MOTOR PERFORMANCE OF YOUNG EXCEPTIONAL CHILDREN

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We hereby recommend that the dissertation prepared under our supervision by Jerry Ann Nestroy entitled MOTOR PERFORMANCE OF YOUNG EXCEPTIONAL CHILDREN

be accepted as fulfilling this part of the requirements for the Degree of Doctor of Philosophy.

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DEDICATION

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This dissertation, however, must also be dedicated to all those who believed in my abilities and efforts through the years. Mountains have been scaled, dreams realized, and goals attained because of your faith, understanding, support, patience, and love.

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CHAPTER I

ORIENTATION TO THE STUDY

"One of the accepted challenges of American education is that of preserving and developing the potential of each child" (Poindexter, 1969, p. 69). Such sentiment was expressed 6 years before federal intervention occurred in the form of Public Law 94-142, the Education for All Handicapped Children Act of 1975. With enactment of this legislation, all handicapped children were ensured a free, public education in the least restrictive but most appropriate environment. Specifically, the Federal law states:

> . . . to the maximum extent appropriate, handicapped children, including children in public or private institutions or other care facilities, are educated with children who are not handicapped, and that special classes, separate schooling, or other removal of handicapped children from the regular educational environment occurs only when the nature or severity of the handicap is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily . . . . (121a.550)

The key word in this definition is "appropriate". Public Law 94-142 does not specifically define an appropriate education. It merely provides an operational definition; one which describes the process of determining an appropriate education.

The principal element in the process of determining an appropriate education is the "individualized education program" (IEP). If an IEP, which provides for the unique needs of the child, is appropriately

developed and fully implemented, the program should meet the unique needs of the child and ensure that he/she is functionally included in the educational process. A child would, however, be functionally excluded if he/she is not provided with the special services needed to allow him/her to benefit to the maximum extent possible from his/her education.

Although P.L. 94-142 clearly requires that handicapped children be educated in the least restrictive and most appropriate educational environment, many misuses, misinterpretations, and abuses have occurred in this provision. School districts, claiming that they are under a mandate to provide educational opportunities for all children, often assign the special child to the regular classroom. This is especially true in physical education. Contrary to present practice, not all handicapped children should be placed in regular programs. Rather, only those children who can be expected to succeed and profit from regular programs, without disrupting the learning of other children, should be placed in such settings (Moran & Kalakian, 1977; Abeson, 1980).

Physical education is the subject area that is specifically mandated for handicapped children in P.L. 94-142. If this physical education instruction is educationally sound, the following benefits, described by Daume (1976), should ensue:

> . . . helps maintain health, compensates deficiencies . . . and increases ability; increases well-being and promotes emotional balance; permits purpose-free and undirected action; provides important and inalienable fundamental experiences for living in our mechanized world; provides an important field of communication through social experiences and insights; reveals behavioural manners and the necessary techniques for using leisure time sensibly after classes and following finishing school. (p. 10)

According to Eriksson (1976), all growing individuals in our modern industrialized society, including exceptional children, must be given sufficient physical training during both school time and spare time as "hard physical training has yet to demonstrate any deleterious effects" (p. 50). In 1964, UNESCO recommended that between one-third and one-sixth of the total school day be designated as time devoted to physical activity for elementary school age children.

There are many potential health benefits of physical activity programs for all children which irrefragably support the need for sound developmental physical activity programs for young exceptional children. Healthy growth depends upon physical or weight bearing activity. Exercise increases bone width and mineralization, whereas inactivity leads to decalcification of bones which results in a weakened and brittle condition. According to Houston, Professor of Diagnostic Radiology at the University of Saskatchewan: ". . . only one week of inactivity often causes noticeable demineralization--loss of half the calcium from a bone. So the amount of activity we get is much more important than the amount of milk we drink" (Cited in Bailey, 1976, p. 82). Thus, if children are active, their bones will be adequately mineralized and both bones and muscles will be strong.

Another propitious result of physical exercise during childhood is the proper development of the functional capacity of the heart and lungs. If undeveloped during the growing years, the potential optimal of these organ systems will likely be lost. Physical fitness, a product of quality activity programs, increases the body's resistance against general

stress and illness throughout life (Cumming, 1976). Adult health problems related to inactivity may possibly be linked to sedentary childhood activity patterns. The fact that the first signs of arteriosclerotic disease appear around age 2 and are reversible with physical activity until age 19 has been documented by Rose (1973). According to Cumming (1976), there are very few medical conditions for which physical activity programs are totally contraindicated.

Educational and medical authorities, thus, agree that the human organism does not develop normally and, in fact, cannot maintain life unless it has mobility. Burt (1937) has stated:

> It is a truism in psychology that the mechanism of the mind stands on a sensori-motor basis. The world outside can stimulate the mind only through one of the senses; and in return, all that the greatest intellect can do is to contract a set of muscles and move a set of bony levers. The end product of every mental process is simply a muscular reaction. (p. ii)

Human movement provides the basic psychomotor framework for development, for through movement children discover critical elements about their bodies, their environment, and their social interactions. Young children must move to learn and learn to move. Thus, the development of movement skills is critical in the developmental process of all children, but especially in the exceptional child. Moran and Kalakian (1977) have stated that:

> Motor experiences can be observed as being the primary means by which a child initially gathers perceptual information about his world. In effect, the child moves to perceive, and perception through motion begins to give meaning and order to a world heretofore characterized by sensory chaos. (p. 270)

Movement patterns of children depend upon the acquisiton of body

management abilities which form the blocks upon which fundamental movement skills are built. These fundamental skills, in turn, provide for the development of more complex personal, vocational, and leisure-time movement skills. Gesell (1940) suggested that the development of the more complex and sophisticated skills is founded upon the acquisition of postural skills. According to Piaget (1936) and Kephart (1960), early motor experiences are the foundations for all higher learnings. Thus, the motor development which occurs during the early years is an important facilitator and determinant of later cognitive, affective, and psychomotor development (Block, 1977; McClenaghan & Gallahue, 1978; Luebke, 1981).

Although the typical sequence of motor development is highly predictable, the number of individual variations within this sequence may be great. Exceptional children often lag behind in functional motor skills in one or more areas of body management or fundamental skills. These children may have difficulty with the efficient performance of such locomotor patterns as skipping, hopping, and jumping, and with such gross and fine motor manipulative skills as writing, throwing, striking, kicking, and catching. Such basic skill deficiencies may be compounded by the lack of participation in vigorous activities requiring the utilization of these skills. Consequently, these children may not participate in those activities necessary for the development of such physical fitness components as strength, endurance, flexibility, and balance (Hayden, 1968).

There is ample evidence to suggest that significant restriction of physical activity can lead to most of the physical and motor problems characteristic of the handicapped. Because motor skill acquisition is specifically dependent upon the exposure and perfection of many skills, proper experience and practice opportunities in all fundamental skills must be provided to ensure that skill maturation occurs. Dennis (1963) found that children aged 1 to 4 years who were not provided with specific kinds of learning opportunities were retarded in normal locomotor development.

Motor retardation is a product of a sedentary lifestyle that begins early in childhood and progresses throughout the life of most exceptional individuals. Most of these children are severely underexercised because the typical physical education and recreation activities are not suitable for their abilities. Rules are too complex, skills required for participation are too demanding, and activities are too strenuous for their low levels of fitness.

Delays in motor development may be the result of many factors. Environmental limitations may restrict the variety of experiences available to the child. Parents and peer groups may be overly protective and cautious. Developmental lags are often, but not necessarily, overcome when children are placed in stimulating, appropriate, and secure environments. It is believed that the earlier such intervention programs are initiated, the more successful they are likely to be. "Remediation of motor skills occurs most efficiently in early childhood at a time

when the discrepancy between the normal level of development [critical period] and delayed motor function is negligible" (Moran & Kalakian, 1977, p. 407). Despite the fact that authorities from diverse educational fields agree on the importance of early motor activities for children, many assumptions about the movement capabilities and needs of youngsters have not been verified by research.

Since motor development is vital to a child's total functioning, it is important to investigate the relationship between motor characteristics and certain handicaps. Although the measurement and evaluation of motor skills and abilities may not be as exact as the assessment of certain other aspects of human behavior, research is essential to determine whether specific handicapping conditions affect this fundamental area of behavior. The motoric weaknesses and strengths of exceptional children must be known if those concerned with the education and welfare of these children are to initiate appropriate procedures to ensure that the motor aspects of human behavior are developed to the maximum extent possible in all children. According to Rarick (1976), "one of the greatest research needs is for exploration of the motor . . . abilities of the children in the age range 5 to 15 years. Very little research of consequence has been done" (p. 212).

Purpose of the Study

The purpose of this study was to determine the motor performance levels of young exceptional children who were receiving special services in the Texas public schools. In addition, the study was designed to

answer the following specific questions:

1. Are mentally retarded, learning disabled, and emotionally disturbed children motorically handicapped?

2. How do the motor performances of various etiological groups of exceptional children compare with each other and with those of nonhandicapped children?

3. Should all handicapped children as defined in this study be 'mainstreamed' in regular physical education classes or would they benefit more from an adapted physical education program?

4. Is an observational checklist a valid assessment tool for determining the most appropriate physical education class placement for handicapped children?

5. Is the Test of Motor Impairment a valid instrument for determining the most appropriate physical education class placement for handicapped children?

Statement of the Problem

The problem of this study was to assess the motor abilities of 1,135 young handicapped children, ages 5, 6, 7, 8, and 9, who were educationally classified as mentally retarded, learning disabled, or emotionally disturbed. All subjects were enrolled in public schools throughout the various geographical sections of the state of Texas, including urban, suburban, and rural areas. Data were collected during the spring of 1981 through the administration of the following two evaluation instruments: (a) Test of Motor Impairment (Stott, Moyes, &

Henderson, 1972) and (b) Observational Checklist of Movement Tasks, an adaptation of Sinclair's (1971) Movement Task Analysis Forms. Sinclair's checklist was utilized to evaluate the subjects' abilities to perform 12 selected fundamental movement patterns: creeping, walking, running, galloping, hopping, skipping, sliding, jumping, throwing, catching, kicking, and balancing. Stott's Test of Motor Impairment was employed to determine the presence of any motor/neurological impairment. For statistical comparisons, the subjects were grouped by sex, age, and educational classification. Their scores were also compared to those of 522 nonhandicapped subjects as well as to normative data available in the literature.

Definitions and/or Clarification of Terms

For the purpose of clarification, the following definitions and/or explanations of terms were established for use throughout the study. Because the investigator accepted the school districts' educational classifications of subjects, the definitions established by the Texas Education Agency (TEA) were used.

Special Education

"Special education is the provision of a continuum of child-centered educational and supportive services in combination with those provided in the general school program to meet the needs of students who are handicapped." (TEA, 1979, p. 2)

Handicapped Students

The terms 'handicapped' and 'exceptional' are synonymous and were

used interchangeably in this study.

> Handicapped students are those . . . between the ages of 3 and 21, inclusive, with educational handicaps . . . mentally retarded, emotionally disturbed, learning disabled, . . . whose disabilities are so limiting as to require the provision of special services in place of or in addition to instruction in the regular classroom. (TEA, 1979, p. 2)

Mentally Retarded Students

"Mentally retarded students are students with significantly sub-average general intellectual functioning existing concurrently with deficiencies in adaptive behavior and manifested during the developmental period . . ." (TEA, 1979, p. 3). These students are "functioning more than two standard deviations below the mean on individually administered scales of verbal ability, performance or nonverbal ability, and adaptive behavior" (TEA, 1979, p. 22).

Emotionally Disturbed Students

Emotionally disturbed (ED) students are those who have been "psychologically or psychiatrically" evaluated to exhibit:

> . . . one or more of the following characteristics over a period of time and to a degree which adversely affects educational performance:
>
> (i) an inability to learn which cannot be explained by other defined handicapping conditions;
>
> (ii) an inability to build or maintain satisfactory interpersonal relationships with peers and teachers;
>
> (iii) inappropriate types of behavior or feelings under normal circumstances;
>
> (iv) a general pervasive mood of unhappiness under normal circumstances; or
>
> (v) a tendency to develop physical symptoms or fears associated with personal or school problems. (TEA, 1979, pp. 24-25)

Learning Disabled Students

Learning disabled (LD) students are those who have

> . . . been determined by a multidisciplinary team not to be achieving commensurate with their age and ability levels. The lack of achievement is found when the student is provided with learning experiences appropriate for their age and ability levels in one or more of the following areas: oral expression, basic reading skill, reading comprehension, mathematics calculation, mathematics reasoning, or spelling. (TEA, 1979, p. 25)

Normal Students

Normal students are those who have no known handicapping conditions. The terms 'normal' and 'nonhandicapped' are synonymous and were used interchangeably in this study.

Motor Impairment

Motor impairment is defined as:

> . . . the level of impairment which would begin to be a handicap to a child in his everyday life, whether it be his ability to play the games of his age-group, avoid accidents to himself or the objects he comes in contact with, or develop manual skills such as writing or using tools. (Stott, Moyes, & Henderson, 1972, p. 8)

Test of Motor Impairment

The Test of Motor Impairment, in its present form, was marketed in 1972 by Stott, Moyes, and Henderson as an instrument to detect "impairment of motor function". It was modeled after the original Oseretsky Tests of Motor Proficiency (1923) in format and after Göllnitz's (1960) modification and scoring system. The test is divided into five categories: Balance, Upper Limb Coordination, Whole Body Coordination, Manual Dexterity, and Simultaneous Movement. Test-retest reliabilities have been reported to range from .89 to .99 at the various age levels. Age range for the test is from sub-5 to 13+ years.

Movement Tasks

Movement tasks "are those activities commonly considered fundamental to the performance of more complex motor actions" (Sinclair, 1971, p. 1).

Observational Checklist of Movement Tasks

The Observational Checklist of Movement Tasks, hereafter referred to as Sinclair's Checklist, consists of 12 movement tasks adapted from Sinclair's (1971) developmental study. Items include creeping, walking, running, galloping, hopping, kicking, sliding, skipping, broad jumping, walking the beam, throwing, and catching. Each task is broken into appropriate components which comprise the mature and successful pattern of movement.

Hypotheses of the Study

The .05 level of statistical significance was used to determine the tenability of the following null hypotheses:

1. There is no significant difference between the degree of motor impairment of nonhandicapped, handicapped, age, or sex groups as measured by the Test of Motor Impairment.

2. There is no significant difference between nonhandicapped, handicapped, age, or sex groups in the performance of fundamental movement tasks as measured by Sinclair's Checklist.

Limitations of the Study

The study was subject to the following limitations: (a) the availability of subjects at each age level and of each sex who were

educationally labeled mentally retarded, learning disabled, or emotionally disturbed; (b) the degree to which the subjects were correctly classified educationally; (c) the degree to which the subjects were representative of the populations from which they were drawn; (d) the degree to which the subjects were motivated to perform during the testing sessions; (e) the validity, reliability, and objectivity of the test items; (f) the reliability of the test administrator to evaluate the subjects' performances on each of the test items; (g) the degree of objectivity exhibited by the test administrator; (h) the degree of cooperativeness demonstrated by the public school teachers and/or diagnosticians; and (i) the degree to which the testing facilities were similar.

CHAPTER II

REVIEW OF RELATED LITERATURE

As this study focused on the motor abilities of young exceptional children, an extensive investigation of related literature, including several database searches, revealed that no previous research was being duplicated. Although some noteworthy studies have been reported by both educators and physical educators, most researchers have concentrated on the physical fitness of mentally retarded (MR) populations, age 10 years and older. There is, in fact, a paucity of research investigating the motor patterns and abilities of learning disabled (LD) and emotionally disturbed (ED) children. Of the few studies reported, most of them have explored instructional methodologies or fitness levels of these populations. Although all literature pertaining to the motor behavior of exceptional children was surveyed and studied in the development of this study, this review was limited to selected studies which primarily examined the motor abilities of elementary age children. These studies are presented under the etiological headings of Learning Disabled, Emotionally Disturbed, and Mentally Retarded.

Learning Disabled

It has been estimated that of the 46 million school-aged individuals in the United States, over 12% are handicapped to the extent of needing special education assistance. Of this percentage, 3% is

learning disabled (Crowe, Auxter, & Pyfer, 1981, p. 19), although incidence reports vary from 3% to 20% of the total population. According to Cratty (1980), there are between 1,100,000 and 2,200,000 children between the ages of 5 and 18 years who are educationally labeled learning disabled (p. 170). Fait (1978) estimated that 1 out of every 5 children with average or above average intelligence has perceptual, cognitive, or coordination problems of neurological origin which interfere with optimal success in the regular school environment (p. 235). Despite the large number of students with learning disabilities, relatively little research pertaining to the motor characteristics of this particular population has been conducted. Of the studies reported in the literature, only one specifically explored the motor ability of young LD children.

In a validational study for the Bruininks-Oseretsky Test of Motor Proficiency, Bruininks and Bruininks (1977) found both gross and fine motor skills of LD students to be significantly ($p < .001$) lower than those of nondisabled students. More variability in performance was also noted for the LD group. Within the LD group were 38 boys and 17 girls ranging in age from 6 to 13 years. A comparison group (n=55) was comprised of normal subjects matched by age and sex. The greatest significant deficiencies ($p < .01$) of the LD subjects were in tasks requiring body equilibrium, controlled fine visual-motor movements, and bilateral coordination of movements involving different parts of the body. Accordto the investigators, all of these areas include complex motor

patterns which require integration of visual and kinesthetic senses to all motor responses, thus the areas of deficiency lie chiefly within the sensory-motor realm.

The results of this study should be weighed cautiously because of the small sample size. Bruininks and Bruininks failed to stipulate the sample size at each of the 8 age levels although the subjects were matched by age. Also to be considered is the fact that students of both sexes were grouped together.

Research has yet to verify any developmental delay of motoric ability in young LD children. Several investigators, however, have reported successful attempts to design specific physical education programs for remediation of motor deficits. Lamport (1974) found that a perceptual-motor program of 16 weeks duration was significantly ($p < .05$) effective in the improvement of 8- and 9-year-old boys' ability to perform static balancing tasks. Boys, 7 and 8 years old, significantly improved in dynamic balance ability after participation in the program, whereas 9-year-old girls demonstrated significant improvement only in the ability to catch a ball. According to Kraft (1977), perceptual-motor and modified traditional physical education programs were equally effective as instructional methods in the gross motor development of 92 6- and 7-year-old LD children. Elstein (1977) demonstrated that a 9-month individually determined program of highly structured basic motor skills significantly ($p < .05$) increased the fitness of 44 LD children between the ages of 6½ and 15½ years.

Emotionally Disturbed

Estimates of the incidence of emotional disturbance in school populations range from 2% to between 10 and 15% (Cratty, 1980). According to the United States Office of Education's Bureau of Education for the Handicapped (1978), there were 284,385 students educationally classified as emotionally disturbed. This number represented 7.6% of the total population of handicapped children receiving special education and related services during the 1976-77 academic year.

Because of the inconsistencies in defining this population and the unique problems associated with these students, very few investigators have studied the motor abilities of ED children. Those studies which have been reported in the literature should be scrutinized carefully to determine whether or not the subjects were actually ED. This educational label is flagrantly misused and applied to individuals with a variety of symptoms and/or conditions--from mild and temporary disturbances to severe and chronic disorders. Other terms used interchangeably in the literature, but not necessarily correctly, with ED children include behavior disorder, mental illness, neurosis, autism, psychosis, schizophrenia, and occasionally hyperactivity. Thus, many individuals who are correctly labeled by one of the foregoing terms are many times educationally classified as emotionally disturbed.

According to the results obtained in a 3-year study by Poindexter (1969), coordinated locomotor patterns of hopping and skipping, trampoline performance, and balance (static and dynamic), of 7- to 10-year-old

ED youngsters were deficient in comparison with a normal group. This deficiency was not statistically significant. The ED subjects, however, scored significantly lower than their normal age-mates on measures of strength, balance, and speed. Grip strength was measured by a hand dynamometer, shoulder and arm strength by use of the Elgin table, and abdominal strength by performance on the Kraus-Weber test, bent knee sit-ups, and knee extension. Power was evaluated by performance on the standing broad jump, and speed was reflected by performance on the 30-yard dash. Agility was determined by a shuttle run task and walking beam. The perceptual-motor abilities of the ED group, as measured by the Purdue Perceptual-Motor Survey, were also significantly ($p < .01$) lower than the normal group.

Contrary to Poindexter's findings, Rider (1973) found that ED children scored significantly ($p < .05$) lower on only 1 of the 4 gross motor performance subtests of the Purdue Perceptual-Motor Survey--the obstacle course. The ED group, however, was significantly ($p < .05$) deficient in balancing on one foot with eyes closed, but performed within normal limits with eyes open. Rider's study utilized 20 subjects, 6 girls and 14 boys, between the ages of 6½ and 12½ years. All were diagnosed as ED by a committee comprised of elementary school counselors, classroom teachers, a psychologist, and the school principal. The comparison group, with no known dysfunctions, was composed of 23 subjects (8 girls and 15 boys) matched by sex and grade placement.

The survey of literature indicated that research involving ED populations concentrated on fitness or programming rather than on motor

skills or abilities. And, as with studies on the LD population, the majority of investigators used teenage or adult subjects.

Based on the findings of case studies of 12 ED children between 7 and 15 years of age, Haley (1969) found that gross motor skills could be improved by individualized motor programs. Beyer (1973) found that for 97 subjects between the ages of 6 and 10 years, a specially designed physical education program was significantly ($p < .05$) more successful in the development of motor fitness than either a regular physical education or sensory-motor training program. Cardiovascular endurance, however, was not significantly affected by any of the three programs. It was noted that although the ED subjects exhibited a normal curve of physical development, they appeared to be below their peer group in the performance of motor activities.

Mann, Burger, Green, Proger, Hilsendager, and Bayuk (1973) concluded from the results of a project funded by the United States Office of Education that training contributed to improved physical fitness of 192 ED subjects between the ages of 8 and 14 years. The nature of such improvement, however, was not delineated and appeared to follow patterns different from those expected with normal children. The results indicated that during the first summer of the project, significant improvement occurred in only 5 of the 36 skills measured. During the second summer program, improvement was noted in only 7 of the 36 skills. Employing the same evaluation as Mann et al. (Basic Motor Fitness Test for Emotionally Disturbed), Brown (1976) found that motor fitness of 19

6- and 7-year-old ED children could be significantly increased through structured physical education classes.

Mentally Retarded

According to Fait (1978), 3% of the population in the United States is mentally retarded. Of these 6 million retardates, approximately 4 million are children under 20 years of age (p. 217). Crowe, Auxter, and Pyfer (1981) have indicated that only 2.3% of the total 12% of handicapped school aged children is mentally retarded (p. 19). As there are several degrees of retardation founded upon IQ scores, this lucubration was specifically concerned with only the mildly and moderately retarded populations. Cratty (1980) estimated that there are approximately 2,100,000 mildly retarded and 144,000 moderately retarded children under 21 years of age. Until recently, MR children were educationally labeled as educable mentally retarded (EMR) and trainable mentally retarded (TMR), respectively. Today, these children are educationally classified as mentally retarded without any differentiation of IQ-based categories.

The literature abounds with research on various aspects of motor behavior of MR subjects. Although many experimental studies suffer from inadequate controls and samples, the evidence that is available indicates that MR children are slower, weaker, and less skillful than their normal counterparts (Francis & Rarick, 1959; Rarick, Widdop, & Broadhead, 1970; Rarick & Dobbins, 1972; Rarick & McQuillan, 1977). This deficiency increases as the complexity and precision requirements of the task increase (Baumeister, Hawkins, & Holland, 1956; Howe, 1959; Nunley,

1965; Langan, 1965). Evidence, however, is available to indicate that great physical improvement is possible (Hayden, 1968; Sharpe, 1968; Funk, 1969; Pyfer, 1970). It is not unusual for TMR youngsters to score in the upper quartiles of fitness norms as demonstrated by Hayden (1968). Hayden (1968), Wyrick and Owen (1970), and Rarick and Dobbins (1972) have reported a wider degree of variance in the retarded than in the normal populations.

The majority of investigative reports have dealt with the physical fitness of MR populations (Francis & Rarick, 1959; Howe, 1959; Sengstock, 1963; Auxter, 1966; Solomon & Pangle, 1967; Hayden, 1968; Rarick, Widdop, & Broadhead, 1970; McClure, 1970; Chavez, 1971; Campbell, 1973; Peries, 1973). A large number of these investigations have involved teenage or adult subjects. This review, therefore, was limited to those studies which specifically related to the younger MR population.

Howe (1959) compared the performance of MR and normal children on a variety of motor skill tasks. Selected as subjects were 42 normal and 42 retarded children, ages 6½ to 12 years, matched by sex, age, and socio-economic background. The mean IQ scores for the MR groups were 67.5 for boys and 64.5 for girls. For the normal groups, the mean IQ scores were 99.9 and 97.5 for boys and girls, respectively. The 11 motor tasks included the following: Sargent jump, balance on one foot, tracing speed, grip strength, tapping speed, zig-zag run, 50-yd. dash, dotting speed, squat thrusts, ball throw for accuracy, and maze tracing. The findings revealed that the group of normal girls was superior to the

group of MR girls on all but two tasks--grip strength and throw for accuracy. The performances of the normal boys significantly ($p < .05$) exceeded those of the MR boys in all events. Although retarded boys performed better than retarded girls, these differences were not significant.

Langan (1965) found that mildly retarded children between 7.6 and 10.5 years of age scored significantly ($p < .05$) below youngsters of normal intelligence on the Lincoln-Oseretsky Motor Development Scale. A motor deficiency of 1½ years at age 8 increased to 2 years at age 10. The developmental curve of the younger retarded subjects resembled that of normal subjects. All subjects were enrolled in public school classes. Langan also reported that no significant differences were found between middle- and lower-class retarded subjects or between EMR boys and girls.

Clawson (1969) found that elementary school age EMR children with higher IQ scores performed better than those with lower IQ scores on perceptual-motor and motor performance items. Preliminary norms for the state of Missouri were established for EMR boys and girls, aged 8, 9, and 11 years, on the items included on the Missouri Perceptual-Motor and Motor Performance Test Battery. Approximately 1,020 EMR children in special classes were evaluated by this battery. All analysis of regression comparisons indicated that the actual form of regression was linear. Each individual test item was examined to determine if a significant difference existed in performance of the High IQ and the Low IQ EMR boys and girls. A significant difference was noted between High IQ

and Low IQ girls at age 8 and 9 years on all measures. Coordination, movement patterns, and strength items did not differ significantly for the boys.

The purpose of a study by Hollingsworth (1971) was to determine the relationship of the motor proficiency of MR and normal individuals of a specific chronological age (CA) and to determine the relationship of the motor proficiency of MR and normal individuals of a specific mental age (MA). All subjects for this study were enrolled in an EMR special class or regular third, fourth, and fifth grades. The Columbia Mental Maturity Scale was used to classify subjects into three groups composed of three age levels: MRCA, MRMA, and intellectually normal. There were 10 subjects in each group at each age level of 8, 9, and 10 years. Motor proficiency of all subjects was determined by the Lincoln-Oseretsky Motor Development Scale.

Results of the study revealed that when paired on CA, EMR children were significantly ($p < .05$) below their intellectually normal peers in motor performance at ages 8, 9, and 10 years. When paired on MA, EMR children were significantly ($p < .05$) superior to their intellectually normal peers in motor performance at the same age levels. A positive progression of motor performance scores within each group classification from one age level to the next higher age level was also found. Because of the significant differences found between these three groups, Hollingsworth concluded that there is no justification for placing EMR students in physical education programs with intellectually normal

students.

In an investigation by Stewart (1971), the relationship between sex and selected abilities of gross motor performance was examined. The relationship of selected abilities at different CA intervals was also studied to determine which measures best predict gross motor performance. Four test batteries were utilized in the development of this study: the Frostig Developmental Test of Visual Perception, Wechsler Intelligence Scale for Children (WISC), Wepman Auditory Discrimination Test, and Cratty's Six-Category Gross Motor Performance Test. A total of 74 EMR boys and girls between the ages of 7 and 12 years were evaluated. Assessment of motor performance included measures of body perception, ball throwing, ball tracking, gross agility, balance, and locomotor agility.

Results of the study revealed that eye-motor coordination, spatial relationships, auditory discrimination, and sex can be used as predictors of gross motor performance. The EMR subjects without auditory discrimination problems tended to score higher on gross motor performance tasks than those with problems. Boys in the age range from 7 through 12 years tended to perform better than girls on the gross motor performance tasks. Age did not contribute significantly to the prediction of gross motor performance; however, age did appear to be a factor related to the performance of the ball-throwing task.

Windell (1971) compared the walking patterns of normal and TMR subjects to determine if the TMR exhibit a characteristic gait which significantly differs from that of normal children. Included in the study

were 58 TMR children between the ages of 7 and 18 years, and 63 normal children between the ages of 8 and 17 years. The range of IQ scores for the TMR group was reported as 28 to 68; however, it should be noted that an IQ score of 68 was definitely too high for this classification as the range for trainable mentally retarded is from 25 to 49.

Procedurally, selected muscles were examined electromyographically by a dynograph while the time relation between stance and swing phases of the lower extremity was simultaneously measured by a gait transducer. The 12 characteristics which were analyzed included the following: time of swing and stance phases, time of difference between stance and swing phases, duration of inactivity of the anterior tibialis, peroneus longus, and gastrocnemius during the stance, swing, and total gait cycle. Each subject had 10 consecutive steps analyzed. Based on the findings of the study, Windell concluded that there is a characteristic gait pattern for the TMR which differs from that of normal subjects.

The biomechanical movement configurations of a group of 30 TMR children were compared to those of a matched peer group of normal children in a study by Boelter (1975). The movement task involved stepping up onto and jumping off a 10-in. high platform. Analysis was done by means of biplanar cine-film recording which incorporated two synchronized cameras. The data were analyzed statistically at each of three observation intervals--initial movement, take-off, and landing. Nine biomechanic variables were examined. These included segmental linear velocity, acceleration, momentum, force; angular velocity, acceleration,

momentum, torque; and kinetic energy. The investigator concluded that the significant difference ($p < .01$) between the two groups was indicative of the TMR group's developmental lags in gross motor performance.

Ryan (1977) compared selected basic gross motor skill performances of moderately retarded children and children of normal intelligence. A criterion referenced assessment tool, the Ohio State University Scale of Intra Gross Motor Assessment (O.S.U.-SIGMA), was used. This scale of 11 basic motor skills is subdivided into 4 levels of motor performance ranging from the least mature to the most mature functional level. Each level within a skill is defined by performance criteria stated in behavioral form to reflect sequential development within each skill. The purpose of Ryan's investigation was to distinguish the qualitative differences in performance between 120 MR and 120 normal children between the ages of 6 and 8 years. The IQ scores of the MR group were reported as ranging from 20 to 53 (moderately retarded range). It was concluded that the performances exhibited by the MR children were significantly ($p < .05$) less mature developmentally than those of children of normal intelligence. Normal boys were more mature than normal girls in throwing, catching, striking, and kicking. On the other hand, normal girls were better than normal boys in skipping, hopping, and ladder climbing. Retarded boys surpassed the retarded girls in the skills of running, hopping, skipping, throwing, catching, kicking, striking, ladder climbing, and stair climbing. The greatest differences found between the MR and normal groups were in the complex skills of hopping, skipping, and

catching.

Schrum (1977) assessed the gross motor performances of 159 TMR children between the ages of 6 and 14 years with a 13-item test battery. Findings of the study indicated that performance differences could be blocked over 3-year intervals before significant differences were found. The three major age groupings were identified as: (a) 6, 7, and 8 years, (b) 9, 10, and 11 years, and (c) 12, 13, and 14 years. As chronological ages advanced, motor performances improved. No differences were found between the performances of the boys and girls.

Rider (1979) compared a group of TMR boys, between the ages of 8 and 12 years, with a group of nonretarded boys of the same ages to determine if common characteristics exist in gait patterns. The patterns were filmed with a 16mm movie camera and analyzed using the Vanguard Motor Analyzer. The following parameters were examined: stride length and rate, duration of stride, swing, stance, and double support, and mean angular displacement. Comparisons of the raw score means from both groups indicated a gait pattern that was consistently different. Graphical representations of the mean angular displacements of the knee, hip, and ankle indicated greater velocity, extension, and flexion in the patterns of the nonretarded subjects. The TMR group walked at a much slower pace with stride lengths which were significantly ($p < .05$) shorter. Additionally, the TMR group remained in the various supportive phases--duration of stride, stance, and double support--for a significantly longer time. There was little difference between the patterns of the

two groups for the duration of the swing.

Although volumes of information are available on activities and programs for the retarded, most of it has been put forward on the basis of face validity and personal experience; only a few studies have been completed. Special programs of physical education, were found by several investigators to effect greater development of motor skills in the young MR populations than traditional programs (Gearheart, 1963; Sharpe, 1968; Harkins, 1970). In turn, a traditional physical education program was significantly ($p < .01$) more effective than a movement exploration program in promoting fitness in TMR youngsters (Goodwin, 1970). On the other hand, Taylor (1969) and Richardson (1970) found no significant improvement in fitness in TMR subjects who participated in an organized physical education program. Funk (1969) and Pyfer (1970) reported that well-planned daily physical education programs can effect significant improvement in fitness and balance skills. Chavez (1970), however, failed to discover significant differences in fitness of EMR subjects after a 6-week training program.

In all probability, the most precise and comprehensive studies examining motor performances of MR subjects have been directed by Rarick (Francis & Rarick, 1959; Rarick, Widdop, & Broadhead, 1970; Rarick & Dobbins, 1972; Rarick, Dobbins, & Broadhead, 1976; Rarick & McQuillan, 1977), although all have been in the realm of fitness. In essence, these studies have substantiated the significant fitness inferiority of MR subjects to normal subjects. The performances of TMR

subjects were significantly exceeded by EMR subjects with the exception of flexibility measures; the performances of EMR subjects were significantly surpassed by those of normal subjects. Generally, the performances of the boys significantly exceeded those of the girls. Approximately 5,000 EMR and 460 TMR students have been evaluated through the efforts of Rarick. The ages for these subjects ranged from 6 to 21 years. Two weaknesses of these studies are evident. First, the sample sizes at the younger age levels for girls have been as few as 6 and 8. Secondly, the IQ scores for some of the EMR subjects appeared to be well within the normal range.

CHAPTER III

PROCEDURES FOLLOWED IN THE DEVELOPMENT OF THE STUDY

This investigation was undertaken to evaluate and compare the motor abilities of young children educationally classified as nonhandicapped (NH), learning disabled (LD), emotionally disturbed (ED), and mentally retarded (MR). The procedures followed in the development of this study are described in this chapter under the following headings: Sources of Data, Preliminary Procedures, Selection and Description of the Instruments, Selection of the Subjects, Collection of Data, and Treatment of Data.

Sources of Data

Utilized in this study were data gathered from both documentary and human sources. Documentary sources included available books, periodicals, microfilms, published studies, and unpublished reports of research related to the motoric abilities of young exceptional children. The human sources of data included the investigator, adapted physical education consultants, special education teachers, and 1,657 elementary school aged children, both handicapped and nonhandicapped.

Preliminary Procedures

Available documentary sources related to all aspects of the proposed study were surveyed and studied prior to the actual investigation.

Initial contacts with public school personnel were made through inservice training provided by the investigator at the request of numerous Education Service Centers throughout the state of Texas. Possible testing sites were thus informally selected. During the latter part of the fall semester of 1980, formal solicitations were made by mailing a detailed description of the study to supportive personnel at each of the 20 Education Service Centers. These personnel then identified schools within their regions whose administrators had verbally acknowledged consent for their students to participate in the research. Pending receipt of written confirmations, a tentative outline for the study was developed and filed in the form of a Prospectus in the Office of the Provost of Graduate Studies at The Texas Woman's University, Denton, Texas. Permission to conduct the study was granted from the Human Subjects Review Committee at The Texas Woman's University, Denton, Texas.

Selection and Description of the Instruments

The instruments used in the collection of data for this investigation were selected according to the following criteria: (a) the instrument must be reliable, objective, and valid; (b) the instrument must be applicable to both boys and girls, ages 5 through 9 years; (c) the instrument must be appropriate to the testability of subjects with limited intellectual or learning abilities; (d) the instrument must be designed to identify children with motor problems; (e) the instrument must require performances that are safe, interesting, and challenging; (f) the instrument must resemble assessments administered to nonhandicapped

children; (g) the instrument must be simple to organize, administer, score, and interpret for either classroom, special education, or physical education specialists; (h) the instrument must not require elaborate apparatus which requires technical skills; (i) the instrument must consist of materials that are easily transportable; (j) the instrument must require administration time of less than 30 minutes per subject; (k) the instrument must differentiate gross motor performance levels of young children; and (l) the instrument must require very limited space.

An extensive 3-year study of the literature produced a surprisingly large number of diagnostic tools which purport to measure motor ability of special populations. However, of the myriad of tests available, a minimum were designed specifically to evaluate the motor abilities of children with limited verbal and performance skills. Scrutiny revealed that most test batteries are composed primarily of fitness-type items. The selection of instruments was further restricted by the stringent criteria established for the study.

Test of Motor Impairment (TMI)

The first of two diagnostic instruments which met the established criteria was the Test of Motor Impairment by Stott, Moyes, and Henderson (1972). It was modeled after Oseretsky's Tests of Motor Proficiency (1923) in format but followed Göllnitz's (1960) modification and scoring system. Designed to differentiate between motor/neurologically impaired and normal children, it is applicable to both boys and girls, ranging in age from 5 to 15 years, with an IQ of 50 or above. The test is divided

into five categories to measure the following: (a) static balance, (b) control and coordination of the upper limbs, (c) control and coordination of the body while in motion, (d) manual dexterity with emphasis on speed, and (e) simultaneous movement with precision.

Although presently under revisional study in England, Canada, and the United States, the TMI was originally standardized by ages on a sample of 854 children from 31 schools in Ontario. For children aged 5 through 9 years, test-retest after 2 days (n=24) yielded correlation coefficients of .94 to .99 on Category I (Balance). Percentage of agreement on test-retest for Category III (Whole Body Coordination) ranged from 79 to 100. For 15 LD children, test-retest after 2 weeks yielded percentages of agreement ranging from 78.3 on Category IV (Manual Dexterity) to 100 on Category V (Simultaneous Movement).

Using 60 motor-impaired 6- to 8-year-old children and 60 control subjects matched by age, sex, and social class, Moyes (1969) found a tetrachoric correlation of .85 ($p < .01$) between test scores and teacher assessments. These same subjects were retested 2 to 4 weeks later. At that time, a tetrachoric correlation of .93 was found ($p < .001$).

The most significant findings of the TMI were reported in case studies (Stott, Moyes, & Henderson, 1972). In several instances, the TMI suggested neurological dysfunction 3 years prior to medical diagnosis. Such findings are indicative of its value as a diagnostic tool.

The TMI is individually administered, requiring 10 to 30 minutes, dependent upon the degree of motor impairment exhibited by the subject.

The test yields an age score and a total score. Each of the 5 categories is scored 'pass' or 'fail' with either 1 or 2 points given for each item failed. A score of 2 or more denotes motor impairment.

Observational Checklist of Movement Tasks (Sinclair's Checklist)

The second instrument selected was Sinclair's Checklist, an adaptation of the Movement Task Analysis Forms developed by Sinclair (1971) to identify general characteristics of movement patterns of children in the age range of 2 to 6 years. Each task was broken into appropriate conponents which comprise the mature and successful pattern of movement. These components were identified by observation, motion photography, and analyses of the performances of 119 subjects over 6 academic semesters. Sinclair's observations and analyses were validated by the findings of three renown physical educators--G. L. Rarick, Barbara Godfrey, and Helen Eckert. An agreement percentage of 91.7 was reported. The Movement Task Analysis Forms have recently been embraced by Project ACTIVE (Vodola, 1976).

Only 12 of Sinclair's 25 movement tasks were adapted for use in this study. Those items include creeping, walking, running, galloping, hopping, kicking, sliding, skipping, broad jumping, walking a beam, throwing, and catching. The selection of movement tasks was based on the empirical need of children to possess these abilities for successful participation in play and physical education activities. As the components in each task were inclusive, none was deleted or altered; however, after an initial study of 40 subjects, several components were added.

(A copy of this checklist may be found in Appendix B.)

The score for each task was merely the total number of components exhibited by the subject while performing the task. Subjects received a score for each task as well as a total score for all tasks.

As an observational instrument is only as accurate or reliable as the observer, the abilities of 40 randomly selected subjects to perform the movement tasks were rated by the investigator and three physical educators from the public schools: an adapted physical education specialist, an elementary school physical education specialist, and the adapted physical education consultant from Region II Education Service Center. The subjects included one child to represent each of the study's 40 comparison groups (e.g., 1 5-year-old LD boy, 1 6-year-old ED girl, 1 7-year-old MR boy, 1 8-year-old normal girl). Using Kendall's Coefficient of Concordance, 99.5% agreement was found. Thus, as it was not feasible to employ multiple raters for each subject, this degree of reliability was accepted.

Selection of Subjects

The subjects for this study included boys and girls, ages 5, 6, 7, 8, and 9 years, who were educationally classified as nonhandicapped, learning disabled, emotionally disturbed, or mentally retarded by their respective schools. These subjects were determined by a convenience sampling design through the efforts of supportive personnel employed by the Education Service Centers in the 20 regions throughout the state of Texas. These centers were established to serve the public schools and

were founded at strategic geographical sites based on the population distribution and proximity of surrounding schools. The areas served by each of these centers are shown in Figure 1. Also indicated in Figure 1 are the 13 areas in which specific school districts consented to participate in the study.

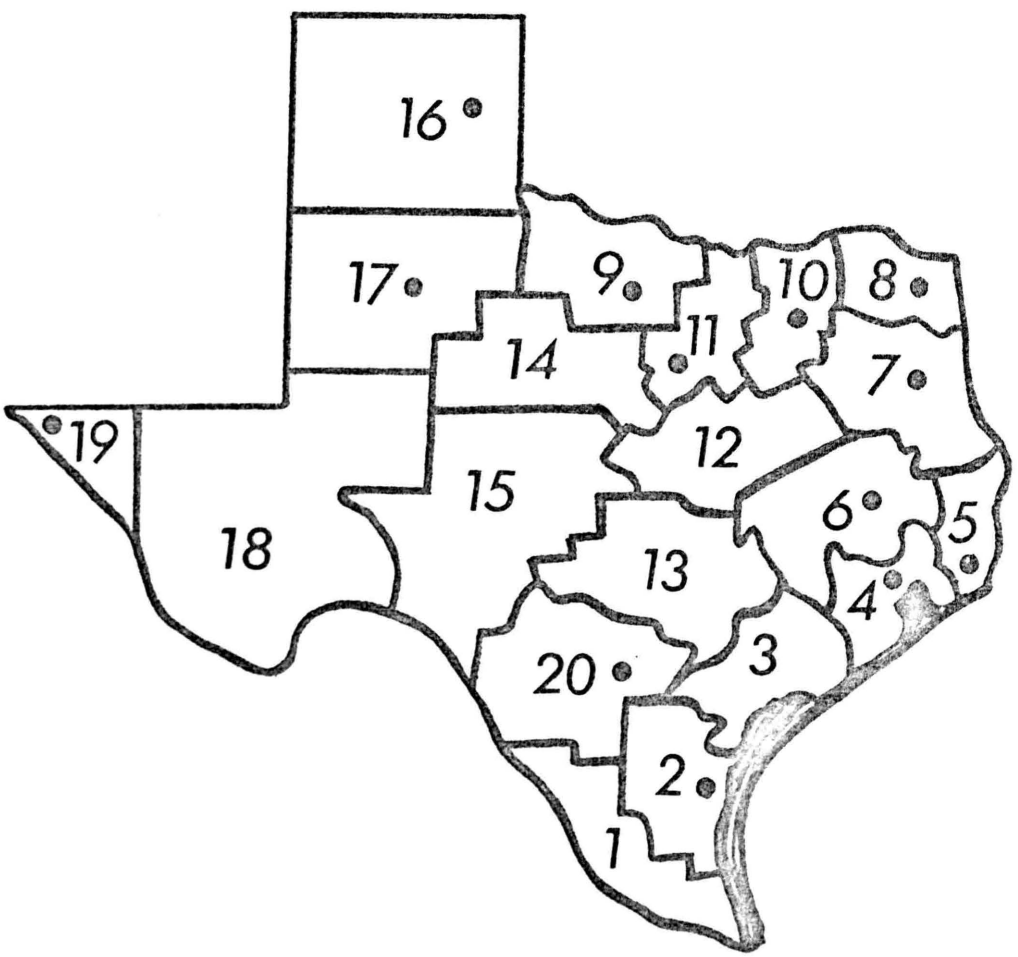


Figure 1. The 20 regions of Texas served by the Education Service Centers with the areas represented in this study designated by a ●.

The Education Service Centers in the areas designated in Figure 1 serve 159 (62.6%) counties, 751 (67.3%) school districts, and 264,092 (79.3%) handicapped students in the state of Texas (TEA, 1979). In some instances, permission was granted directly by school districts but with the stipulation that anonymity be maintained because of the confidentiality of students' records.

The following criteria were established for selection of exceptional subjects: (a) subjects must be between the ages of 5-0 and 9-11 years; (b) subjects must be enrolled in the public schools and receiving special services; and (c) the subjects must be educationally classified as either learning disabled, emotionally disturbed, or mentally retarded with no concomitant handicap. Criteria established for the selection of nonhandicapped subjects were essentially the same as for handicapped children with the exception: subjects must not be receiving special services or possess any known mental, physical, emotional, or learning handicap. Upon the basis of the criteria established, 1,135 handicapped subjects and 522 nonhandicapped subjects participated in this research.

Collection of Data

All data were collected during the spring semester of 1981. Prior to the instigation of the study, appropriate record sheets were formulated to facilitate the collection of data. One form was designed for the teacher/diagnostician to record personal information from the school files. Such data included birthdate, IQ score with determinant test, and educational classification as well as age, sex, and ethnicity. The

form for scoring the TMI was merely a simplification of the original score sheet as all tests not applicable to the study's population ages were deleted. A third form was created for scoring Sinclair's Checklist. Copies of these three forms may be found in Appendix B.

Upon arrival at each site, appropriate testing facilities were selected according to availability, similarity, and convenience for the teacher, subjects, and investigator. A minimal space of 18 ft. by 12 ft. with one blank wall was desirable. The close proximity of a playground was also advantageous. With rare exceptions, testing facilities were graciously provided by the school. Special wall and floor markings, such as a 15-ft. by 18-in. alley, were designated with masking tape for easy removal. A small desk and chair were borrowed from the classroom teacher for the administration of Categories IV and V of the TMI. All other equipment was supplied by the investigator. The TMI kit was replete except for a stopwatch, tennis ball, and headless matchsticks; all of which were obtained prior to any testing. The administration of Sinclair's Checklist required 3 tennis balls, 100-ft. tape measure, 5-ft. tape measure, stopwatch, 9-in. sponge ball, and a walking beam. The beam was constructed of a 2-in. by 4-in. by 5-ft. long board mounted on 2 wooden supports 9 in. high.

Initial Procedures

After the facilities were prepared, the investigator accompanied the subject to the testing area as each was evaluated individually during 1 20- to 30-minute session. Each student was asked to write or

print his/her name on a consent form so that hand preference was determined. [Preference was confirmed during the performance of movement tasks.] The consent form was explained and placed in an envelope for the student to take home for his/her parents' signature and return to the teacher the following day. The teacher witnessed the forms when returned and forwarded them to the investigator. In compliance with policies at The Texas Woman's University, the scores of children who failed to return parental consent forms were deleted from the study. The scores of all subjects, however, were given to the subjects' teachers and/or diagnosticians for appropriate action. This service was provided by the investigator to participating schools as an integral part of the research.

Height and weight measurements were usually taken first to allow the student to adjust to the surroundings. Height was recorded to the nearest inch, and weight was recorded to the nearest pound. The order of tests was not regimented, and some of the tasks from Sinclair's Checklist were interspersed among the TMI items. The subject's curiosity frequently determined the sequence of testing.

Test of Motor Impairment

To ensure objective and valid results, the TMI was administered precisely according to the test manual. Subjects were encouraged to perform well and were verbally rewarded for all performances regardless of results. On timed tests, subjects were permitted to complete the tasks without acknowledgment of time expiration. Instead, subjects were

asked to repeat the task 'a little faster'. In some instances, subjects were permitted to perseverate on a task if requested. At other times, the promise of repeating a task served as the necessary motivation to complete other less intriguing tasks.

Administration. Testing was initiated at the subject's chronological age level. Each category contained one task, but some required testing of both preferred hand/foot and nonpreferred hand/foot. If the subject passed all five categories, testing was discontinued. If the subject failed one or more categories, testing was continued at the age level immediately below his/her chronological age. This procedure continued until the subject passed all five categories at one particular age. A generalized description of the five categories follows.

1. Category I consisted of balancing tasks, ranging in difficulty from standing on tiptoes with feet together and hands on hips at age 5 to maintaining equilibrium on a balance board at age 9. Tasks at all age levels were timed. Beginning at age 6, both preferred and nonpreferred foot were tested. Scoring consisted of 0, 1, or 2 points with 0 denoting a perfect score.

2. Category II items were designed to evaluate upper arm coordination and involved ball handling skills at most age levels. Both hands were tested but with different criterion. Scoring consisted of 0, 1, or 2 points with 0 denoting a perfect score.

3. Category III included items such as a knee-high jump or jump and clap twice, all of which were devised to assess whole body

coordination. Scoring consisted of 0 or 2 points with 0 denoting a perfect score.

4. Category IV was comprised of items designed to evaluate manual dexterity with emphasis on speed. Both hands were tested but with different criteria. Scoring consisted of 0, 1, or 2 points with 0 denoting a perfect score.

5. Category V items were constructed to evaluate simultaneous movement with precision. All tasks were timed. At the 7- and 8-year age levels, each hand was tested separately. Scoring consisted of 0, 1, or 2 points with 0 denoting a perfect score.

Scoring. The age score was the sum of points for all five categories at the subject's chronological age. Failure, or motor impairment, was indicated by a score of 2 or more and necessitated further testing. The total score was the sum of points for all test items failed. One fallacy of this scoring system was that the lowest total score possible for a 5-year-old subject was 20, whereas the lowest score possible for a 9-year-old subject was 60. Because of the difference in possible low scores, the total score was deleted from the statistical comparisons.

Sinclair's Checklist

No specific sequence was established for the completion of Sinclair's Checklist. Many of the items were presented as movement education tasks. When feasible, the subjects were evaluated quantitatively as well as qualitatively. Although the quantitative measurements were extraneous to this study, they were motivational.

Administration. Instructions for the 12 movement tasks varied with the age and educational classification of each subject. Each task was explained and demonstrated. When testing the younger handicapped children, several explanations and demonstrations were often necessary. Several trials were permitted for each task, as the object of the testing was to determine the subjects' ability to perform, not to follow instructions. The general instructions for each of the movement tasks follows.

1. Creeping a minimal distance of 15 ft. was the task. Using an alley 15 ft. long and 18 in. wide designated by masking tape, the subject was asked to "creep on hands and knees like a puppy dog" between the lines. If the instructions were not comprehended or if the subject hesitated, the investigator demonstrated while explaining the task. When the task was completed, the subject was instructed to turn around and creep back to the investigator who was standing at the opposite end of the alley. In some instances, the investigator crept beside the subject the entire distance. This task was scored 0 to 9 points.

2. Walking a minimal distance of 15 ft. was the task. To ensure a natural gait, the walking pattern of each subject was evaluated informally as both the investigator and subject walked to the testing site, the playground, and back to the classroom. These walks provided the investigator several opportunities to assess the subject's walking without causing undue self-consciousness. This task was scored 0 to 12 points.

3. Walking two lengths of the balance beam was the task. The task was demonstrated as the subject was directed to walk the length of the

beam, turn around, and walk back. When necessary, the subject was afforded assistance in mounting the beam and/or traversing it. This task was scored 0 to 10 points.

4. Broad jumping for distance was the task. The subject was instructed to stand behind, but with toes touching, a restraining line as demonstrated by the investigator. The subject was then directed to jump "as far as possible" beside a tape measure. A two-foot take-off and landing were required. Three trials were allowed with the best trial recorded in millimeters. Distance was measured from the take-off line to the heel or part of the body that touched the floor nearest the take-off line. The investigator marked the distance of the first jump and asked the subject to jump over it. If the subject persistently used a one-foot take-off, the task was demonstrated again with verbal emphasis on "jumping with both feet at the same time". This task was scored 0 to 8 points.

5. Hopping a minimal distance of 15 ft. on each foot was the task. Older subjects were directed to hop down the alley on one foot and back to the starting line on the other foot. Younger subjects were instructed to "show me how you can hop on one foot". The preferred foot was noted. When the subject reached the end of the alley, he/she was instructed to "hop on the other foot". When necessary, the correct pattern was demonstrated by the investigator. This task was scored 0 to 10 points.

6. Skipping a minimal distance of 15 ft. was the task. Older

subjects were asked to skip down the alley and back. Younger subjects were asked "can you skip like this" while the pattern was demonstrated. This task was scored 0 to 10 points.

7. Galloping a minimal distance of 15 ft., leading with one foot and then the other was the task. The preferred lead foot was noted. Subjects were asked to "gallop like a horse". For the younger subjects, sound effects were added for motivation. Demonstration for this skill was repeated several times. This task was scored 0 to 9 points.

8. Sliding a minimal distance of 15 ft., leading with one side and then the other, was the task. The subject was asked, "Can you do this?" as the investigator demonstrated. With the younger or less capable subject, it was generally necessary for the investigator to face the subject, hold hands, and perform the movement with him/her. This task was scored 0 to 10 points.

9. Catching a 9-in. sponge ball 2 out of 3 trials from a distance of 10 ft. or farther, depending upon age of subject, was the task. The subject assumed a position at one end of the test alley. Using an underhand pattern, the investigator tossed the ball to the subject at chest height. The subject was permitted to return the ball in any pattern desired. This task was scored 0 to 8 points.

10. Kicking a rolled 9-in. sponge ball 3 out of 6 trials was the task. The subject assumed a position at one end of the test alley with the investigator positioned near the opposite end. Each subject was then asked to "show me how you can kick". The ball was rolled toward the center of the subject's stance to determine foot preference. This

task was scored 0 to 10 points.

11. Throwing a tennis ball for distance was the task. Only overhand patterns were counted as trials. The subject was positioned behind a restraining line marked on the playground and instructed to throw the ball over the investigator's head. The longest of three throws was measured from the restraining line to the landing point. Distance was recorded to the nearest foot. The preferred hand was noted. This task was scored 0 to 10 points.

12. Running 30 yards for time was the task. The subject stood behind a restraining line and was instructed to run "as fast as possible" to a marker 5 yards beyond the finish line. Each subject was given the verbal signal of "Go" accompanied by the downward sweep of the investigator's arm. The score was the elapsed time between the instant the subject moved forward and the instant the finish line was crossed. Time was recorded to the nearest 1/10th of a second. This task was scored 0 to 11 points.

Scoring. Each movement task was scored according to the number of characteristics exhibited by the subject. The total movement score was then the sum of all task scores.

Treatment of Data

Following completion of data collection, raw scores were grouped according to age and sex under educational classifications for statistical analysis. (Raw data are stored at The Texas Woman's University.) The range, standard deviation, mean, and standard error of the mean were

then computed for each of the 40 distributions. To determine the differences between nonhandicapped and handicapped children, a three-factor analysis of variance was employed for both the TMI and Sinclair's Checklist. A DEC-50 computer at the University Computer Center of The Texas Woman's University, Denton, Texas, was utilized to execute the program, BMDP2V, from the University of California at Los Angeles. The Scheffé test was used for mean comparisons when significant F ratios were found in the analysis of variance.

CHAPTER IV

PRESENTATION OF THE FINDINGS

This chapter includes the results of the statistical analyses of the data and a discussion of the findings. The purpose of the study was to determine the motor performance levels of young exceptional children who were receiving special services in the Texas public schools. The subjects included 1,135 boys and girls, ages 5 through 9 years, who were educationally classified as learning disabled (LD), emotionally disturbed (ED), or mentally retarded (MR) according to criteria established by the Texas Education Agency (TEA). In addition, data were collected on 522 nonhandicapped (NH) children of the same chronological ages. All subjects were evaluated by the Test of Motor Impairment (TMI) and Sinclair's Checklist during the spring semester of 1981. For statistical analyses, subjects were grouped according to age and sex under educational classifications. Thus, 40 groups were created for comparative purposes. To determine the differences between the groups, a three-factor analysis of variance was employed for age scores of the TMI and for the total scores of Sinclair's Checklist. When significant F ratios were demonstrated by the analysis of variance, the Scheffé Test of Mean Difference was applied. All data were presented in the following sections: Description of Subjects, Findings on the Test of Motor Impairment, Findings on Sinclair's Checklist, and Examination of Hypotheses.

Description of Subjects

Through a convenience sampling design, 1,135 handicapped subjects and 522 nonhandicapped subjects who met the study's subject-selection criteria were evaluated. The chronological ages of the subjects were: 5-0 to 5-11 years, 6-0 to 6-11 years, 7-0 to 7-11 years, 8-0 to 8-11 years, and 9-0 to 9-11 years. The number of children by age and sex is presented in Table 1.

Table 1

Distribution of Subjects by Age and Sex

Age (yrs)	Boys	Girls	Totals
5	215	143	358
6	151	140	291
7	176	140	316
8	172	150	322
9	225	145	370
Totals	939	718	1,657

As shown in Table 1, male subjects outnumbered female subjects. Of the total number of subjects, 939 were boys and 718 were girls.

The numerical distribution of subjects by sex and educational classification is shown in Table 2. The total population tested included 440 LD subjects, 325 ED subjects, 370 MR subjects, and 522 NH subjects.

Table 2

Distribution of Subjects by Sex and Educational Classification

Classification	Boys	Girls	Totals
NH	269	253	522
ED	175	150	325
LD	290	150	440
MR	205	165	370
Totals	939	718	1,657

Table 3 presents the numerical distribution by age, sex, and educational classification of the entire populations assessed. The minimum number of subjects at any age was 30; the LD sample of 5-year-old boys, however, numbered 100. Of the total population, 358 were 5-year-olds, 291 were 6-year-olds, 316 were 7-year-olds, 322 were 8-year-olds, and 370 were 9-year-olds.

Table 3

Distribution of Subjects by Age, Sex, and Educational Classification

	Boys				Girls			
Age (yrs)	NH	ED	LD	MR	NH	ED	LD	MR
5	50	35	100	30	53	30	30	30
6	56	30	30	35	50	30	30	30
7	61	35	50	30	50	30	30	30
8	52	30	45	45	50	30	30	40
9	50	45	65	65	50	30	30	35
Total	269	205	290	205	253	150	150	165

Table 4 further defines the subjects by educational classification and ethnicity. Of the total population evaluated, 68.68% were Anglo, 14.67% were Black, and 15.99% were Mexican-American (M-A). The small percentage indicted by the 'Other' column included subjects of Indian, Oriental, Arabian, Iranian, and Vietnamese origin. The largest Anglo concentration was found in the ED category. Disregarding the Other column, the smallest concentration of ED subjects was in the Mexican-American group.

Table 4

Percentage Distribution of Subjects by Educational Classification and Ethnicity

Educational Classification	Ethnic Group			
	Anglo	Black	M-A	Other
NH	65.13	18.58	15.13	1.15
ED	90.77	6.15	3.08	.00
LD	71.14	9.55	18.18	1.14
MR	51.35	22.70	25.95	.00
Total	68.68	14.67	15.99	.66

IQ Scores

The IQ scores of all subjects were procured from the student files by local school personnel. As most exceptional children undergo evaluation by a number of instruments, the scores determined by the Wechsler Intelligence Scales for Children (WISC) were accepted by the investigator. The ranges, means, and standard deviations of subjects are

presented by age and sex according to educational classification in Tables 5 through 8.

Table 5

Descriptive IQ Statistics for NH Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	50	49 (74-123)	101.06	13.03	1.84
Girls	53	50 (70-120)	103.51	10.33	1.46
Age 6					
Boys	56	53 (70-123)	101.64	12.58	1.68
Girls	50	39 (82-121)	97.94	12.94	1.77
Age 7					
Boys	61	49 (82-131)	99.02	19.78	2.53
Girls	50	49 (72-121)	101.84	11.20	1.58
Age 8					
Boys	52	49 (74-123)	95.92	16.48	2.29
Girls	50	49 (74-123)	100.52	11.86	1.68
Age 9					
Boys	50	55 (72-127)	99.60	15.00	2.12
Girls	50	49 (82-131)	101.90	13.60	1.92

As demonstrated in Table 5, the IQ scores for the NH groups spanned from 70 to 131, a range of 61 points. The 5-year-old group of girls had the highest mean IQ score (103.51) of any group, whereas the 8-year-old group of boys had the lowest mean IQ score (95.92). All scores, however, were within the range of normalcy. The standard deviations indicated great variability within the ranges of IQ scores for all age levels, particularly for the boys. For the groups of girls, the standard deviations for the age levels of 6 and 9 years indicated greater variability than anticipated for the range of scores.

According to Table 6, the IQ scores for all ED groups of subjects spanned from 43 to 115, a range of 72 points. The 6- and 9-year-old groups of girls had the highest mean IQ scores of any group, 100.93 and 100.43 respectively, whereas the 5-year-old group of boys had the lowest mean IQ score (84.89). With the exception of the 5-year-old group of girls and the 7-year-old group of boys, the standard deviations at all age levels demonstrated greater variability than anticipated for the range of scores.

Table 6

Descriptive IQ Statistics for ED Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	35	53 (61-114)	84.89	23.68	4.00
Girls	30	71 (43-114)	93.87	16.19	2.95
Age 6					
Boys	30	53 (61-114)	95.33	15.97	2.91
Girls	30	32 (82-114)	100.93	9.99	1.82
Age 7					
Boys	35	49 (57-106)	91.71	7.71	1.30
Girls	30	27 (82-109)	92.27	7.33	1.34
Age 8					
Boys	30	44 (62-106)	85.93	15.94	2.91
Girls	30	40 (66-106)	92.03	12.49	2.28
Age 9					
Boys	45	39 (58-97)	89.8	14.95	2.23
Girls	30	26 (89-115)	100.43	7.81	1.43

As presented in Table 7, the IQ scores for all LD groups spanned from 48 to 100, a range of 61 points. The 6-year-old group of boys had the highest mean IQ score (79.27) of any group, whereas the 9-year-old group of boys and the 7-year-old group of girls had the lowest mean IQ

scores, 68.45 and 68.83 respectively. For the girls at all age levels, the standard deviations demonstrated greater variability than anticipated for the range of scores. For the groups of boys, the standard deviations for the age levels of 6 and 9 years indicated greater variability than anticipated for the range of scores.

Table 7

Descriptive IQ Statistics for LD Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	100	38 (51-89)	71.69	7.73	.77
Girls	30	18 (62-80)	72.77	11.03	2.01
Age 6					
Boys	30	52 (48-100)	79.27	13.79	2.52
Girls	30	7 (67-74)	70.00	2.42	.44
Age 7					
Boys	50	19 (63-82)	71.44	3.73	.53
Girls	30	16 (60-76)	68.83	5.46	1.00
Age 8					
Boys	45	18 (60-78)	69.47	4.53	.68
Girls	30	13 (63-76)	70.00	4.73	.86
Age 9					
Boys	65	28 (60-88)	68.45	13.36	1.66
Girls	30	20 (58-78)	70.90	5.68	1.04

Table 8

Descriptive IQ Statistics for MR Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	30	23 (29-52)	43.67	7.31	1.33
Girls	30	28 (30-58)	44.90	8.83	1.61
Age 6					
Boys	35	20 (30-50)	42.71	6.79	1.15
Girls	30	32 (30-62)	53.07	5.09	.93
Age 7					
Boys	30	17 (40-57)	48.17	6.16	1.12
Girls	30	36 (38-74)	50.20	8.91	1.63
Age 8					
Boys	45	38 (21-59)	42.80	11.62	1.73
Girls	40	35 (25-60)	43.60	10.62	1.79
Age 9					
Boys	65	40 (28-68)	49.12	12.45	1.54
Girls	35	31 (28-59)	49.74	8.64	1.46

As shown in Table 8, the IQ scores for the MR groups spanned from 21 to 74, a range of 53 points. The mean IQ scores were all within the range of moderate mental retardation. The 6-year-old group of girls had

the highest mean IQ score (53.07) of any group, whereas the 6- and 8-year-old groups of boys had the lowest mean IQ scores, 42.71 and 42.80 respectively. With two exceptions, the standard deviations for groups at all age levels demonstrated greater variability than anticipated for the range of scores. The standard deviations for the 6- and 7-year-old groups of girls indicated expected variability within the range of scores.

Hand and/or Foot Preference

Hand preference was determined by having the subjects write or print their name on a consent form. This preference was then validated by the ball-throwing task. If the hand preference differed on these tasks or if the subject alternated hands while performing these tasks, the subject was considered to have no hand preference.

Foot preference was determined by the foot used by the subject to kick a ball. To confirm this choice, the preferred foot for hopping and for balancing on Category I of the TMI was noted. With few exceptions, however, all children were more successful at hopping and balancing on the non-kicking foot. The foot preference, therefore, was determined solely by the kicking foot. Table 9 presents the hand/foot preferences in percentages for all subjects for educational classification.

As demonstrated in Table 9, 98.47% of the normal populations exhibited a right hand and foot preference while only 1.53% appeared to be left handed/footed. For the MR groups, 63.24% showed a mixed preference, no hand or foot preference, or no foot preference. The ED groups were predominantly right handed and footed, although 16.92% demonstrated

a mixed preference. Only 53.64% of the LD subjects exhibited a right hand and foot preference as 40.68% showed mixed preferences.

Table 9

Percentages of Hand-Foot Preference for Subjects by Educational Classification

Group	Right Hand-Foot Pref.	Left Hand-Foot Pref.	Mixed Pref.	No Hand-Foot Pref.	No Foot Pref.	No Hand Pref.
NH	98.47	1.53	.00	.00	.00	.00
ED	72.31	.00	16.92	3.08	6.15	1.54
LD	53.64	4.55	40.68	1.14	.00	.00
MR	30.00	6.76	20.81	11.89	30.54	.00

Findings on the Test of Motor Impairment

The Test of Motor Impairment (TMI) yielded two scores, an age score and a total score. Comparisons of the total TMI scores were not deemed feasible as the lowest possible score for each age level differed from 20 points at age 5 years to 60 points at age 9 years. The descriptive statistics for both scores, however, are presented in Tables 10 through 13.

Table 10

Descriptive Statistics Obtained on the TMI: NH Subjects

Group	n	Age Score[a] Range	Mean	SD	SE_m	Total Score[b] Range	Mean	SD	SE_m
Age 5									
Boys	50	0 (0-0)	.00	.00	.00	0 (0-0)	.00	.00	.00
Girls	53	2 (2-0)	.08	.38	.05	2 (2-0)	.08	.38	.05
Age 6									
Boys	56	3 (3-0)	.21	.68	.09	3 (3-0)	.21	.68	.09
Girls	50	2 (2-0)	.18	.56	.08	2 (2-0)	.18	.56	.08
Age 7									
Boys	61	1 (1-0)	.07	.25	.03	1 (1-0)	.07	.25	.03
Girls	50	2 (2-0)	.12	.44	.06	2 (2-0)	.12	.44	.06
Age 8									
Boys	52	1 (1-0)	.08	.27	.04	1 (1-0)	.08	.27	.04
Girls	50	0 (0-0)	.00	.00	.00	0 (0-0)	.00	.00	.00
Age 9									
Boys	50	1 (1-0)	.02	.14	.02	1 (1-0)	.02	.14	.02
Girls	50	0 (0-0)	.00	.00	.00	0 (0-0)	.00	.00	.00

[a] Note. Highest score possible was 0; lowest score possible was 10.

[b] Note. Highest score possible was 0; lowest score possible was 20 at age 5, with 10-point incremental increases for each age up to 60 at age 9.

As demonstrated in Table 10, the range of scores for NH subjects on the TMI was minute at all age levels. According to the norms established for the TMI, a score of 0 or 1 denotes normal motor ability, or lack of motor impairment. The scores of the NH subjects, thus, were equivalent to the normative population with several exceptions. None of the mean age scores indicated motor impairment as they were all below 2. The standard deviations for all groups denoted very little variability in the scores for the NH subjects. Because the NH subjects were representative of the established norms, they were omitted from further comparison studies.

According to Table 11, the scores of the ED groups spanned from 10 to 0, a range of 10 points. The 8-year-old group of girls had the lowest mean score (8.33), whereas the 9-year-old group of girls had the highest mean score (4.50). The standard deviations for groups at all age levels demonstrated greater variability than anticipated for the range of scores.

For the groups of girls, the mean total scores ranged from 21.67 at age 8 to 7.50 at age 9. For the groups of boys, the mean total scores ranged from 15.56 at age 9 to 8.17 at age 5. The standard deviations for the total scores also demonstrated greater variability than anticipated for the range of scores.

Table 11

Descriptive Statistics Obtained on the TMI: ED Subjects

Group	n	Age Score[a] Range	Mean	SD	SE_m	Total Score[b] Range	Mean	SD	SE_m
Age 5									
Boys	35	6 (10-4)	5.03	2.36	.40	14 (20-6)	8.17	5.63	.95
Girls	30	8 (10-2)	6.67	2.47	.45	16 (20-4)	13.33	5.50	1.00
Age 6									
Boys	30	6 (10-4)	6.17	2.23	.41	18 (22-4)	10.83	6.23	1.14
Girls	30	6 (10-4)	6.17	2.23	.41	14 (22-8)	13.17	4.64	.85
Age 7									
Boys	35	9 (10-1)	5.62	3.68	.46	35 (36-1)	13.57	13.66	2.31
Girls	30	8 (10-2)	5.83	3.24	.59	20 (20-2)	11.83	7.44	1.36
Age 8									
Boys	30	6 (10-4)	7.67	1.99	.26	26 (32-6)	13.33	9.15	1.67
Girls	30	4 (10-6)	8.33	1.83	.33	40 (46-6)	21.67	14.36	2.62
Age 9									
Boys	45	10 (10-0)	5.00	3.16	.47	58 (58-0)	15.56	18.82	2.80
Girls	30	7 (8-1)	4.50	2.26	.41	13 (14-1)	7.50	4.26	.78

[a] Note. Highest score possible was 0; lowest score possible was 10.

[b] Note. Highest score possible was 0; lowest score possible was 20 at age 5, with 10-point incremental increases for each age up to 60 at age 9.

Table 12

Descriptive Statistics Obtained on the TMI: LD Subjects

Group	n	Age Score[a] Range	Mean	SD	SE_m	Total Score[b] Range	Mean	SD	SE_m
Age 5									
Boys	100	10 (10-0)	6.73	2.68	.27	18 (18-0)	11.15	5.25	.53
Girls	30	8 (10-2)	7.07	2.65	.48	18 (20-2)	10.93	5.28	.96
Age 6									
Boys	30	2 (10-8)	9.33	.96	.18	10 (26-16)	21.83	3.24	.59
Girls	30	6 (10-4)	6.67	2.25	.41	20 (24-4)	13.67	6.69	1.22
Age 7									
Boys	50	8 (10-2)	7.10	2.49	.35	24 (28-4)	14.40	7.15	1.01
Girls	30	6 (8-2)	5.50	2.18	.40	13 (17-4)	11.50	4.69	.86
Age 8									
Boys	45	8 (10-2)	6.33	2.78	.41	34 (36-2)	14.78	10.38	1.55
Girls	30	10 (10-0)	5.00	3.47	.63	22 (22-0)	8.67	7.21	1.32
Age 9									
Boys	65	10 (10-0)	4.08	2.58	.32	32 (32-0)	7.62	8.09	1.00
Girls	30	10 (10-0)	6.00	3.90	.71	40 (40-0)	17.00	14.94	2.73

[a] Note. Highest score possible was 0; lowest score possible was 10.

[b] Note. Highest score possible was 0; lowest score possible was 20 at age 5, with 10-point incremental increases for each age up to 60 at age 9.

As indicated in Table 12, the scores of the LD groups spanned from 10 to 0, a range of 10 points. The 6-year-old group of boys had the lowest mean score (9.33), whereas the 9-year-old group of boys had the highest mean score (4.08). The standard deviations for groups at all age levels demonstrated greater variability than anticipated for the range of scores.

For the groups of girls, the mean total scores ranged from 17.00 at age 9 to 8.67 at age 8. For the groups of boys, the mean total scores ranged from 21.83 at age 6 to 7.62 at age 9. The standard deviations for the total scores also demonstrated greater variability than anticipated for the range of scores.

As shown in Table 13, the scores of the MR groups spanned from 6 to 0, a range of 6 points. The mean score for all but 3 groups was 10.00. Only the 8- and 9-year-old groups of girls and the 9-year-old group of boys had different mean scores. Those scores were 9.75, 8.57, and 8.62 respectively. The standard deviations indicated very little, if any, variability in the scores of these groups.

For the groups of girls, the mean total scores ranged from 19.07 at age 5 to 42.88 at age 8. For the groups of boys, the mean total scores ranged from 20.00 at age 5 to 42.27 at age 8. Contrary to the findings on the age scores, the standard deviations for the total scores demonstrated great variability.

Table 13

Descriptive Statistics Obtained on the TMI: MR Subjects

Group	n	Age Score[a] Range	Mean	SD	SE_m	Total Score[b] Range	Mean	SD	SE_m
Age 5									
Boys	30	0 (10-10)	10.00	.00	.00	0 (20-20)	20.00	.00	.00
Girls	30	0 (10-10)	10.00	.00	.00	2 (20-18)	20.00	.00	.00
Age 6									
Boys	35	0 (10-10)	10.00	.00	.00	2 (30-28)	29.71	.71	.21
Girls	30	0 (10-10)	10.00	.00	.00	1 (30-29)	29.83	.38	.07
Age 7									
Boys	30	0 (10-10)	10.00	.00	.00	15 (39-24)	35.00	5.29	.97
Girls	30	0 (10-10)	10.00	.00	.00	14 (40-26)	38.04	4.47	.82
Age 8									
Boys	45	0 (10-10)	10.00	.00	.00	30 (50-20)	42.27	9.68	1.44
Girls	40	1 (10-9)	9.75	.44	.07	30 (50-20)	42.88	9.63	1.52
Age 9									
Boys	65	6 (10-4)	8.62	2.29	.28	48 (58-10)	38.31	18.93	2.35
Girls	35	3 (10-7)	8.57	1.52	.26	40 (56-16)	34.29	13.86	2.34

[a] *Note*. Highest score possible was 0; lowest score possible was 10.

[b] *Note*. Highest score possible was 0; lowest score possible was 20 at age 5, with 10-point incremental increases for each age up to 60 at age 9.

A three-factor analysis of variance was computed to determine if any differences existed between the ED, LD, and MR groups on the age scores of the TMI. The results of the statistical analysis have been summarized in Table 14.

Table 14

Summary of Analysis of Variance for the TMI Age Scores

Source	df	SS	MS	F	p
Mean	1	56,283.90	56,283.90	10,693.82	.000*
Groups	2	2,840.30	1,420.15	269.83	.000**
Sex	1	.66	.66	.13	.723
Age	4	496.28	124.07	23.57	.000***
Groups x Sex	2	66.67	33.33	6.33	.001**
Groups x Age	8	299.06	37.38	7.10	.000****
Sex x Age	4	80.13	20.03	3.81	.004***
Groups x Sex x Age	8	208.95	26.12	4.96	.000****
Error	1,105	5,815.86	5.26		

*$F_{.95}(1,1105) = 3.84$

**$F_{.95}(2,1105) = 3.00$

***$F_{.95}(4,1105) = 2.37$

****$F_{.95}(8,1105) = 1.94$

According to Table 14, significance greater than .001 was found for the main effects of groups and age. All of the interactions, groups by sex, groups by age, sex by age, and groups by sex by age, demonstrated significance greater than the .01 level. The Scheffé test, therefore,

was applied to the means of the groups. As the scores of the NH group were found to be equivalent to the normative data established for the TMI, the scores of all other groups indicated significant but various degrees of motor impairment. The ED and LD groups were significantly ($p < .05$) less motor impaired than the MR group. However, there was no significant difference between the mean scores of the LD and ED groups. Girls at all ages demonstrated superior motor ability to boys, but these differences were not significant. Significant ($p < .05$) differences were found between various age levels, but there was no pattern for such differences. Figure 2 graphically depicts the differences of the mean scores by sex, age, and educational classification.

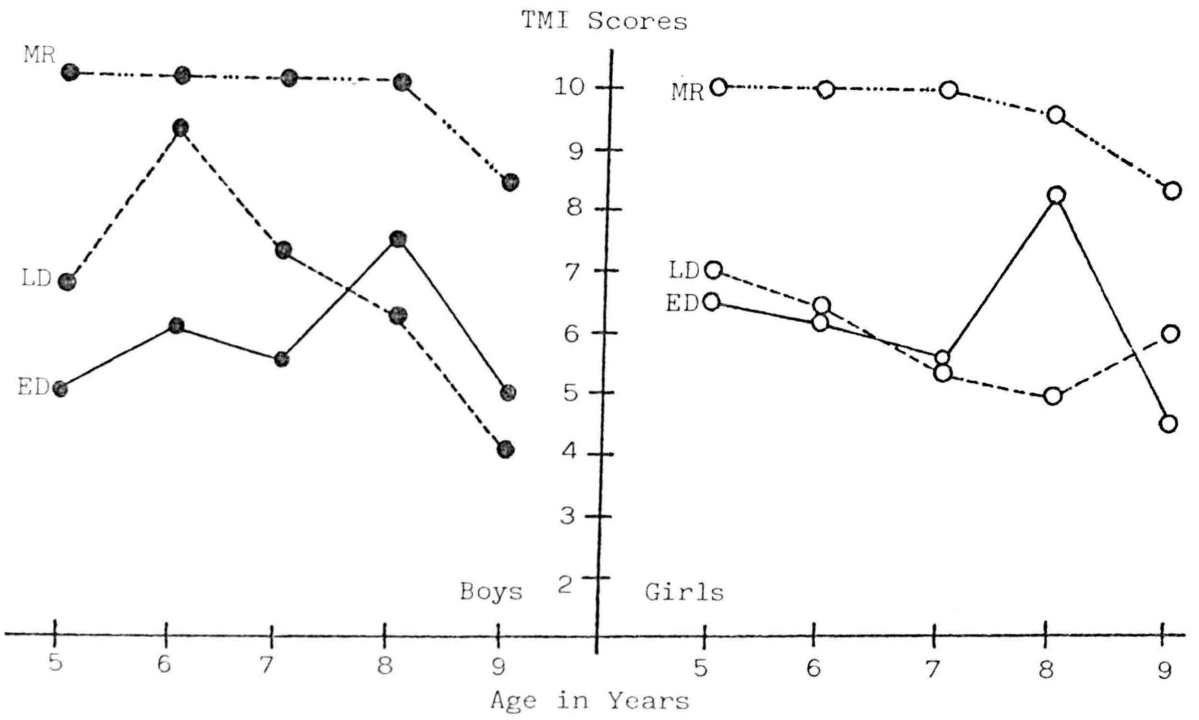


Figure 2. Group x Sex x Age interaction of the TMI age scores.

As indicated by Figure 2, the differences of the groups were further depicted. A significant difference ($p < .05$) was found between the motor abilities of the ED and LD groups of girls at age 8, with the ED subjects exhibiting greater motor impairment. At age 6, the motor abilities of LD girls were significantly ($p < .05$) superior to that of LD boys. Also, at age 6, a significant ($p < .05$) difference was found between the motor ability of ED and LD boys. The LD subjects showed greater motor impairment. No age trends were depicted by any group. With the exception of the LD girls, all groups demonstrated less motor impairment at age 9 than at any other age level.

Findings on Sinclair's Checklist

Although Sinclair's Checklist yielded scores for each movement pattern, only the total score was utilized in the statistical analysis. The range, mean, standard deviation, and standard error of the mean were computed for each of the 40 comparison groups. These descriptive statistics are presented in Tables 15 through 18.

As demonstrated in Table 15, the motor performance scores of the NH groups, as measured by Sinclair's Checklist, spanned from 93 to 117, a range of 24 points. For both boys and girls, the 5-year-old groups had the lowest mean scores of 101.64 and 99.96, respectively. The highest mean scores for both boys (115.00) and girls (114.00) were found at the age 9 level. The mean scores of both sexes steadily increased at each age level. The standard deviations for both sexes were indicative of little variability at all age levels.

Table 15

Descriptive Statistics Obtained on Sinclair's Checklist[a] for NH Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	50	14 (95-109)	101.64	2.77	.39
Girls	53	13 (95-108)	99.96	2.35	.32
Age 6					
Boys	56	17 (93-110)	105.80	4.49	.60
Girls	50	13 (97-110)	104.16	3.58	.51
Age 7					
Boys	61	16 (101-117)	110.97	2.46	.31
Girls	50	11 (104-115)	109.68	2.42	.34
Age 8					
Boys	52	8 (107-115)	113.71	2.42	.33
Girls	50	8 (108-116)	111.84	2.07	.29
Age 9					
Boys	50	13 (103-116)	115.00	2.96	.42
Girls	50	5 (111-116)	114.10	1.46	.21

[a]Note. Maximum score = 117.

Table 16

Descriptive Statistics Obtained on Sinclair's Checklist[a] for ED Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	35	43 (16-59)	45.26	13.81	2.33
Girls	30	43 (36-79)	60.17	14.73	2.69
Age 6					
Boys	30	43 (36-79)	54.17	13.28	2.42
Girls	30	40 (36-76)	55.17	11.61	2.12
Age 7					
Boys	35	38 (30-68)	46.69	13.34	2.26
Girls	30	38 (36-74)	55.67	14.15	2.58
Age 8					
Boys	30	27 (65-92)	78.93	10.33	1.89
Girls	30	41 (35-76)	56.33	12.82	2.34
Age 9					
Boys	45	38 (48-86)	72.04	12.09	1.80
Girls	30	17 (76-93)	85.33	7.23	1.32

[a]*Note.* Maximum score = 117.

According to Table 16, the motor performance scores of the ED groups of boys, as measured by Sinclair's Checklist, spanned from 16 to

92, a range of 76 points. For the girls, the scores spanned from 35 to 93, a range of 58 points. The lowest mean score (45.26) for the boys was found at the 5-year-old level, whereas the lowest mean score (55.17) for the girls was found at the 6-year-old level. For the boys, the 8-year-old group had the highest mean score of 78.93, but for the girls, the 9-year-old group had the highest mean score of 85.33. The standard deviations for both sexes at all age levels were indicative of great variability in performance.

As presented in Table 17, the motor performance scores of the LD groups of boys, as measured by Sinclair's Checklist, spanned from 24 to 103, a range of 79 points. For both boys and girls, the 5-year-old groups had the lowest mean scores of 40.67 and 50.90, respectively. The highest mean scores for both boys (92.03) and girls (73.17) were found at the age 9 level. The mean scores of both sexes increased at each age level. The standard deviations for both sexes, however, were indicative of great variability in performance at all age levels.

Table 17

Descriptive Statistics Obtained on Sinclair's Checklist[a] for LD Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	100	35 (24-59)	40.67	9.50	.95
Girls	30	64 (29-93)	50.90	19.62	3.58
Age 6					
Boys	30	21 (44-65)	51.13	5.95	1.09
Girls	30	15 (44-59)	52.00	4.84	.88
Age 7					
Boys	50	64 (24-88)	67.50	18.23	2.58
Girls	30	19 (60-79)	70.33	7.14	1.30
Age 8					
Boys	45	33 (57-90)	71.89	10.27	1.53
Girls	30	13 (63-76)	69.93	3.77	.69
Age 9					
Boys	65	19 (84-103)	92.03	4.02	.50
Girls	30	19 (61-80)	73.17	7.58	1.38

[a]Note. Maximum score = 117.

Table 18

Descriptive Statistics Obtained on Sinclair's Checklist[a] for MR Subjects

Group	n	Range	Mean	SD	SE_m
Age 5					
Boys	30	9 (15-24)	19.27	2.83	.52
Girls	30	31 (20-51)	26.63	7.95	1.45
Age 6					
Boys	35	22 (21-43)	30.40	7.38	1.25
Girls	30	12 (13-25)	18.33	4.94	.90
Age 7					
Boys	30	58 (19-77)	39.10	16.75	3.06
Girls	30	24 (32-56)	41.60	9.19	1.68
Age 8					
Boys	45	64 (3-67)	36.64	17.46	2.60
Girls	40	54 (12-66)	31.08	13.06	2.07
Age 9					
Boys	65	36 (16-52)	35.65	9.62	1.19
Girls	35	60 (18-78)	35.77	15.07	2.55

[a]*Note*. Maximum score = 117.

As shown in Table 18, the motor performance scores of the MR group of boys, as measured by Sinclair's Checklist, spanned from 3 to 77, a

range of 74 points. For the girls, the scores spanned from 12 to 78, a range of 66 points. The lowest mean score (19.27) for the boys was found at the 5-year-old level, whereas the lowest mean score (18.33) for the girls was found at the 6-year-old level. The highest mean scores for both boys (39.10) and girls (41.60) were found at the age 7 level. The standard deviations for both sexes were indicative of great variability in motor performance at all age levels.

A three-factor analysis of variance was computed to determine if any differences existed between the NH, ED, LD, and MR groups on the performance scores of Sinclair's Checklist. The results of the statistical analysis have been summarized in Table 19.

Table 19

Summary of Analysis of Variance for Performance Scores of All Groups on Sinclair's Checklist

Source	df	SS	MS	F	p
Mean	1	6,634,041.45	6,634,041.45	71,597.07	.000*
Groups	3	1,335,269.64	445,089.88	4,803.58	.000**
Sex	1	37.89	37.89	.41	.523
Age	4	103,705.13	25,926.28	279.81	.000***
Groups x Sex	3	1,333.27	444.42	4.80	.003**
Groups x Age	12	37,643.27	3,136.94	33.86	.000****
Sex x Age	4	10,965.56	2,741.39	29.59	.000***
Groups x Sex x Age	12	19,389.89	1,615.82	17.44	.000****
Error	1,617	149,828.00	92.66		

*$F_{.95}$ (1,1617) = 3.84

**$F_{.95}$ (3,1617) = 2.60

***$F_{.95}$ (4,1617) = 2.37

****$F_{.95}$ (12,1617) = 1.75

According to Table 19, significance greater than .001 was found for the main effects of groups and age. All of the interactions, groups by sex, groups by age, sex by age, and groups by sex by age, demonstrated significance greater than the .01 level. The Scheffé test, therefore, was applied to the means of the groups. The NH group was significantly superior to the ED and LD groups who were significantly superior to the MR group. There was, however, no significant difference between the mean scores of the LD and ED groups. Figure 3 graphically depicts the

differences of the mean scores by age, sex, and educational classification.

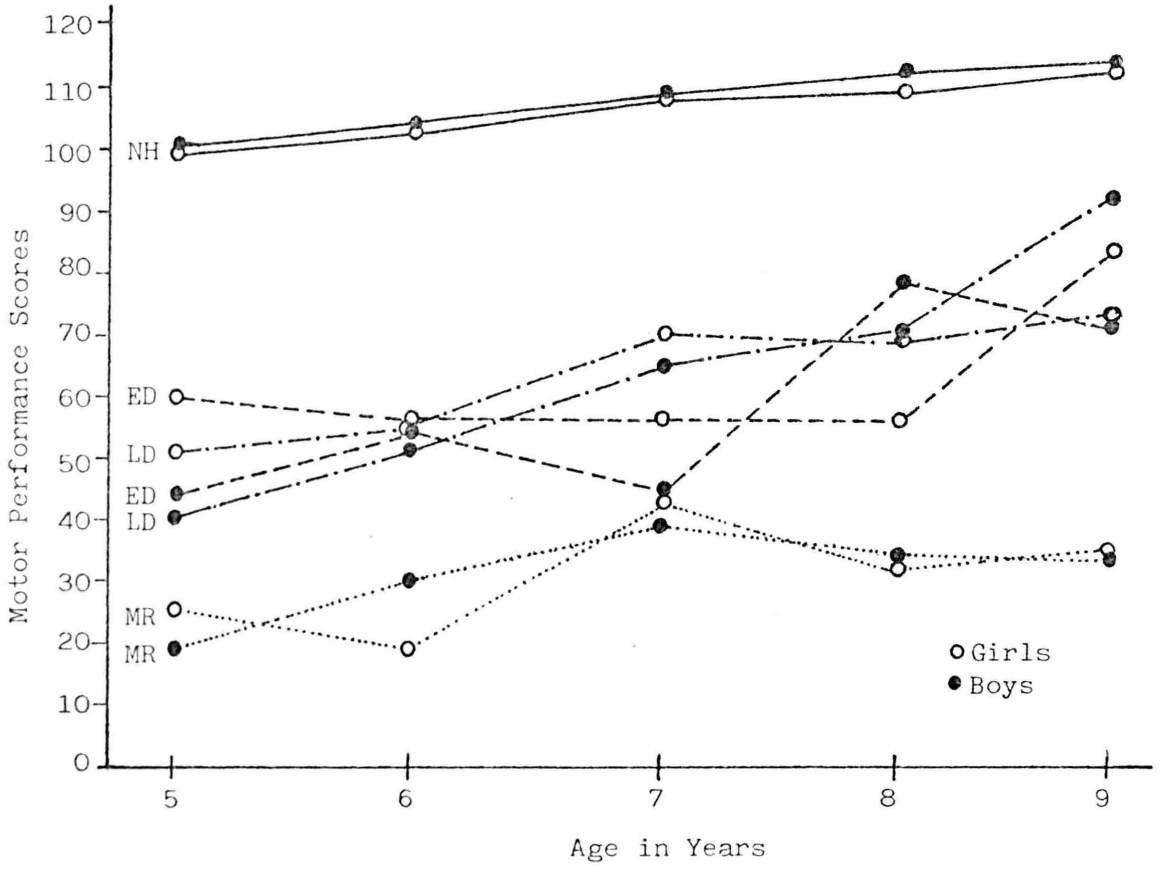


Figure 3. Group x Sex x Age interaction of the performance scores on Sinclair's Checklist.

As demonstrated in Figure 3, the NH boys and girls were significantly superior to all other groups. There was, however, no difference between the motor performances of the boys and girls. The NH groups also exhibited a gradual refinement of motor skills as age increased. The LD and ED groups were very similar in motor performance although their scores were erratic at various age levels. The ED girls appeared

to remain stable in their performance scores until age 9, at which level they exhibited a significant ($p < .05$) improvement in ability. This was also noted for the group of LD boys. The ED boys showed a significant ($p < .05$) improvement in ability from age 7 to age 8. There was also a significant ($p < .05$) increase of ability of the MR girls from age 6 to age 7. At age 7, LD boys and MR girls were very similar in motor performance. Figure 3 depicts the vast difference in motor performance between the MR and NH groups as well as the similarities of the ED and LD groups.

Examination of Hypotheses

Based upon the statistical findings of the study, the following hypotheses were rejected:

1. There is no significant difference between the degree of motor impairment of nonhandicapped, handicapped, age, or sex groups as measured by the Test of Motor Impairment.

2. There is no significant difference between nonhandicapped, handicapped, age, or sex groups in the performance of fundamental movement tasks as measured by Sinclair's Checklist.

CHAPTER V

SUMMARY, CONCLUSION, DISCUSSION, AND RECOMMENDATIONS FOR FURTHER STUDY

Summary

To meet the challenge of American education, that of preserving and developing the potential of each child, federal legislation intervened with Public Law 94-142, the Education for All Handicapped Children Act of 1975. With enactment of this law, all exceptional children were ensured an education in the least restrictive but most appropriate environment. Recognizing its propitious benefits, physical education was specifically mandated for handicapped children by this legislation.

The law did not, however, specifically define an appropriate education; it merely described the process of determining an appropriate education. With this omission, many misinterpretations, abuses, and misuses have occurred in this provision. All too frequently, exceptional children are mainstreamed into regular physical education classes without appropriate assessment. Contrary to such prevalent practices, not all handicapped children should be placed in regular programs. Rather, only those students who possess the potential for success in a regular program, without disrupting the learning of others, should be placed in such an environment.

To initiate appropriate procedures to ensure that the motor aspects of human behavior are developed to the maximum extent possible, the

motor abilities of young exceptional children. Several investigators (Howe, 1959; Schrum, 1977) incorporated selected items into test batteries to measure specific skills. Others have used the Lincoln-Oseretsky Motor Development Scale (Langan, 1965; Hollingsworth, 1971), Missouri Perceptual-Motor and Motor Performance Test Battery (Clawson, 1969), Purdue Perceptual-Motor Survey (Poindexter, 1969; Rider, 1973), and Cratty's Six-Category Gross Motor Performance Test (Stewart, 1971). Other tests included the Ohio State University Scale of Intra Gross Motor Assessment (Ryan, 1977) and the Bruininks-Oseretsky Test of Motor Proficiency (Bruininks & Bruininks, 1977).

Both gross and fine motor skills of LD children were reported as significantly lower than those of nondisabled children in a study by Bruininks and Bruininks (1977). The findings also revealed greater variability in the performances of LD children than in those of normal children.

A study by Poindexter (1969) indicated that trampoline performance as well as hopping, skipping, and balance abilities of ED children were deficient, although not statistically, to those of normal students. Measures of strength, agility, speed, and perceptual-motor abilities of the ED group, however, were significantly inferior to those of normal students. Contrary to Poindexter's findings, Rider (1973) found significant differences between the perceptual-motor abilities of ED and normal children on only one item of the Purdue Perceptual-Motor Survey--the obstacle course.

In all comparison studies of mentally retarded and normal subjects (Howe, 1959; Langan, 1965; Hollingsworth, 1971; Ryan, 1977), the motor abilities of MR children were significantly inferior to those of normal subjects. Although Howe's findings demonstrated EMR boys to be significantly less skillful than normal boys, the differences between the EMR and normal girls were not significant on grip strength and throw for accuracy. For EMR subjects, Langan found a motor deficiency of 1½ years at age 8 which increased to 2 years at age 10. Hollingsworth reported that the motor abilities of EMR children at ages 8, 9, and 10 years were significantly below those of normal children of the same chronological ages. However, comparisons of EMR and normal subjects of the same mental age revealed a significant superiority of the EMR subjects. Ryan found the greatest differences between MR and normal subjects in the complex skills of hopping, skipping, and catching.

The findings of a study by Schrum (1977) indicated that performance differences of TMR children could be blocked over 3-year intervals before significance was evident. These intervals were 6 to 8 years, 9 to 11 years, and 12 to 14 years of age. Schrum also found that as age advanced, motor performances increased. Significant differences between the motor abilities of High IQ and Low IQ EMR girls at ages 8 and 9 years were reported by Clawson (1969).

Langan (1965), Schrum (1977), Howe (1959), Stewart (1971), and Ryan (1977) all reported no signficant differences between the motor abilities of MR boys and girls, although boys tended to score better. This finding

has been substantiated by numerous investigators for the normal populations.

Cinematographic studies have also been employed to examine the movement patterns of MR children. Windell (1971) found that MR children have a characteristic gait pattern. Rider (1979) reported that TMR children walked with a slower pace with significantly shorter stride length and remained in the supportive phases--duration of stride, stance, and double support--for a significantly longer time than normal children.

The present study entailed a comparison between the motor performance levels of boys and girls, ages 5 through 9 years, who were educationally classified as nonhandicapped, ED, LD, and MR. Data were collected on 1,657 subjects through the administration of the Test of Motor Impairment and Sinclair's Checklist. For comparative purposes, subjects were grouped according to sex and age under educational classifications.

To determine if any significant differences existed between the motor performance levels of the groups, a three-factor analysis of variance was employed. The Scheffé test was used as a subsequent test for mean comparisons when significant F ratios were found in the analysis of variance.

The following findings were obtained from the study:

1. Analysis of variance of the age scores of the Test of Motor Impairment of the ED, LD, and MR subjects revealed significant differences for the main effects of between groups and between ages. Significant F

ratios were also found for the interactions of groups by sex, groups by age, sex by age, and groups by sex by age. A subsequent Scheffé test indicated that the ED and LD groups were significantly ($p < .001$) less motor impaired than the MR group. No significant differences were found between the ED and LD groups except for several isolated subgroups. At age 8, LD girls were significantly ($p < .05$) less impaired than ED girls. At age 9, LD boys were significantly ($p < .05$) less motor impaired than ED boys. Significant differences were also found in isolated comparisons between boys and girls. At age 8, ED boys were less ($p < .05$) motor impaired than ED girls. At ages 7 and 9, LD boys were less ($p < .05$) less motor impaired than LD girls, whereas at age 6, LD girls were less ($p < .05$) motor impaired than LD boys. Significant differences between age levels were also evident. From ages 6 to 7 and 8 to 9 years, LD boys decreased ($p < .05$) in the degree of motor impairment exhibited. There were no significant differences noted between MR boys and MR girls at any age, nor were any differences found as age increased.

2. Analysis of variance of the total scores of Sinclair's Checklist of NH, ED, LD, and MR subjects revealed significant differences for the main effects of between groups and between ages. Significant F ratios were also found for the interactions of groups by sex, groups by age, sex by age, and groups by sex by age. A subsequent Scheffé test indicated that the NH group was significantly ($p < .001$) superior in motor ability to the ED, LD, and MR groups. The MR group was significantly ($p < .001$) inferior in motor ability to the ED and LD groups. No significant differences were found between the ED and LD groups except for

several isolated subgroups. At age 9, ED boys were significantly ($p < .05$) more skilled than LD boys. There was a significant ($p < .05$) increase in ability for ED boys from age 7 to age 8, whereas the girls significantly ($p < .05$) decreased in ability. Significant ($p < .05$) differences were found between ED boys and girls at ages 5 and 9, with the boys exhibiting superior ability. At age 8, a significant ($p < .05$) difference was found between LD boys and girls, with boys being superior. There were significant ($p < .05$) increases in motor ability for both LD boys and girls from age 6 to 7 and from age 8 to 9. There were no significant differences found between the MR groups except at age 6; MR boys were significantly ($p < .05$) superior to the girls. The MR girls, however significantly ($p < .05$) improved in motor ability from age 6 to age 7.

Conclusion of the Study

The findings of this study appear to justify the following conclusion: Within the limitations of this investigation, motor performance levels of young ED, LD, and MR children are inferior to those of non-handicapped children. Although the skill levels of the ED and LD groups are comparable, they are considerably superior to those of MR children. Because of the significant degree of motor impairment exhibited by the handicapped children in this study, these children should not be mainstreamed into regular physical education classes. Special physical education programs designed for their specific needs would be more appropriate.

The Test of Motor Impairment as well as an observational checklist are valid instruments for determining appropriate physical education class placement, although the Test of Motor Impairment is not a valid instrument for determining appropriate programming for MR students.

Discussion

The most influential factor which may have affected the findings of this study was the inconsistency with which subjects were educationally classified. Many ED and LD children had IQ scores which were well within the range of mental retardation. This is feasible for ED children because of the unique characteristics which frequently prohibit accurate assessment of their intellectual, emotional, or motor abilities, but extremely questionable for those with learning disabilities. It is unfortunate that educational classification is too frequently founded upon IQ scores as these scores frequently fail to reflect such factors as motivation to learn, emotional stability, or environmental influences.

The educational classification process is not uniform throughout the school districts, although all schools purport to follow the guidelines established by the Texas Education Agency. Some school diagnosticians refuse to classify students as emotionally disturbed because of the stigma attached to the label. Many ED subjects, therefore, were classified as MR or LD. In some areas of the state, hyperactive children were classified as LD; in other areas, they were classified as ED. Although many subjects in this study were reclassified through the process of this research, the results of the diagnostic assessments were not

made available to the investigator before the data were subjected to statistical analysis. In numerous cases, IQ scores varied as much as 20 to 30 points from year to year.

In all probability, female subjects categorized as ED were most often correctly diagnosed of any subjects. This population was scarce. Toward the end of the data collection process, the male/female ratio of ED and LD subjects was 4:1 in favor of the males. This necessitated the evaluation of only LD and ED girls in several schools to obtain the required numbers for comparison groups. All other subjects were evaluated without the knowledge of specific classification.

An interesting observation was the absence of Mexican-American children exhibiting ED characteristics. The small percentage of Mexican-American children who were classified as ED were hyperactive. This observation raises questions about the influence of environment, culture, and family units on the emotional stability of children during the developmental period.

Lack of motivation generally affords several barriers to the assessment process and was anticipated with the populations involved in the study. Only one subject, however, failed to exhibit some degree of motivation. Most subjects were intrigued with the uniqueness of the Test of Motor Impairment. Others simply responded positively to the individualized attention received. Many students balked at returning to their classrooms, and several ED subjects reacted violently upon resumption of their daily class routine. In some instances, such negative

reactions were prevented by further testing or by perseveration of a test item. The subjects were never rewarded materially, although some on behavior modification programs were awarded tokens as designated by the classroom teachers.

It was quite obvious at the onset of the assessment process that the Test of Motor Impairment was not appropriate for MR populations although the test was reported as suitable for children with IQ scores of 50 and above. It was appropriate, however, to distinguish between regular classroom placement or special program placement. It did not differentiate between skills as very few MR subjects could perform the tasks within the specified time limits. The tasks were intriguing to these subjects and provided motivation for completion of other items.

Category I of the TMI consisted of various balance tasks which presented problems for all subjects. Many subjects, who walked the balance beam with ease, experienced difficulty in performing the balance tasks on the TMI. Only one subject, however, walked the beam correctly i.e., without focusing on the feet.

Category IV at the 8-year-old level appeared to be sex-biased as most NH boys required the maximum number of trials to accomplish the task. Girls, however, had little difficulty. Males of Mexican-American heritage also experienced problems because the 'sewing' task was considered feminine in their culture where there is a great distinction between masculine and feminine roles. Nonhandicapped boys who failed this task were successful at the age 9 level. The Test of Motor Impairment,

however, was quite appropriate for determining the lack of motor proficiency in LD and ED populations. Without the time limitations, it might possible be appropriate for MR populations, particularly for those students who are mildly mentally retarded. The subjects in this study were predominantly moderately mentally retarded. The relatively short time needed for administration was very advantageous for this research and for school district diagnosticians.

Sinclair's Checklist was also appropriate for both young boys and girls of various etiological groups. However, for use with all handicapped populations, some modification and refinement is necessary. At the present time, the checklist does not differentiate between a subject who performs an immature pattern and one who is incapable of performing. The few adaptations or modifications for this study proved to be of value. One such modification was the addition of the element 'absence of extraneous movement'. Extraneous movement frequently prohibits successful motor patterns, especially for the hyperactive or ED child. The tasks included on Sinclair's Checklist were fairly well balanced in relationship to sex-linked activities, as boys tended to perform better on ball-handling skills whereas girls generally performed better on skipping, hopping, and sliding. For many subjects, these skills were nonexistent. The majority of subjects failed to respond to the movement pattern of galloping until the task was demonstrated.

Another observation of interest was the mixed hand-foot preference exhibited by a great number of LD children. Also interesting was the

fact that both handicapped and nonhandicapped children preferred to balance and hop on one foot yet kick with the other.

The motor abilities of the subjects, whether handicapped or nonhandicapped appeared to reflect the quality of their physical education programs. Based on observations of the investigator, handicapped students who participated in well-rounded activity programs exhibited higher levels of skills than those who received little or no training. This was equally true for nonhandicapped students.

The significant degree of motor retardation and impairment exhibited by the subjects in this study demonstrated that ED, LD, and MR children should not be mainstreamed in regular physical education classes. Placement there may be the least restrictive but it is not the most appropriate environment for them. The provision of educationally sound motor activity programs are a necessity for all exceptional children to effect and maintain mature and successful motor patterns.

Recommendations for Further Study

Further research is needed in all areas of motor ability of young exceptional children, particularly in the areas of learning disabilities and emotional disturbance. Based upon the findings of this study, the following are recommended for further study:

1. A study replicating the present one, but with a randomized sample, in which the subjects are educationally classified with stringent adherence to the guidelines established by the Texas Education Agency.

2. Cinematographic studies to investigate the movement patterns of

learning disabled children between 5 and 8 years of age.

3. A study to investigate the relationship between learning disabilities and mixed hand/foot preferences of young children.

4. A study to investigate the incidence of emotional disturbance among various cultural groups.

5. A longitudinal study to investigate the motor development of exceptional children between the ages of 2 and 8 years.

6. A study to investigate the task specificity of various balance tests.

7. A study to compare the motor abilities of mildly mentally retarded and moderately mentally retarded children between the ages of 5 and 8 years.

8. A motor development study replicating one of the classical studies to determine the abilities of children between the ages of 2 and 8 years.

APPENDIX A

PERMISSION LETTERS

REGION II EDUCATION SERVICE CENTER
209 NORTH WATER
CORPUS CHRISTI, TEXAS 78401
Phone: 883-9288
Area Code 512

Dr. Thomas Tope, Jr.
Executive Director

January 5, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P.O. Box 23717, TWU Station
Denton, TX 76204

Dear Jerry:

As discussed with you quite extensively earlier in the fall, we will be delighted to assist you in your doctoral study. Many schools have already been contacted and are waiting for you to arrive to begin your assessment.

It is my understanding that you wish to begin the week of your in-service training for our teacners. This would be great. We can get together at that time and map out your schedule. See you then.

Sincerely yours,

George

George J. Kampert

EDUCATION SERVICE CENTER
REGION VI

Route 2, Box 33A
FM 1374 (Possum Walk Rd.)
Huntsville, Texas 77340
Phone 713 295-9161

January 10, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

As discussed via the telephone, we will be glad to assist you in your doctoral study. Many schools have expressed an interest in your assessment procedures. When you determine the exact dates for testing in our region, call me and we can set up our schedule. By the way, many schools are very appreciative of the fact that they will not be mentioned in your study because of the IQ scores.

Sincerely yours,

Charlotte Smith

Charlotte Smith
Consultant

CS/db

region viii education service center
special education component
901 broadway
kilgore, texas 75662
214-984-3071

February 5, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, TX 76204

Dear Jerry:

Again, it is my pleasure to work with you in the area of physical education. I have contacted many schools and all have consented to your study. However, since there are so many, you may want to limit your assessment to a select few. These factors and several others we can discuss when you are ready to begin your data collection. See you soon.

Sincerely yours,

Dan I. Bailey
Special Education Consultant

kam

Region VIII *Education Service Center*

214/572-6676 / 100 North Riddle Street / Mt. Pleasant, Texas 75455

Serving these Counties

Bowie
Camp
Cass
Delta
Franklin
Hopkins
Lamar
Marion
Morris
Red River
Titus

January 6, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P.O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

We have contacted all of the schools within our region and obtained a larger number of schools who are willing to be included in your doctoral work. There is a problem in obtaining IQ scores as this is confidential information and not to be released. When you get here, we can perhaps work out a solution for all involved.

I am in the process of scheduling your assessment. How many days will you need at each town or school? Or, how many subjects can you assess in a school day? I have several other questions, so please call me.

Sincerely,

Pam Fite

Pam Fite
Consultant

PF/kf

Education Service Center region IX

January 20, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

As discussed over the telephone, we will be happy to assist you in your doctoral study. I have already lined up several schools within the immediate area who are willing to cooperate. Several others have indicated an interest in your project.

When will you begin your assessment? When you decide, give me a call so we can make all the necessary arrangements here.

Sincerely yours,

Mrs. Pat Watkins
Consultant Adaptive P.E.

PW/je

EDUCATION SERVICE CENTER
REGION 10

400 EAST SPRING VALLEY, P.O. BOX 1300, RICHARDSON, TEXAS 75080, AC 214 231-6301

COUNTIES
Collin
Dallas
Ellis
Franklin
Grayson
Hunt
Kaufman
Rockwall

February 5, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

It is with great pleasure that you have been granted permission to conduct your research within our region. Many schools have consented to your proposal. Please contact my office when you are ready to make final arrangements.

Sincerely,

Louis E. Glover

Louis E. Glover
Director
Special Educational Services Dept.

LEG:rf

EDUCATION SERVICE CENTER, REGION XI

3001 NORTH FREEWAY • FORT WORTH, TEXAS 76106

TELEPHONE (817) 625-5311

January 15, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

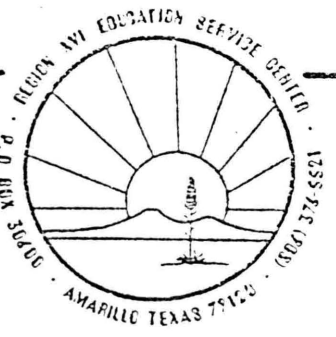
Dear Jerry:

We have always benefited from your inservice training sessions, therefore we are glad to assist you in your doctoral study. Many schools which we contacted have confirmed permission for you to assess their students. As the schools do wish to remain anonymous, I will give them to you when you arrive and are ready to begin your testing within our region.

Very truly yours,

Ronnie Martin
Coordinator

RM:cf



January 16, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

This is to confirm our verbal agreement for you to assess students in several of our school districts. We have at least four principals in the city who would be delighted to have you assess their students plus several districts within our region who have also consented to having you evaluate their students.

When you are ready, call me so that we can finalize all arrangements.

Sincerely,

Gene Norman, Program Director
Division of Special Education

GN:ad

Education Service Center - Region XVIII

700 Texas Commerce Bank Building 763-4127 — 762-0425

Lubbock Texas 79401

February 1, 1981

Miss Jerry Nestroy
Texas Woman's University
Physical Education Department
P. O. Box 23717 TWU Station
Denton, Texas 76204

Dear Jerry:

It is our pleasure to work with you on your doctoral study. Many diagnosticians within our region have expressed interest in your study and have consented to assisting you in your evaluation of their students. As the assessment will be included in their program planning, parental permissions on file are sufficient. If, however, you need additional permission, you may obtain it while you are visiting each school.

Obtaining IQ scores will be rather difficult unless you agree not to mention the individual school districts in your paper. As we discussed via the telephone, perhaps the best way to report these scores is by region service centers as you suggested.

You may begin testing any time you desire. Just notify me by phone a week in advance so that I may again confirm your study in each of the schools and also so that we can work out a schedule for you. Looking forward to working with you again.

Sincerely yours,

Janet Hammonds

Janet Hammonds
Referral Specialist

JH/dd

REGION XIX EDUCATION SERVICE CENTER
6611 BOEING DRIVE P. O. BOX 10716 EL PASO, TEXAS 79997
PHONE (915) 779-3737

DR. JOHN E. UXER
EXECUTIVE DIRECTOR

January 9, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P.O. Box 23717, TWU Station
Denton, TX 76204

Dear Jerry:

We have now obtained permission for you to test in several of our schools. We distributed your explanation of your study to all of the schools in our region, but only a few responded. When you are ready to conduct your evaluations, let me know so that I can personally re-affirm their cooperation.

Sincerely Yours,

John E. Uxer

John E. Uxer
Executive Director

JEU/sa

Education Service Center, Region 20
1550 N. E. Loop 410 — San Antonio, Texas 78209 — Telephone (512) 828-3551

January 15, 1981

Miss Jerry Nestroy
Physical Education Department
Texas Woman's University
P. O. Box 23717, TWU Station
Denton, Texas 76204

Dear Jerry:

This is to confirm my verbal permission to conduct some of your research within this region's area. Pending further notification from you, several school districts have granted permission for you to assess their students for your doctoral study.

When you have your schedule completed, please contact me so that we can arrange a time to discuss the time element necessary. We are looking forward to working with you again.

Sincerely yours,

Dwain M. Estes

Dwain M. Estes
Executive Director

DME/PM/jw

APPENDIX B

DATA COLLECTION FORMS

PERSONAL DATA--CLASS RECORDING SHEET

School_____ Town_____ Date_____

Name	Sex	Age	Date of Birth	Grade	Ethnic Group	Handicap	IQ	Test Used

TEST OF MOTOR IMPAIRMENT: SCORE SHEET

NAME: _____ AGE: _____

HAND PREFERENCE: right left HT: _____ WT: _____

SUMMARY OF TEST ITEMS:

CATEGORIES

Age	I	II	III	IV	V
9	BOARD BALANCE (10 secs ea)	CATCHING ONE HAND (6 out of 10) (3 out of 10)	JUMP & CLAP TWICE	9-HOLE BOARD (14 & 15 secs)	SIMULT. PEGS (16 secs)
8	STORK BALANCE (20 secs ea)	CATCHING OFF WALL (4 catches)	JUMPING SIDEWAYS	LACING BOARD (16 secs)	BEAD-ON-BOARD
7	ONE LEG BAL., ARMS RAISED (20 secs ea)	SPIRAL OF HOLES (23½ or 28½)	HEEL-TOE WALK (10 steps)	PEGS IN BOARD (17 & 21 secs)	FINGERTIP TOUCHING
6	ONE LEG BALANCE (15 secs ea)	BOUNCING ONE-HAND CATCH (8 out of 10) (5 out of 10)	HOP FORWARD	THREAD BEADS (25 secs)	CIRCLE TRACE
5	TOE BALANCE (10 secs)	BOUNCING TWO HAND CATCH (4 catches)	HIGH JUMP	POSTING COINS (18 & 20 secs)	SIMULTANEOUS MARKERS (12 secs)
-5	HEEL-TOE BALANCE (10 & 8 secs)	BRIDGE OF RODS	JUMP & CLAP	12-PIN BOARD (20 & 22 secs)	SIMULTANEOUS MATCHSTICKS (10 secs)

Student's name: _____ Date: _____

School: _____

OBSERVATIONAL CHECKLIST OF MOVEMENT TASKS

TASK	YES	NO	COMMENTS
A. CREEPING			
1. uses arms alternately	___	___	_____
2. uses legs alternately	___	___	_____
3. uses limbs in opposition	___	___	_____
4. points hands forward	___	___	_____
5. keeps feet off floor	___	___	_____
6. keeps back level	___	___	_____
7. controls direction	___	___	_____
8. covers full distance	___	___	_____
9. eyes focus ahead	___	___	_____
TOTAL _____			
B. WALKING			
1. alternates legs symmetrically	___	___	_____
2. uses arms for balance	___	___	_____
3. uses limbs in opposition	___	___	_____
4. toes ahead	___	___	_____
5. moves in straight line	___	___	_____
6. heel strikes ground first	___	___	_____
7. body is well aligned	___	___	_____
8. eyes focus ahead	___	___	_____
9. covers full distance	___	___	_____
10. elbows slight bent	___	___	_____
11. movement is smooth	___	___	_____
12. absence of extraneous movement	___	___	_____
TOTAL _____			

TASK	YES	NO	COMMENTS
3. WALKING THE BEAM			
1. keeps feet on beam	___	___	_____
2. uses arms for balance	___	___	_____
3. toes ahead	___	___	_____
4. symmetrical foot pattern	___	___	_____
5. moves forward continuously	___	___	_____
6. moves forward at steady pace	___	___	_____
7. uses arms in opposition	___	___	_____
8. eyes focus ahead	___	___	_____
9. walks full length	___	___	_____
10. body well aligned	___	___	_____
TOTAL _____			
4. STANDING BROAD JUMP			
1. covers space forward	___	___	_____
2. takes off from mark	___	___	_____
3. uses arms in preparation	___	___	_____
4. uses arms forward, upward direction	___	___	_____
5. uses two foot take off	___	___	_____
6. bends knees well in preparation	___	___	_____
7. controls landing forward	___	___	_____
8. accelerates with legs in air	___	___	_____
TOTAL _____ Distance jumped _____ mm			

TASK	YES	NO	COMMENTS
5. HOPPING			
1. moves in straight line	___	___	_____
2. holds free foot up to rear	___	___	_____
3. uses arms for balance	___	___	_____
4. eyes focus ahead	___	___	_____
5. hops on preferred foot	___	___	_____
6. hops at least 4 times in succession	___	___	_____
7. hops on nonpreferred foot	___	___	_____
8. body well aligned	___	___	_____
9. uses balls of feet	___	___	_____
10. absence of extraneous movement	___	___	_____
TOTAL _____			
6. SKIPPING			
1. alternates feet evenly	___	___	_____
2. uses arms for balance	___	___	_____
3. uses limbs in opposition	___	___	_____
4. uses balls of feet	___	___	_____
5. moves in direct path	___	___	_____
6. rhythmic and steady	___	___	_____
7. covers the full distance	___	___	_____
8. shows no difference, right & left	___	___	_____
9. eyes focus ahead	___	___	_____
10. body well aligned	___	___	_____
TOTAL _____			

TASK	YES	NO	COMMENTS
7. GALLOPING			
1. one foot leads	___	___	_____
2. faces forward	___	___	_____
3. can change lead foot	___	___	_____
4. rhythmic and steady	___	___	_____
5. uses arms in balance	___	___	_____
6. staccato movement	___	___	_____
7. eyes focus ahead	___	___	_____
8. covers full distance	___	___	_____
9. body well aligned	___	___	_____
TOTAL _____			
8. SLIDING			
1. leads with one foot	___	___	_____
2. uses arms for balance	___	___	_____
3. maintains body facing forward	___	___	_____
4. controls direction	___	___	_____
5. rhythmic and steady	___	___	_____
6. eyes focus ahead	___	___	_____
7. 4 or more successive slides	___	___	_____
8. can lead with either foot	___	___	_____
9. can change direction	___	___	_____
10. body well aligned	___	___	_____
TOTAL _____			

TASK	YES	NO	COMMENTS
9. CATCHING			
1. places hands in readiness	___	___	_____
2. lateral stance or adjusts feet	___	___	_____
3. catches with one or both hands	___	___	_____
4. gives to lessen impact	___	___	_____
5. eyes open and focused	___	___	_____
6. uses reaction of catch for return	___	___	_____
7. catches 2 of 3 trials	___	___	_____
8. makes catch without using arms to cradle ball	___	___	_____
TOTAL ____			
10. KICKING			
1. moves toward ball	___	___	_____
2. controls ball with foot	___	___	_____
3. times backswing for kick	___	___	_____
4. uses limbs in opposition	___	___	_____
5. uses same foot each trial	___	___	_____
6. extends knee in kicking	___	___	_____
7. contacts ball squarely	___	___	_____
8. controls direction	___	___	_____
9. moves in direction of kicked ball	___	___	_____
10. eyes track ball	___	___	_____
TOTAL ____			

Foot preference: _____

TASK	YES	NO	COMMENTS
11. THROWING (SMALL BALL)			
1. projection of the ball	___	___	_____
2. sideward stance	___	___	_____
3. shifts weight in preparation	___	___	_____
4. uses body rotation	___	___	_____
5. throws ball with same hand each trial	___	___	_____
6. uses overarm throw	___	___	_____
7. consistent in style	___	___	_____
8. follows through	___	___	_____
9. cocks and uses wrist	___	___	_____
10. controls direction of throw	___	___	_____
TOTAL _____	Distance thrown ____ ft.		

Hand preference:

12. RUNNING			
1. inclines body forward at start	___	___	_____
2. symmetry in leg action	___	___	_____
3. symmetry in arm action	___	___	_____
4. uses limbs in opposition	___	___	_____
5. elbows are well bent	___	___	_____
6. lifts knees well in front	___	___	_____
7. controls direction	___	___	_____
8. toes point ahead	___	___	_____
9. uses ball of foot contact	___	___	_____
10. eyes focus ahead	___	___	_____
11. covers full distance	___	___	_____
TOTAL _____	Time: _____ secs.		

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