthetic aptitude. A multiplicity of activities were provided. In swimming the (S) began to develop a trustful attitude toward the basic fundamental skills, i.e., putting face in water and rhythmic breathing.

Subject C

Born--April 21, 1961

Sex--Female

I. Type of Crippling Condition:

Subject was diagnosed as having damage to the motor area which rendered the child triplegic--involvement of both legs and right arm and hand. At the age of five years an operation to reattach the Achilles tendons was performed. When the (S) was six years old, nerves were cut to the abductor muscles to stop her legs from "scissoring." (S) was dependent upon others for help due to inadequacy of proper corrective devices needed.

II. Corrective Devices:

A reciprocal walker was used by (S) on very limited occasions. At the age of six years she

was beginning to walk on rails.

III. Convulsions:

Report was negative.

IV. Speech, Hearing, and/or Visual Condition:

A. Speech and Hearing--(S) responses appear normal although case records did not indicate that these aspects were tested.

B. Vision--Case record indicates a definite need for re-examination. (S's) left eye converges sometimes and there is a possibility of near-sightedness.

V. Physical Therapy:

Report was negative.

VI. Educational Background:

Preschool was attended by the (S) for one year followed by entrance into elementary school. Academic achievement was average in reading, arithmetic, and spelling in the first grade and was promoted to second grade at the end of the school year.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

(S's) performance in reading comprehension, writing, arithmetic (concrete concepts), social studies, and science were above average. The

Stanford-Binet Form L-M was administered during the summer resulting in an average range of intelligence with weakness in the visual-motor area of performance.

In art and music the (S) was very creative and appeared to enjoy those lessons tremendously. Physical education classes were enjoyed by this individual but found to be tiring due to an inability to maintain correct posture. This was related to the lack of proper support in her conveyance (modified roller-chair).

Swimming progress and performance was evaluated as very good. The (S) has a good disposition and was found to be delightful in guiding her abilities. This individual's family ties and strong feelings were apparent in her desire to be thoughtful, i.e., making assorted gifts.

Subject D

Born--April 16, 1962

Sex--Male

I. Type of Crippling Condition:

Subject was born premature and remained in an incubator for six weeks. At the age of three years, the diagnosis indicated definite cerebral

palsy with spasticity. There was slight hand tremor with legs rigid below the knees. This individual was determined to also have alternating esotropia (eyes turning toward each other). An eye patch was tried beginning May 1964, but surgery was deemed necessary in December 1965 for strabismus (crossed eyes). In May 1966, surgery was performed for eye squint.

II. Corrective Devices:

At the age of three years (S) was using a walker at home and practicing on parallel bars. This individual could walk for a limited distance while holding someone's hand. Crutches were provided to give incentive and added security to the (S). During the summer of 1969 the (S) was still using the crutches although a few steps were taken independently on occasions. High top, stiff sole shoes with Thomas heels were being worn by the (S). At the age of approximately six years, the (S) was fitted with glasses to help correct existing visual defects.

III. Convulsions:

(S) was free of seizures until the age of seven. An EEG was administered and some abnormalities were ascertained. At this time, the

(S) was prescribed an anti-convulsant. The seizures appeared to be under control.

IV. Speech, Hearing, and/or Visual Conditions:

A. Speech--(S) at age of four years was talking fair--some words intelligible. During the summers of 1968 and 1969 the individual's speech was good, but repeated sentences often.

B. Vision--It appeared to be adequate when enrolled in the Hackberry Program in the summer of 1968; but, at the end of that summer, glasses were prescribed due to various visual discrepancies. The glasses rendered normal vision according to an opthalmologist. (S) was six years old at the time.

V. Physical Therapy:

Physical therapy was begun at four years of age and continued through 1969. The therapy was changed as was deemed necessary to meet certain body strengths and weaknesses.

VI. Educational Background:

The (S) at age four attended Tuscaloosa Opportunity School for the severely mentally retarded for three years. During the preschool period, much improvement was noted. In September of 1969 this individual was enrolled in a public school

special education class on the first grade level.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

An academic assessment was not available. The (S) participated only in individual activities in physical education, i.e., sand box, various ball handling activities.

Subject E

Born--September 30, 1959

Sex--Female

I. Type of Crippling Condition:

Subject was diagnosed as having brain damage, enlarged heart, hearing loss, speech problem and general lack of motor coordination. There is marked hyperactivity present. At the age of approximately six years a diagnosis of micro-cephaly was rendered. The (S) is completely independent.

II. Corrective Devices:

A Maico hearing aid with one-half power setting was fitted to wear in the left ear at the age of eight years.

III. Convulsions:

Report was negative.

IV. Speech, Hearing, and/or Visual Condition:

A. Speech--(S) has extremely slow speech and it appears to be labored. This was noted in January, 1967, at which time therapy was begun and continued for two years.

B. Hearing--The (S) was tested in January, 1967, and the audiogram indicated primarily a conductive hearing loss. The right ear had a 56 db loss and the left ear had a 48 db loss. In March, 1967, a hearing aid evaluation was given for an interium hearing aid. A Maico hearing aid was then fitted for the left ear.

V. Physical Therapy:

Report was negative.

VI. Educational Background:

Tuscaloosa Opportunity School was attended by the (S) for three years. In 1966 summer school was also attended. The (S) then entered a special education class; later a hard-of-hearing class and then enrolled in a special education class for the educable mentally retarded in another elementary school. Hackberry was attended during the summer of 1968.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

Academic assessment was not available. The (S's) progress and performance during swimming was good, especially in overcoming a fear of water. During the physical education period, the (S) enjoyed the following activities: rope jumping, hop scotch, lawn bowling, and bait casting.

Subject F

Born--January 30, 1959

Sex--Female

I. Type of Crippling Condition:

Subject was diagnosed as ataxic cerebral palsied. Some assistance is needed when moving due to balance problems and petit mal seizures. Eye surgery was performed when patching did not lend itself to a positive reaction.

II. Corrective Devices:

Glasses were fitted at the age of nine years to correct visual problems which were not completely rectified by surgery.

III. Convulsions:

The (S) has petit mal seizures and has been on medication since six months of age. The medication for the summer of 1969 included five zarontin and four phenobarbital daily.

IV. Speech, Hearing, and/or Visual Condition:

A. Speech and Hearing--According to case history records these appear to be normal.

B. Vision--(S's) vision is normal with glasses. The glasses were prescribed at the age of nine years after patching was attempted (a pattern could not be established) and eye surgery. The exact diagnosis is not available on the surgery.

V. Physical Therapy:

Report was negative.

VI. Educational Background:

Report was negative.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

(S) displayed good comprehension in reading, arithmetic, social studies and science but had a very short attention span. Close supervision was needed constantly to obtain optimum performance. It was noted in art activities that fine-motor coordination was not well developed. There was definite improvement in this individual's swimming ability. During the physical education classes the (S) developed skills in lawn bowling and golf putting. This individual was found to be

a very polite and well-mannered child, but needed to be encouraged to gain self-reliance and greater independence.

Subject G

Born--July 20, 1961

Sex--Female

I. Type of Crippling Condition:

Subject was diagnosed as a hemiplegic with the left extremities involved. The left leg draws up and left hand has little flexibility. Mental retardation was suspected at birth. The (S) is scheduled for surgery during 1970 for a heel cord lengthening and posterior capsulotomy. The longitudinal arches of the feet are shortened.

II. Corrective Devices:

Corrective shoes were prescribed in late 1969, but this did not correct the supination of the left foot.

III. Convulsions:

According to the case history the (S) began having seizures at age of one year at approximately one month intervals. Medication has not been prescribed.

IV. Speech, Hearing, and/or Visual Condition:

A. Speech and Hearing--According to the case history record, speech and hearing appear to be normal.

B. Vision--The (S) was given a gross eye examination in January, 1969. Some astigmatism was diagnosed in each eye.

V. Physical Therapy:

Report was negative.

VI. Educational Background:

This individual did not attend preschool or elementary school prior to the summer Hackberry Program.

VII. Excerpts from the 1969 Hackberry Summer Program Assessment:

The (S) was exposed to readiness concepts in the language arts, arithmetic, and social studies. Art and music appeared to be enjoyed in depth by the individual. Tremendous progress was made in swimming, especially in overcoming fear of the water. Physical education was enjoyed but close supervision was required at all times. The first few days of the program were upsetting as the individual had never been away from home before. Within a short time, (S) appeared to be adjusting to the new environment. The individual's

actions reflected positive feeling in sharing and helping others.

Procedures and Program

The procedures established and utilized were based upon the related research in the areas of special education and health, physical education and recreation. The: (a) selection of primary age group children; (b) in-service conference; (c) evaluation test battery for children; (d) activities and skills; (e) evaluation of trainees, assistants and over-all physical education program were further based on the developmental aspect which is indicated in the following principles of development for the child age five years to ten years.

I. Age 5, 6, and 7 years

A. Physical Growth and Development

1. Growth is relatively slow during this period as compared to the early period.
2. At five years the legs are lengthening rapidly. The spine has adult curves. The six year old girl is as mature skeletally as the seven year old boy.
3. The large muscles of the arms and legs are more developed than the small muscles of the hands and fingers.

4. Muscular development is uneven and incomplete but motor skills are developing.
5. Some postural defects may have been established by the age of five years.
6. Hand-eye coordinations are incomplete.
7. These ages are highly susceptible to respiratory infections.
8. The eyeballs are still increasing in size. Good habits of use, as in reading, writing, etc., are essential.

B. Characteristics

1. He has frequent urges to action and is still for only a short time. He is interested in the activity, not in the result. He has a sense of equilibrium. He can stand on one foot, hop and skip, keep time to music, and bounce and catch a ball. He likes to climb and jump from heights.
2. He is susceptible to fatigue and may withdraw from play when tired.

C. Needs

1. Expression through movement and noise is necessary for growth. Vigorous exercise

will increase the heart action and respiration thus helping to build endurance. Active boisterous games with unrestrained running and jumping are needed.

2. It is part of the child's development to play in mud, wade in puddles, fall in snow, walk in fallen leaves, and roll down hills. He may approximate rock-and-tree climbing activities on playground climbing apparatus. Playing animals (walking on all fours) will develop muscles of the back and abdomen. Use of the walking board (balance beam) will help to correct pronation (flatfoot). Scooters and coaster wagons develop the leg muscles and fulfill a need for speed.
3. There must be opportunity to organize simple group play, to skip and dance in small groups. Half a dozen children are capable of playing together for a 15 minute period or longer. All demand attention from one another and demand their own "turns."
4. The withdrawn child must be encouraged gradually to find his place in the group.

5. Since the attention span is short the periods should be short.

II. Age 8, 9, and 10 years

A. Physical Growth and Development

1. Growth in height and weight are normally slow and steady at this age. There will be a lag just prior to pubescence.
2. Differences in individual ossification are very wide--as much as five or six years at a given age. Malnutrition or serious illness may delay ossification.
3. Mental maturity and social adjustment have some correlation with skeletal maturity.
4. The small muscles are developing. Manipulative skill is increasing.
5. Muscular coordinations are good. The hand-eye coordinations are continuing to develop.
6. Posture may be poor, not even as good as during the first year of school. The spindly type of body is most inclined to drop. In some cases, poor posture may be symptomatic. Its presence may indicate a condition needing attention: chronic infection, fatigue, malnutrition, orthopedic

difficulties, emotional maladjustment, etc.

7. The heart develops in size less rapidly than the body. Its work is increased. Damage to the heart is prevented during play because the skeletal muscles fatigue first. Taxing the heart should be avoided by seeing that children do not compete with those who are stronger or more mature physically.
8. At the end of this period the eyes function as well as those of adults. Myopia (near sightedness) may develop around the age of eight years. Many eye defects can be remedied by glasses.

B. Characteristics

1. He now has a wider range of interests and a longer attention span. His goals are immediate and consistency is demanded, as in individual justice.
2. He is learning to cooperate better. He plays in self-made groups over a longer period. He is beginning to be interested in teams and will abide by group decisions.
3. The child desires prestige and may seek it

boasting, or through rivalry.

C. Needs

1. There must be full opportunity to develop body control, strength and endurance. The child of eight, nine, or ten years needs activities involving use of the whole body: stunts, throwing and catching, running "it" games with their accompanying noise, etc. Seasonal play is important: kites, tops, marbles, etc.
2. He needs organized games for team play. He is willing to practice in order to become adequate in skills for games. He gains self-confidence by excelling in some one thing.
3. It is important for children to learn good fellowship as it is for them to learn good leadership.
4. The teacher must see that pupils having visual or aural defects always maintain strategic positions in the class.
5. Close supervision is required to assure properly adjusted furniture and to prevent slumping over desks. Creation of an awareness that good posture is important.

The primary age was selected for evaluation because of previous research by Cratty (1966) which indicated that body perception, gross agility, and balance were the areas which needed emphasis because of poor performance. Therefore; it was concluded that early programs would be of most benefit since children suspected of neurological damage performed better during late childhood and early adolescence.

The five girls and two boys in the primary group at the summer Hackberry program for 1969 appeared to have a wide range of neurological problems. Consequently, the group was selected.

An in-service conference prior to the arrival of the children emphasized: (a) the activities and skills to be taught and supervised, (b) suggestions to the trainees and assistants, and (c) the reason for the need to establish a program for primary and older age multiply handicapped children. A brief case history was presented to enlighten the trainees and assistants as to possible actions and reactions that might have occurred. The evaluation battery was not discussed so as to eliminate any conscious teaching for this pre and post evaluation of the children.

The evaluation test battery will be discussed in further detail in Chapter IV. (Also see Appendix C).

The battery was to evaluate perceptual-motor performance prior to the physical education program and after five weeks of participation in activities, skills, and exercises geared mainly to gross motor movements.

The activities and a brief explanation of each were designed as follows:

1. Body mechanics (executed with tumbling mats under the individuals for protection)--various exercises such as: (a) sit-ups, (b) pull-ups, (c) leg and arm lifts using various sand bag weights, (d) elevation of the body weight on the balls of the feet, (e) head and shoulder lifts while lying prone on the mat and (f) leg lifts while lying prone on the mat.
2. Ball and bean bag skills and games. Throwing, catching, kicking, and rolling skills were included in most activities due to the developmental lag in the neurologically handicapped child. The skill of batting using a whiffle ball and bat and table tennis paddle. Special attention was given to directionality and to the weaker extremities.
3. Sand box activities using plastic toys. This activity was provided so that individuality

and creativity could be expressed.

4. Swimming. This activity provided for many and varied gross motor movements along with the basic fundamental arm and leg movements.
5. Tether ball. This activity provided for gross-motor arm movements and was also physically constructed so that the children in wheel-chairs could participate. (See Appendix D.)
6. Basketball shooting. In this activity the utility ball size was varied according to the abilities of the individual. The basketball goal was designed so that the height could be adjusted according to the individual differences of the children. (See Appendix D.)
7. Round bolo bat and whiffle ball attached. This individual activity was used to enhance eye-hand coordination. The handle on the bolo bat was large enough to be grasped securely by the children with flexor and extensor problems.
8. Jump rope. This activity was selected because it stimulates the vestibular system, increases leg muscle strength and it also improves motor control.
9. Hopscotch. This activity was included as a

challenge for those children who had mastered the skill of jumping. Since balance and visual-motor coordination are the prime factors involved in the above activity, the child had to learn compensatory measures if he was to be successful.

10. Bait casting. In this activity gross motor movement was involved in the actual casting of the lure, but visual-motor assimilation was needed to participate in the competition of casting for targets. Fine motor movements were involved in reeling the lure back to the rod.
11. Golf putting. The swinging action involving the club was a gross motor movement but once again to be successful in hitting the target the visual-motor had to be coordinated.

In the final analysis, the procedures and the program was designed to teach and supervise motor skills. The trainees and assistants endeavored to do the following: (a) help the child to learn motor skills; (b) promote the child's knowledge in areas associated with motor skills; (c) guide the child's learning of approved social attitudes through certain motor skills and activities (Connor, 1967).

Each child was programmed according to his own strengths and weaknesses. A rotation system was established in an effort to keep the child constantly involved and interested. Approximately every twenty minutes the children were rotated or moved to a different activity within the confines of the play area. This made it possible for a child to participate in three activities per class period. The play area was designed so as to eliminate time being lost due to moving long distances for the various activities. (See Appendix D.) The trainees and assistants remained stationary each day, but were assigned a different activity each day they were present.

During the first three days of the program the trainees were the only adults present, but the remainder of the program utilized five trainees and six assistants each day with the exception of the last three days of the program when only assistants were present for teaching and supervising.

The trainees and assistants were evaluated by the Director of the physical education program on the following areas: (a) personal qualities; (b) professional equipment; (c) the teaching situation; and (d) any related comments. (See Appendix C.) Upon completion of the program the trainees and assistants evaluated the physical

education program. Various additions and deletions were suggested for the summer program of 1970.

CHAPTER IV

ANALYSIS OF DATA

The evaluation battery administered to the primary age group of multiply handicapped children in the summer Hackberry physical education program was a combination of evaluative activities by Cratty (1967), and Roach and Kephart (1966). (See Appendix C.) The Static Balance on a mat (Phase I--ten movements) by Cratty (1967) was devised for neurologically impaired children. This particular test was administered to evaluate sequential balance with the body's center of mass near the floor. Being able to perceive the body's relationship to its surroundings was paramount. Two others parts of the evaluation were designed by Roach and Kephart, (1966) to evaluate the following: (a) space localization through Identification of Body Parts and (b) unilateral, bilateral, and contralateral movement through Imitation of Movements.

By the use of this evaluative battery combination, it was anticipated that definite strengths and weaknesses in relation to perceptual-motor skills would be determined.

When the battery was administered to each child individually in a secluded area, the following procedure was established:

I. Identification of Body Parts

A. The subject stood facing the examiner.

B. The following commands were given:

1. touch your shoulder
2. touch your hips
3. touch your head
4. touch your ankles
5. touch your ears
6. touch your feet
7. touch your eyes
8. touch your elbows
9. touch your mouth.

C. A rating was assigned based on the subject's entire performance. The rating was as follows:

1. four points if the subject performed adequately throughout,
2. three points if the subject showed only slight hesitancy or confusion,
3. two points if the subject showed hesitancy in more than one or two of the commands or if response is to only one of the paired

parts, and

4. one point if the subject was unable to identify one or more of the parts called for, if marked hesitancy was displayed (except elbows) or if subject "feels around" to find the part.

II. Static Balance on a Mat--Phase I

A. The subject was to sit on the mat and listen very carefully as the examiner/teacher explained each movement.

B. The examiner/teacher then told the subject to try very hard to do the following commands correctly:

1. seated balance; the attempt should be made to remain relatively immobile for increasingly lengthy periods of time (15 to 30 seconds);
2. balancing while lying on the side--left and right;
3. hand and knee balance, four points touching the mat;
4. hand and knee balance on three points, lifting either one hand or foot from the mat;
5. upright kneeling;

6. hand and knee balance, two points (cross pattern), i.e., left arm and right leg in air;
7. hand and knee balance, two points, (same side);
8. hand and knee balance, with modifications, two and three points--the child was asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat;
9. same knee-foot balance, two points; and
10. knee only balance, two points.

C. Comments were made by the examiner/teacher on each of the above movements.

III. Imitation of Movements

A. The subject could stand or sit facing the examiner.

B. The subject was told, "I am going to move my arms [demonstrate several positions] and I want you to move your arms just like I do. Are you ready?"

C. The examiner then moved through the seventeen arm positions in order, waiting for the subject's response at each position.

D. Evaluation was based on over-all performance.

1. If the subject performed promptly, consistently, and surely on all patterns. Subject's performance must be exact duplicate of the examiner's.
2. If the subject performed promptly, consistently, and surely, but mirrors the examiner's movements.
3. If the subject showed hesitation or lack of certainty.
4. If the subject made more than one error. If there was abortive movement in several patterns.

Evaluation Batteries

Subject A

Born--July 11, 1963

Sex--Male

I. Identification of Body Parts

A. Pre-evaluation: (S) was not able to identify two parts of the body. The hips were identified as the knees and the ankles as the legs. Both elbows were touched simultaneously. Score was recorded as one point.

B. Post-evaluation: (S) was not able to identify

two parts of the body. The hips and ankles were not identified correctly as in the pre-evaluation. One elbow was touched for both elbows. Score was recorded as one point.

II. Static Balance on a Mat--Phase I

A. Seated balance: (S's) one pre- and post-evauation was the same. The shoulders were rounded and the back in a slumped position.

B. Balancing while lying on the side: Pre- and post-evaluation--(S's) performance was the same on the left and right side. On the left side balance, the arm remained in a bent position under the head and forward of the face. On the right side balance, the arm remained bent under the head and forward of the face. With this compensation, adequate balance was maintained.

C. Hand and knee balance, four points touching the mat: Pre- and post-evaluation--(S's) performance was the same. The left hand was closed, back swayed slightly; however, balance was good.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat: Pre- and post-evaluation--(S's) balance was extremely

unsteady when the left hand was lifted from the mat. When the right hand was lifted from the mat, the left hand was closed and head turned toward the left. The balance was observed to be more stable.

E. Upright kneeling: Pre- and post-evaluation--(S's) balance was very good. Compensation was made by using arms away from the body to balance the body weight.

F. Hand and knee balance, two points (cross pattern):

1. Pre-evaluation--(S) could not perform this balance with any proficiency.
2. Post-evaluation--(S's) balance was very poor, but legs and arms were lifted from the mat momentarily.

G. Hand and knee balance, two points (same side):

1. Pre-evaluation--(S) could not balance in this position.
2. Post-evaluation--(S) could balance briefly in this position, but with extreme difficulty.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an

elbow, or perhaps to use a three point balance with his back nearest the mat: Pre- and post-evaluation--(S) could not lift body off of mat to even gain a balance position.

I. Same knee-foot balance, two points:

1. Pre-evaluation--(S) found a balance point after much adjustment. The right knee was on the mat--balance was maintained for five to eight seconds.
2. Post-evaluation--(S) maintained balance adequately with the right knee on the mat.

J. Knee only balance, two points:

1. Pre-evaluation--(S's) performance was negative. A balance position was not established.
2. Post-evaluation--(S) was able to establish and maintain a balance position for a brief period of time. Extension of arms helped to establish a compensatory position.

III. Imitation of Movements

A. Pre-evaluation: (S) was reminded by the examiner to observe closely and slow down responses. The first three movements were paralleled and the remainder were "mirrored."

2. Post-evaluation--(S) responded in a more concentrated manner and "mirrored" all movements. The response was indicative of his developmental stage of growth.

Subject B

Born--January 5, 1959

Sex--Female

I. Identification of Body Parts

A. Pre-evaluation: (S) responded by touching one body part when plurals were asked. All body parts were known. A supposition was made that the (S) did not hear the word used in plural form or due to lack of visual acuity in the right eye, identification was associated with one-half of the body. Score was recorded as one point.

B. Post-evaluation: (S's) performance was adequate throughout the evaluation. One elbow was identified rather than both. Score was recorded as four points.

II. Static Balance on a Mat--Phase I

A. Seated balance: (S's) performance on pre- and post-evaluation was the same. The back and shoulders were rounded, head leaned

forward, and feet were turned outward.

B. Balancing while lying on the side: (S's) performance was the same on pre- and post-evaluation. While balanced on right side, the body leaned forward slightly.

C. Hand and knee balance, four points touching the mat: (S's) performance was the same on the pre- and post-evaluation. After the examiner demonstrated the position, (S) performed adequately.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat: (S's) performance was the same on the pre- and post-evaluation. When right leg was lifted from the mat the body balance remained stationary; however, when the left leg was lifted from the mat the body balance became unstable and the right arm was bent at the elbow.

E. Upright kneeling: (S's) performance was the same on the pre- and post-evaluation--adequate.

F. Hand and knee balance, two points (cross pattern): (S's) performance was the same on the pre- and post-evaluation. When the right arm and left leg were lifted from the mat, the balance was unstable. Also when the left arm

and right leg were lifted from the mat, the balance was unstable. On both balance skills, the legs crossed over the mid-line of the body to give stability.

G. Hand and knee balance, two points (same side): (S's) performance was the same on the pre- and post-evaluation. When the right leg and arm were lifted, balance was negative. When the left leg and arm were lifted, balance was maintained but unsteady. A supposition was made in relation to visual security and balance; due to the (S's) right visual inadequacy, perhaps concrete security was needed so by lifting the right arm and right leg at the same time this security was denied.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat: (S's) performance was the same on the pre- and post-evaluation. The examiner demonstrated the skill then the (S) performed adequately with the back nearest the mat. The concept of feet placement was difficult for the (S) to comprehend.

I. Same knee-foot balance, two points: (S's) performance was the same on the pre- and post-evaluation--adequate.

J. Knee only balance, two points: (S's) performance was the same on the pre- and post-evaluation--adequate.

III. Imitation of Movements

(S's) performance was the same on the pre- and post evaluation. The (S) consistantly "mirrored" and arms were always bent at elbows.

Subject C

Born--April 21, 1961

Sex--Female

I. Identification of Body Parts

A. Pre-evaluation: (S) displayed slight hesitancy on the identification of ankles and elbows. Score was recorded as three points.

B. Post-evaluation: (S) performed adequately throughout. Score was recorded as four points.

II. Static Balance on a Mat--Phase I

A. Seated balance: (S's) performance on the pre- and post-evaluation was the same. The left knee was bent and extreme curvature of the spine with rounded shoulders when sitting.

B. Balancing while lying on the side: (S's) performance on the pre- and post-evaluation indicated adequate balance on the left side, but right side was unsteady (bent arm and leg on right side).

C. Hand and knee balance, four points touching the mat: (S's) performance on the pre- and post-evaluation indicated both arms bent at elbow and right foot turned out. However, the shoulder-to-hip alignment was good with the exception of the rounded shoulders.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat:

   1. Pre-evaluation--(S) could not balance at all when the right arm was lifted from the mat.
   2. Post-evaluation--(S) could balance when right arm was off the mat; although the balance was shaky.

E. Upright kneeling:

   1. Pre-evaluation--(S) could not maintain balance at all.
   2. Post-evaluation--(S) could maintain balance for a few moments.

F. Hand and knee balance, two points (cross

pattern):

1. Pre-evaluation--(S's) performance was negative on right and left side of the cross pattern.
2. Post-evaluation--(S's) right arm-left leg balance was negative; but left arm-right leg balance could be achieved momentarily.

G. Hand and knee balance, two points (same side): (S's) pre- and post-evaluation was negative.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat: (S's) pre- and post-evaluation was negative.

I. Same knee-foot balance, two points: (S's) pre- and post-evaluation was negative.

J. Knee only balance, two points: (S's) pre- and post-evaluation was negative.

III. Imitation of Movements

A. Pre-evaluation: (S) was not consistant with movements (sometimes "mirror," sometimes parallel) as three of the movements were paralleled.

B. Post-evaluation: (S) was not consistent with

movements (sometimes "mirror," sometimes parallel) as five movements were paralleled.

Subject D

Born--April 16, 1962

Sex--Male

I. Identification of Body Parts

A. Pre-evaluation: (S) did not respond to commands. Score was recorded as zero.

B. Post-evaluation: (S) was not able to identify three parts of the body--hips, ankles, and elbows. The attention span was very short; consequently, the examiner had to give the test item in rapid succession. Score was recorded as one point.

II. Static Balance on a Mat--Phase I

A. Pre-evaluation: (S's) performance was recorded as negative. The individual did not respond to any of the requested movements, but cried while lying on the mat.

B. Post-evaluation:

1. Seated balance: (S) responded but shoulders were rounded and head was kept down.

2. Balancing while lying on the side: (S's)

performance was adequate.

3. Hand and knee balance, four points touching the mat: (S's) performance was adequate.
4. Hand and knee balance on three points, lifting either one hand or foot from the mat: (S's) performance was unstable, but a good response was elicited.
5. Upright kneeling: (S's) performance was good although the body was in a slumped position.
6. Hand and knee balance, two points (cross pattern): (S's) performance was negative. A response was not given.
7. Hand and knee balance, two points (same side): (S's) performance was negative. A response was not given.
8. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat: (S) could lift hips off the mat while performing this skill (back to the mat). The arms could not lift the upper part of the body.

9. Same knee-foot balance, two points: (S's) performance was negative. A balance point was not established.

10. Knee only balance, two points: (S's) performance was adequate, although unstable.

III. Imitation of Movements

A. Pre-evaluation: (S) did not respond to any movements displayed by the examiner. Performance was negative.

B. Post-evaluation: (S) performed the various movements with much hesitation and uncertainty. All skills were "mirrored."

Subject E

Born--September 30, 1959

Sex--Female

I. Identification of Body Parts

Pre- and post-evaluation: (S) displayed hesitancy in more than one command. The ankles were identified as the elbows and only one elbow was touched when the individual was asked to touch both. Score was recorded as two points on each evaluation.

II. Static Balance on a Mat--Phase I

A. Seated balance: (S's) performance on pre- and

post-evaluation was the same. The shoulders were rounded and back in a slumped position.

B. Balancing while lying on the side:

1. Pre-evaluation--(S's) balancing ability on the right side was adequate, but left side was extremely shaky.
2. Post-evaluation--(S's) balancing ability on the right side was extremely shaky while the left side was adequate (right foot was used to help balance).

C. Hand and knee balance, four points touching the mat: (S) displayed adequate balance.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat:

1. Pre-evaluation--(S's) balance while lifting left leg was adequate, but right leg does not straighten out completely.
2. Post-evaluation--(S's) balance was adequate in relation to the right and left leg.

E. Upright kneeling: Pre- and post-evaluation--(S's) performance was adequate on both evaluations.

F. Hand and knee balance, two points (cross pattern): Pre- and post-evaluations--(S's) performance was extremely unsteady with the left arm, right leg balance.

G. Hand and knee balance, two points (same side):

1. Pre-evaluation--(S) could not maintain this balance position.
2. Post-evaluation--(S) performed this balance adequately.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat:

1. Pre-evaluation--(S) attempted the three point stance with back nearest the mat. The legs were good, but they could not lift the body from the mat.
2. Post-evaluation--(S) performed this balance adequately for a brief time.

I. Same knee-foot balance, two points: (S's) performance on the pre- and post-evaluation was adequate.

J. Knee only balance, two points:

1. Pre-evaluation--(S) could not maintain this balance position.
2. Post-evaluation--(S) performed this balance adequately.

III. Imitation of Movements

A. Pre-evaluation: (S) "mirrored" all movements and could not consistantly identify the right and left side of the body.

B. Post-evaluation: (S) "mirrored" all movements but did distinguish between the right and left side of the body.

Subject F

Born--January 39, 1959

Sex--Female

I. Identification of Body Parts

Pre- and post-evaluation: (S) displayed slight hesitancy on the identification of hips and elbows. The (S) appeared to respond with more confidence on the post test. Score was recorded as three points.

II. Static Balance on a Mat--Phase I

A. Seated balance:

1. Pre-evaluation--(S;s) performance was good with the exception of the upper body slump and rounded shoulders.

2. Post-evaluation--(S's) performance was adequate.

B. Balancing while lying on the side: Pre- and post-evaluation--(S) had great difficulty

maintaining balance while lying on right side of the body. Balance on left side was adequate.

C. Hand and knee balance, four points touching the mat:

1. Pre-evaluation--(S) maintained her balance adequately after the examiner positioned her.
2. Post-evaluation--(S) performed this balance position adequately.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat:

1. Pre-evaluation--(S's) balance was unstable on the right and left side of the body.
2. Post-evaluation--(S) performed adequately while balancing on the right and left side.

E. Upright kneeling:

1. Pre-evaluation--(S) balanced for 5 to 10 seconds and then fell forward on the mat.
2. Post-evaluation--(S) balanced adequately and in a stable manner.

F. Hand and knee balance, two points (cross pattern):

1. Pre-evaluation--(S) was not able to maintain a balance position--negative.

2. Post-evaluation--(S) balanced using left arm-right leg in cross pattern for a maximum of five seconds, but was not able to maintain balance using right arm-left leg cross pattern.

G. Hand and knee balance, two points (same side):
   1. Pre-evaluation--(S) was not able to maintain balance position--negative.
   2. Post-evaluation--(S) was able to balance but position was unstable.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat:
   1. Pre-evaluation--(S) was able to maintain balance position, but very unstable.
   2. Post-evaluation--(S) maintained adequate balance position.

I. Same knee-foot balance, two points: Pre- and post-evaluation--(S) was able to obtain balance position adequately.

J. Knee only balance, two points: Pre- and post-evaluation--(S) was able to maintain a balance position for a short period of time. The

balance point was unstable.

III. Imitation of Movements

Pre- and post-evaluation: (S) was not consistant (some times "mirror" sometimes parallel). The first three movements were paralleled.

Subject G

Born--July 20, 1961

Sex--Female

I. Identification of Body Parts

A. Pre-evaluation: (S) was not able to identify four parts of the body--shoulders, hips, ankles, and elbows. Attention span was extremely short. Score was recorded as zero.

B. Post-evaluation: (S) was not able to identify three parts of the body--shoulders, hips, and elbows. Response was similar to the pre-evaluation. Score was recorded as one point.

II. Static Balance on a Mat--Phase I

A. Seated balance: Pre- and post-evaluation--The examiner demonstrated the balance position. (S) then responded with the shoulders rounded and left leg flexed slightly at the knee.

B. Balancing while lying on the side: Pre- and post-evaluation--(S) was not able to

distinguish right side of body from left, but once concentrated instructions were presented the balance on the right side was adequate. Left side was very unstable.

C. Hand and knee balance, four points touching the mat:

1. Pre-evaluation--(S) rocked from side to side with back sagging in the middle.
2. Post-evaluation--(S's) response was adequate at the time. Movement was at a minimum.

D. Hand and knee balance on three points, lifting either one hand or foot from the mat: Pre- and post-evaluation--(S's) balance with left leg or arm lifted off of the mat was adequate. (S's) balance was very unstable with the right leg or arm lifted off of the mat. The latter movements appeared to move the body out of alignment.

E. Upright kneeling: Pre- and post-evaluation--(S) was able to balance for three to five seconds in this position.

F. Hand and knee balance, two points (cross pattern): Pre- and post-evaluation--(S) was able to maintain a balance position

briefly when the left leg-right arm cross pattern was demonstrated. (S) was not able to establish a balance position when the right leg-left arm cross pattern was attempted.

G. Hand and knee balance, two points (same side): Pre- and post-evaluation--(S) was able to balance briefly when the left knee was on the mat, but a balance point could not be established when the right knee was on the mat.

H. Hand and knee balance with modifications, two or three points--the child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat: Pre- and post-evaluation--(S's) response was negative--the body could not be lifted from the mat.

I. Same knee-foot balance, two points: Pre- and post-evaluation--(S's) performance was very unstable.

J. Knee only balance, two points: Pre- and post-evaluation--(S) was able to maintain balance for approximately ten seconds, although it was unstable.

III. Imitation of Movements

A. Pre-evaluation: (S) was not consistant with

movements. Three imitations were paralleled. (S) did not look at the examiner much of the time.

B. Post-evaluation: (S) paralleled four movements. Response was good when (S) watched examiner or was repeatedly told to look at the examiner.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The writer in the previous chapters has attempted to bring to light the effects that gross motor movements have on the perceptual-motor development of primary age multiply handicapped children. A review of related literature was presented on motor development, perceptual development, and perceptual-motor development in an effort to give the reader a combination of the developmental sequence of primary age children.

This study involved an evaluation battery comprised of three parts administered to each child individually at the beginning and end of a summer program. The battery was devised to evaluate sequential balance with the body's center of mass near the floor, space localization, and unilateral, bilateral, and contralateral movement.

Case histories were presented so that the reader could identify each child with his abilities and disabilities along with each test item and comments by the examiner. It was anticipated that definite strengths and weaknesses in relation to perceptual-motor skills could be determined through the administration of the

evaluation battery.

A structured program was devised prior to the pre-evaluations and changed to meet the individual needs of each child immediately after the evaluation. An in-service conference was presented to relay significant information about each child and the activities to be structured. Through this explanation it was hoped the changing of activities throughout the program would be met with a minimum amount of confusion on the part of the trainees and assistants. At this conference, the evaluation battery was not discussed so as to eliminate any teaching for the evaluation. The children were pre and post tested early in the day before fatigue became a major factor.

Since the summer program is an internship for special education majors in the area of crippling, an evaluation was submitted by the director of the physical education program to the director of the Hackberry Project. It was felt that the evaluation forms being used did not meet specific criteria for teaching and supervising physical education and recreation activities; consequently, a new form was devised and submitted to the director.

Two pieces of equipment were designed to better identify the need for adapted equipment for the multiply

handicapped child. (See Appendix D.) The equipment was constructed and installed by the University of Alabama Maintenance and Shop Department.

Conclusions

After collection, accumulation, and assimilation of observations and related data, the following hypotheses of suppositions were made by the writer:

1. Specific skills and body movements are best taught through interesting and varied activities.
2. Basic large muscle skills should be mastered prior to the teaching and development of fine muscle skills.
3. Perceptual skills possibly are learned more effectively through gross motor movements.
4. It is possible to develop a physical education program that incorporates activities that are directed to the individual child's abilities and disabilities and includes evaluatory measures for habilitating or rehabilitating the parts of the body involved.
5. Regardless of a person's area of proficiency, a program can be established but it must be based on organized concepts and planned for

efficient management.

Recommendations

The previous information appeared to indicate a dire need for more research to be pursued in relation to the multiply handicapped primary age child. The following recommendations are suggested:

1. A refinement in the evaluation battery to render it more objective.
2. The utilization of an internship program for the special educator and physical educator cooperatively.
3. The establishment of a program such as Hackberry for a full year with constant evaluation of the children and program. The emphasis should be on perceptual-motor aspects in relation to the program.
4. The primary age range should include three years to ten years.
5. It is important to provide parents of multiply handicapped and marginal children with well-planned, common-sense programs to help them stand by while the child emerges into an appropriate developmental level. There is no proof that stimulation techniques are

responsible for a child achieving a higher than anticipated level, but there is no proof that such techniques are wasteful or harmful.

APPENDIX A

Physical Examination Form and

Case History Record

PHYSICAL EXAMINATION FORM

TO WHOM IT MAY CONCERN:

You have my permission to release whatever medical information is needed on my child _____ to Miss Bonita (Bonnie) Hendry for purposes of her study in conjunction with the Special Education Department, University of Alabama.

_____
Signature

CASE HISTORY RECORD

NAME _____ SEX _____ BIRTHDATE _____

I. DESCRIPTION OF THE INDIVIDUAL:

A. Describe Type of Crippling Condition and Possible Area of Damage:

_____

_____

_____

_____

Independent _____ Needs Some Assistance _____

Very Dependent _____ Entirely Dependent _____

Indicate Below if Child Uses or Needs the Folowing: (braces, wheelchair, walker, special shoes, etc.-- date/type)

_____

_____

_____

_____

_____

B. Hyperactivity:

None _____ Somewhat _____ Marked _____

Describe in Detail if Necessary: _____

_____

C. Speech:

Normal: yes _____ no _____

Defective: yes _____ no _____

Therapy: yes _____ no _____

Describe in Detail if Necessary: _____

II. PHYSICAL HISTORY:

A. Prenatal: (describe maternal illness during pregnancy if any)

_____

_____

_____

B. Prenatal Care: yes _____ no _____

C. Age of Mother at Birth of Child: _____

D. Birth:

hospital: yes ___ no ___ weight at birth: _____

home: yes ___ no ___ premature: _____

midwife: ___ M.D.: ___ breech: yes ___ no ___

normal: yes ___ no ___ anoxia: yes ___ no ___

precipitate: yes ___ no ___ apgar score: _____

instrument: yes ___ no ___

*comments _____

_____

E. Developmental History:

began to walk (age) _____

began to talk (age) _____

feeding (unusual) _____

enuresis (bed wetting) _____
(age stopped)

sexual development "normal"--medical viewpoint:

_____

F. Convulsions: yes _____ no _____

age on onset: _____

now present: yes _____ no _____

frequency of attacks (prior to present) _____

severity: _____

under treatment: yes _____ no _____

how long? _____

on medication: yes _____ no _____

what kind? _____

under what circumstances do convulsions occur:

_____

EEG: yes _____ no _____

date: _____

*Results of data as recorded by individual reading test:

_____

_____

_____

G. Illnesses:

operations and date: _____

_____

_____

accidents and date: _____

_____

_____

H. Hearing and Vision:

Hearing:

running ears: yes _____ no _____

earaches: yes _____ no _____

abscesses: yes _____ no _____

mastoid operation: yes _____ no _____

Remarks: _____

Audiometric findings/date: right ear _____

left ear _____

Vision:

normal without glasses: yes _____ no _____

normal with glasses: yes _____ no _____

glasses worn: yes _____ no _____

type of visual defect: _____

date of detection: _____

Remarks (operations/dates) _____

_____

_____

I. Present Physical Status of Child: _____

_____

J. At what age did you first notice your son/ daughter was different from other children? _____

Who has helped you most with understanding him/her?

_____

III. FAMILY SITUATION:

A. Siblings: age grade defect

_____ ____ _____ _____

_____ ____ _____ _____

_____ ____ _____ _____

_____ ____ _____ _____

B. Does youth live with parents? _____

If no, with whom? _____

C. Health condition of:

mother: _____

father: _____

IV. EDUCATIONAL HISTORY:

A. Attendance at kindergarten? yes ___ no ___

length of time? _____

B. Attendance at elementary school? yes ___ no ___

length of time? _____

C. Over-all academic assessment: _____

_____

_____

_____

V. Behavior of child at home: (i.e., difficulties, discipline, etc.)

_____

_____

VI. Hackberry assessment for summer 1969 in relation to swimming, physical education and recreation: (Director of HPR program)

_____

_____

_____

_____

APPENDIX B

In-Service Conference

IN-SERVICE CONFERENCE

Explanation and discussions encompassed the following:

Activities to be Taught and Supervised

Badminton (singles and doubles)

Basketball (horse)

Bowling (lawn)

Croquet

Deck Tennis

Horsehoes

Newcombe (lead up to volleyball)

Tetherball

Bait Casting

Golf (putting)

Wiffleball (proper swing to hit ball)

Frisbee (how to throw it)

Football (passing and catching)

Teach the following skills:

Catching

Throwing

Pitching (horseshoes & softball)

Badminton strokes

Croquet swing (mallet)

Tossing deck tennis ring

Suggestions to Instructors

1. Encourage students to use proper skills and form when possible.
2. Provide opportunities each day for success. Failure comes often enough.
3. Be alert to determine if student is comprehending your explanations - use athletic jargon and explain what you mean.
4. Encourage the student to do the very best that he can.

5. Be sure to teach and supervise the activities you are assigned each day.

6. Encourage friendly competition and explain that a person cannot expect to excel in all activities.

7. Display enthusiasm and encourage good sportsmanship.

8. Try to help each child understand the need for physical activity each day.

APPENDIX C

Rating Sheet for Student Teaching and Evaluation Battery

RATING SHEET FOR STUDENT TEACHING
College of Education
University of Alabama

Name of Student_____Semester_____19 __

Class(es) taught_____

Cooperating Teacher_____Grade Level_____

A. PERSONAL QUALITIES	Poor	Average	Good
1. General appearance-- grooming, posture, etc.			
2. Attendance			
3. Quality and effectiveness of speech			
4. Initiative			
5. Understanding of student age group			
6. Originality in planning			
7. Accepts and evaluates criticism			
8. Adaptability to varied situation			
9. Variety of interests			
10. General Adjustment			
11. Punctuality			
B. PROFESSIONAL EQUIPMENT			
1. Knowledge of subject matter			
2. General education			
3. Familiarity with variety of materials			
4. Ability to select appropriate methods of instruction			
5. Ability to plan units and daily lessons			
6. Understanding and use of evaluation techniques			
7. Professional attitude			
C. THE TEACHING SITUATION			
1. Efficiency in handling routine			

RATING SHEET FOR STUDENT TEACHING
College of Education
University of Alabama

Name of Student_____Semester_____19 __

Class(es) taught_____

Cooperating Teacher_____Grade Level_____

A. PERSONAL QUALITIES	Poor	Average	Good
1. General appearance-- grooming, posture, etc.			
2. Attendance			
3. Quality and effectiveness of speech			
4. Initiative			
5. Understanding of student age group			
6. Originality in planning			
7. Accepts and evaluates criticism			
8. Adaptability to varied situation			
9. Variety of interests			
10. General Adjustment			
11. Punctuality			
B. PROFESSIONAL EQUIPMENT			
1. Knowledge of subject matter			
2. General education			
3. Familiarity with variety of materials			
4. Ability to select appropriate methods of instruction			
5. Ability to plan units and daily lessons			
6. Understanding and use of evaluation techniques			
7. Professional attitude			
C. THE TEACHING SITUATION			
1. Efficiency in handling routine			

	Poor	Average	Good
2. Attention to health factors--light, heat, etc.			
3. Willingness to assume responsibility			
4. Interest in individual students			
5. Ability to inspire confidence and respect			
6. Fairness and sympathy with students			
7. Handling of disciplinary situations			
8. General effectiveness in motivating learning			

Please use back of sheet for your comments concerning the use of this rating scale.

Recommended grade _____

IDENTIFICATION OF BODY PARTS

NAME _____

AGE _____

	Points	Comments
Touch your shoulders		
Touch your hips		
Touch your head		
Touch your ankles		
Touch your ears		
Touch your feet		
Touch your eyes		
Touch your elbows		
Touch your mouth		

SCORING: A rating is assigned based on the child's overall performance. Assign the child one of the following ratings:

4. If the child performs adequately throughout.

3. If he shows only slight hesitancy or confusion.

2. If the child shows hesitancy in more than one or two of the commands. If he points to only one of the paired parts.

1. If the child is unable to identify one or more of the parts called for. If he shows marked hesitancy (except elbows) or if he "feels around" to find the part.

STATIC BALANCE ON A MAT

Phase I

NAME _____

AGE _____

1. Seated balance; the attempt should be made to remain relatively immobile for increasingly lengthy periods of time.

_____

(COMMENTS)

2. Balancing while lying on the side.

_____

(COMMENTS)

3. Hand and knee balance, four points touching the mat.

_____

(COMMENTS)

4. Hand and knee balance on three points, lifting either one hand or foot from the mat.

_____

(COMMENTS)

5. Upright kneeling.

_____

(COMMENTS)

6. Hand and knee balance, two points (cross pattern), i.e., left arm and right leg in air.

_____

(COMMENTS)

7. Hand and knee balance, two points, same side.

(COMMENTS)

8. Hand and knee balance, with modifications, two and three points. The child might be asked to posture on three points one of which is an elbow, or perhaps to use a three point balance with his back nearest the mat.

(COMMENTS)

9. Same knee-foot balance, two points.

(COMMENTS)

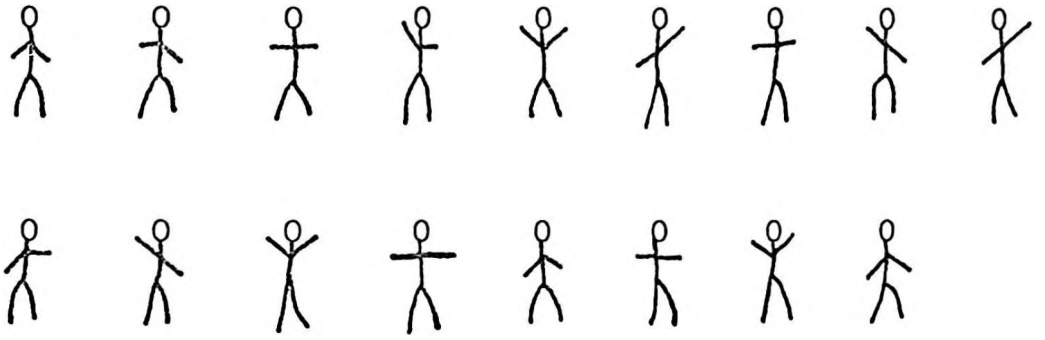
10. Knee only balance, two points.

(COMMENTS)

IMITATION OF MOVEMENT

NAME _____

AGE _____



COMMENTS

Does not mirror the patterns _____

Not consistent (sometimes mirror sometimes parallel) _____

Shows hesitation or lack of certainty _____

Makes abortive movements _____

Moves wrong limb _____

Does not recognize errors spontaneously _____

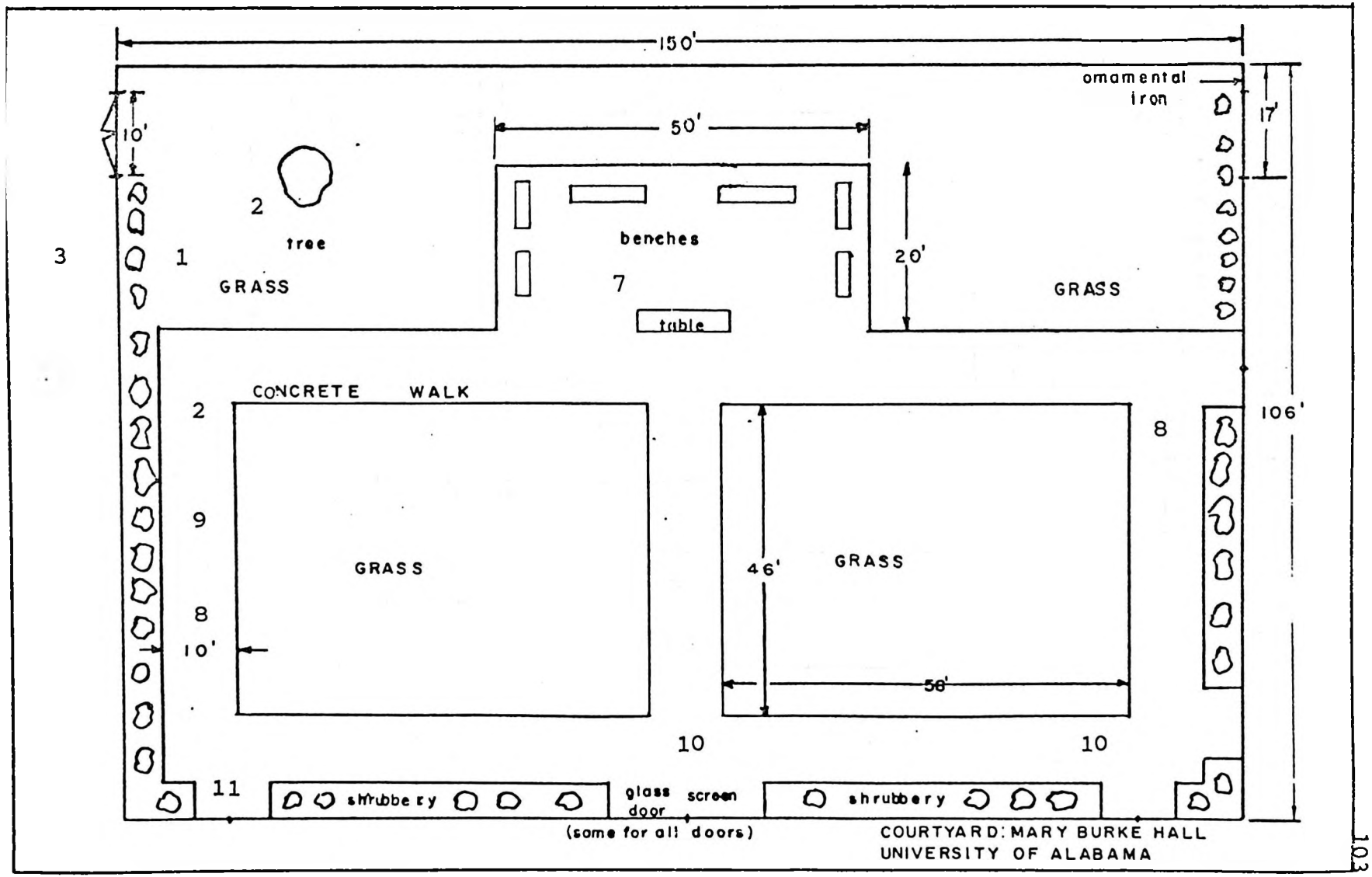
Recognizes errors after some delay _____

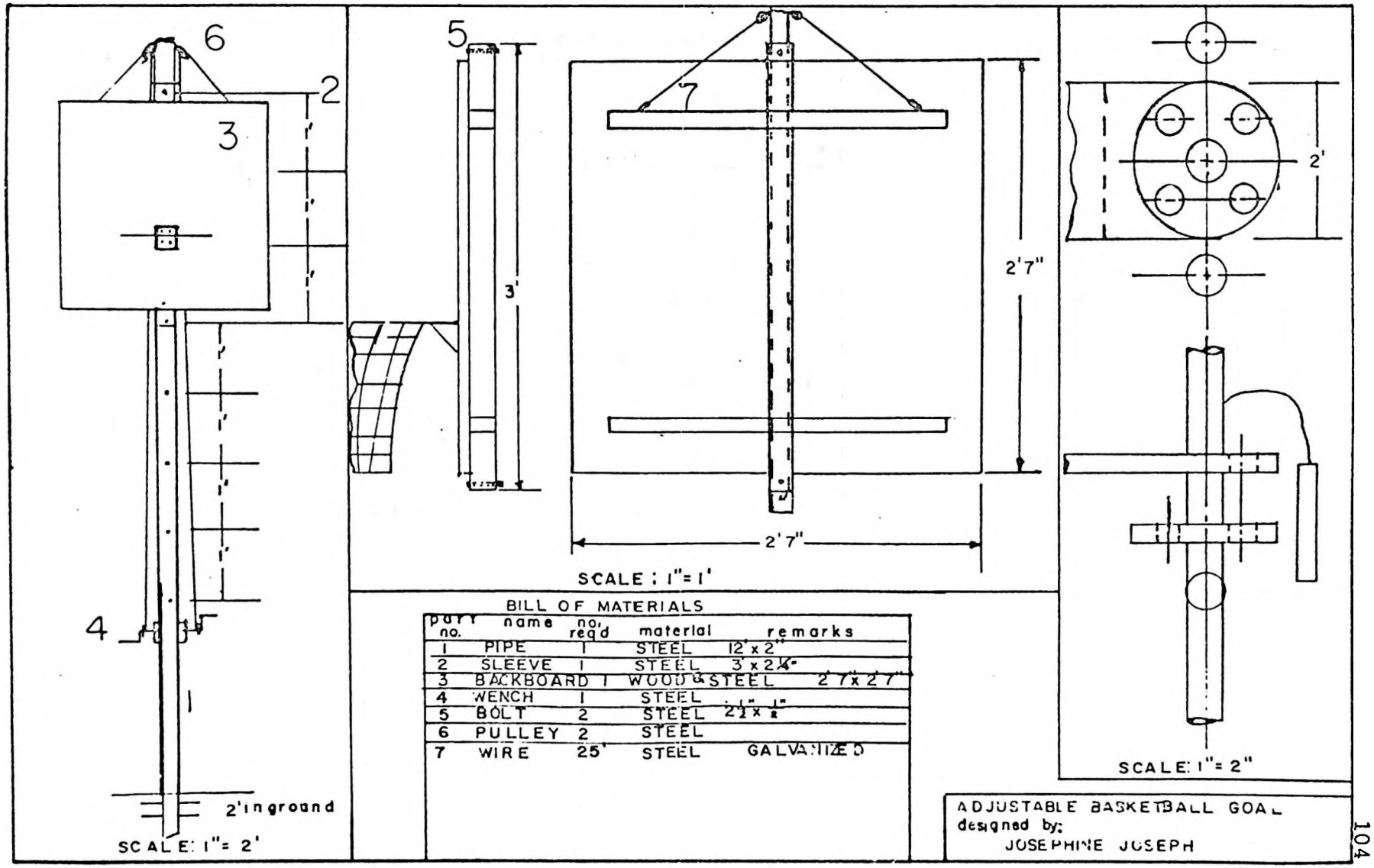
APPENDIX D

Diagram of Play Area and Adapted Equipment Designed for Program

ACTIVITIES

1. Body mechanics
2. Ball and bean bag skills and games
3. Sand box activities using plastic toys
4. Swimming (Natatorium)
5. Tetherball (Hackberry location)
6. Basketball shooting (Hackberry location)
7. Round bolo bat and whiffle ball attached
8. Jump rope
9. Hopscotch
10. Bait casting
11. Golf putting

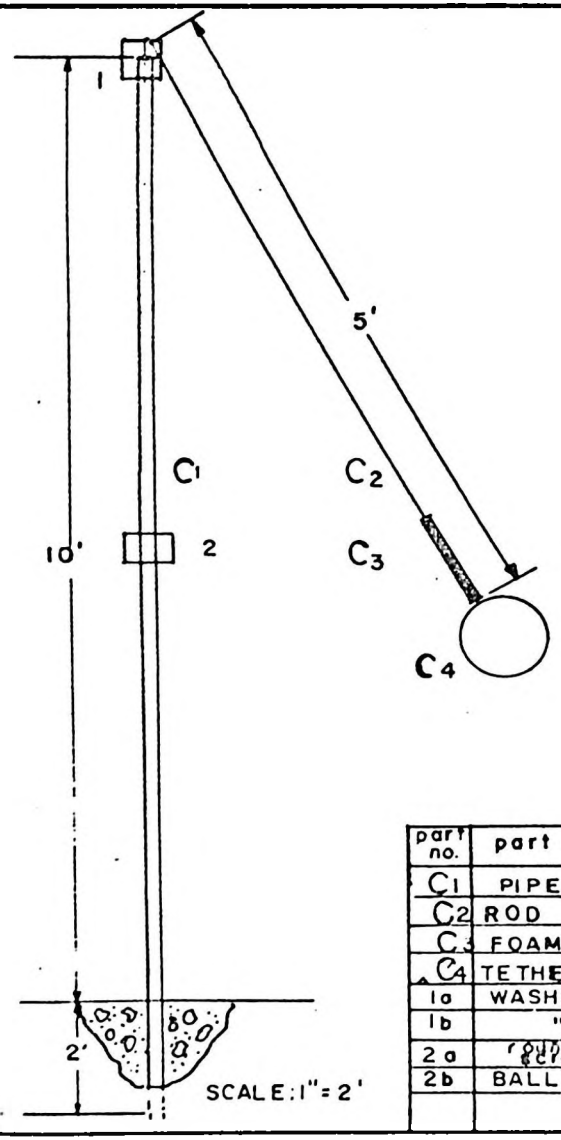

150'
ornamental iron
17'
10'
50'
2
tree
benches
20'
3
1
GRASS
7
table
GRASS
CONCRETE WALK
2
8
106'
9
GRASS
46'
GRASS
8
10'
56'
10
10
11
shrubbery
glass screen door
(some for all doors)
shrubbery
COURTYARD: MARY BURKE HALL
UNIVERSITY OF ALABAMA



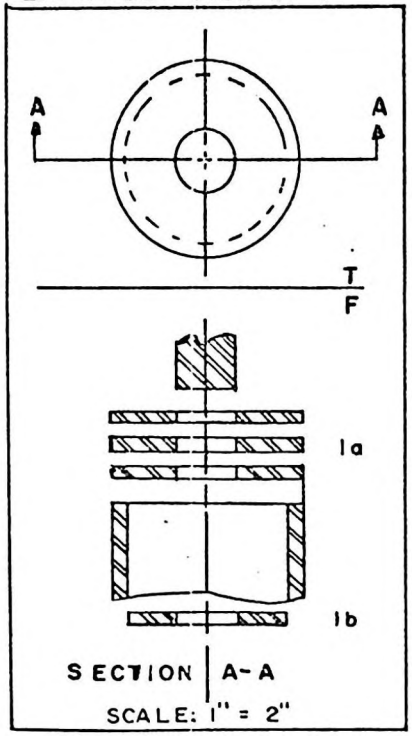
BILL OF MATERIALS

part no.	name	no. req'd	material	remarks
1	PIPE	1	STEEL	12' x 2"
2	SLEEVE	1	STEEL	3" x 2½"
3	BACKBOARD	1	WOOD & STEEL	2'7" x 2'7"
4	WENCH	1	STEEL	
5	BOLT	2	STEEL	2½" x ½"
6	PULLEY	2	STEEL	
7	WIRE	25'	STEEL	GALVANIZED

ADJUSTABLE BASKETBALL GOAL
designed by:
JOSEPHINE JOSEPH



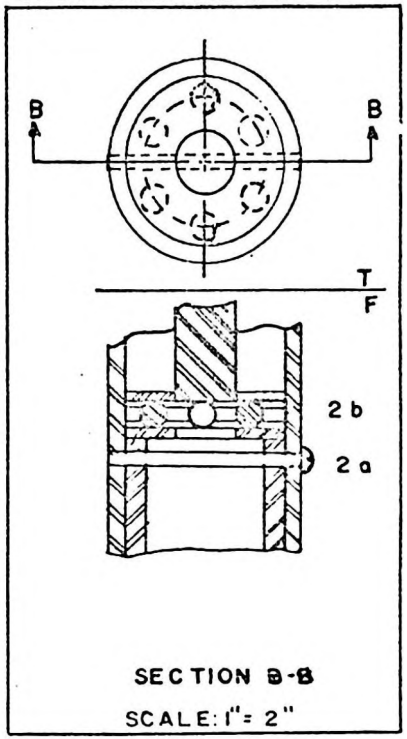
EXPLODED VIEW OF 1



SECTION A-A

SCALE: 1" = 2"

SECTIONED VIEW OF 2



SECTION B-B

SCALE: 1" = 2"

BILL OF MATERIALS

part no.	part name	no. req'd	material	remarks
C1	PIPE	1	STEEL	12' x 1.5"
C2	ROD	1	STEEL	10' x 0.62"
C3	FOAM INSU.	1	RUBBER	12" x 2" dia.
C4	TETHER BALL	1	RUBBER	
1a	WASHER	3	STEEL	1.5" x $\frac{1}{8}$" x $\frac{5}{8}$" dia
1b	"	3	"	1.9" x $\frac{1}{8}$ x $\frac{5}{8}$" dia
2a	roundhead screw	1	"	$\frac{3}{16}$ x 1.9"
2b	BALL BEARING	1	"	1.8" dia.

MODIFIED TETHER BALL

designed by: JOSEPHINE JOSEPH

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REFERENCES

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