TRANSFER OF LEARNING IN EDUCABLE

MENTALLY RETARDED INDIVIDUALS

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DEDICATORIA

A la Memoria de Mi Hermano,

Arturo

A Mis Padres,

Carolina y Salvador

A Mis Hijos,

Salvador, Carolina Michelle,

y Steven Arturo

A Mi Esposo,

Tyler

y Mis hermanos,

Sergio, Francisco, Paqui, y Gina

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CHAPTER I

INTRODUCTION

The phenomenon of transfer of learning has been an important educational issue for the last 100 years. Transfer of learning has been defined by different authors in many different ways, and all of their definitions lead to the same concept: Transfer is "the influence of previously practiced skills on the learning of a new skill" (Magill, 1989, p. 331). What makes transfer so important to educators is the close relationship existing between the everyday knowledge learned at the school and the application of this knowledge to real life situations. The role of transfer constitutes a critical factor in all forms of learning; prior experiences can facilitate, inhibit, or not affect the acquisition of a given task (Adams, 1987).

Transfer was first the concern of psychologists, but throughout the years it has become an important part of study for therapists and educators as well. Although transfer of learning has been studied more extensively in the cognitive domain, its benefits can also reach the psychomotor and affective domains. There are different opinions among researchers (Magill, 1989; Schmidt, 1987; Stallings, 1982; Singer, 1980; and Cratty, 1973) about how much learning can be transferred from one task to another and under which circumstances, however they all agree that almost all learning experiences are based on the assumption that the learning will have transfer value outside of the training settings.

Transfer studies have been conducted as early as the late 1800's and early 1900's. The majority of these studies are related to the cognitive area and involve only average or normal populations. Fewer studies have been done with mentally retarded individuals and their ability to transfer information. Even more rare are the studies directed toward the motor performance of the mentally retarded individual and his/her ability to transfer motor skills.

In 1961 Clarke and Blakemore confirmed that transfer of learning in mentally retarded individuals was inversely proportional to age. They compared individuals of ages 9, 17, and 23 on a number of perceptual motor tasks. They concluded that 9-year-old children had greater capability of transferring information in comparison with those aged 17 and 23. A year later Clarke and Cookson (1962) again used perceptual motor tasks to look for transfer among mentally retarded children, but the tasks were of greater complexity. The results were confirmed using four different tasks and again the youngest group showed a greater amount of transfer in learning how to learn, perceptual discrimination, and conceptual discrimination. Clarke and Cooper (1966) used young mentally retarded children to demonstrate that task complexity was a major variable in transfer for this population. The results suggested that the greater the difficulty of the task, the greater the transfer and that transfer may be associated indirectly with low chronological age. In these three studies, results confirmed that educable and trainable mentally retarded individuals indeed can transfer information from an old task to a new one.

Other investigators have reported some kind of transfer of learning with mentally retarded children. Kaufman and Gardner (1969) used 26 mildly mentally retarded children to determine if mentally retarded individuals could transfer information from the object-quality of a learning set task to the discrimination reversed task. The results showed positive transfer. Four years later Sidman and Cresson (1973) indicated that crossmodal transfer was possible among severely mentally retarded individuals. They trained two severely retarded Down Syndrome boys on visual-auditory discrimination skills. Later, the boys transferred this information to a visual-visual stimulus equivalence. According to Bilsky, Whittermore, and Walker (1982) recall transfer occurred when they conducted an experiment with an educable mentally retarded group. The group was trained to discover and utilize categorical list structure. They used two different groups of EMH subjects, one under a multiple training session approach and the other group simply received practice with the trained material. The multi-session trained group achieved a criterion of perfect recall in fewer trials than the untrained group. Borkowski and Varnhagen (1984) conducted a study with 18 educable mentally retarded children. The purpose of the study was to evaluate two transfer of learning strategies: Self-instructional and traditional training. This was investigated as a better way to transfer specific strategies to new tasks. Although no differences were found for self-instruction vs. traditional training formats, significant improvement in recall strategy accuracy was noted for both formats.

Unfortunately, very few studies have been conducted regarding the ability to transfer information from one motor skill to another. Generally speaking, transfer of learning with motor skills is very small, and the reason is that researchers do not analyze similarities and differences between the two tasks being considered. Very often the tasks have nothing in common, thus indicating a lack of transfer or at least a very small amount (Schmidt and Young, 1987).

The ability to transfer information from one motor skill to another among mentally retarded people is still questionable. Cratty (1980) believes that mentally retarded individuals do not transfer very well. He believes the reason is that they have not been taught by teachers employing the idea of transfer effects. Berdine and Blackhurst (1985) stated that one characteristic of a mentally retarded individual is the poor ability to transfer recently learned skills to new situations. They must be trained in this area as a part of their educational program. Kaufman (1966) emphasized that it is possible that the frequent failure to obtain transfer among mentally retarded individuals is simply the result of using inadequate methods.

In summary, mentally handicapped people are able to transfer some of the information that they already know. The amount and quality of this transfer will depend on the task and its difficulty, the kind of transfer, and the individuals' past experiences related to the new task.

Statement of the Problem

The problem of this study was to determine the extent of possible transfer effects occurring from dynamic to static balance skills and from static to dynamic balance skills.

Hypotheses

The following hypotheses will be tested at the .05 significance level.

1. There would be no significant difference in the posttest scores of static balance skills between EMH children who practice tasks involving dynamic balance and those who practice unrelated recreational tasks.
2. There would be no significant difference in the posttest scores of dynamic balance skills between EMH children who practice static balance tasks and those who practice unrelated recreational tasks.

Delimitations

The study was delimited by:

1. The already-formed groups of educable mentally retarded males and females from a city school system that offered self-contained classes for EMH children.
2. The specific balance skills included in the activities and testing situations.

Limitations

The study was limited by:

1. The tests, which were not specifically designed for mentally retarded individuals.
2. The sex, age, and race of subjects in each pre-established group.
3. The use of pre-established groups taught by one teacher.

Assumptions

1. The students were not trained in any other balance activities during the study time.
2. The testing conditions were equal for all subjects during the administration of the test.
3. The subjects' participation in the study were voluntary.

Definitions

1. Mental Retardation: "Significantly subaverage general intellectual functioning resulting in or associated with concurrent impairments in adaptive behavior and manifested during the developmental period" (Berdine and Blackhurst, 1985, p. 347).

2. Mildly Mentally Handicapped (EMH): "Individuals with IQ between 50 and 70, who also exhibit maladaptive behavior. Includes approximately 89 percent of all mentally handicapped individuals" (Kalakian and Eichstaedt, 1987, p. 645).

3. Transfer of Learning: "A phenomenon that has been defined as the gain or loss in the capability for responding in the criterion task as a result of practice or experience on some other task" (Schmidt and Young, 1987, p. 4).

4. Balance: "The ability to maintain one's equilibrium in relation to the force of gravity" (Gallahue, 1982, p. 255).

5. Static Balance: "Any stationary posture, upright or inverted, in which the center of gravity falls within the base of support" (Gallahue, 1982, p. 255).

6. Dynamic Balance: "Controlled movement while moving through space while the center of gravity is constantly shifting" (Gallahue, 1982, p. 255).

7. Growth: "The measurable physical and biological changes" (Seaman and DePauw, 1982, p. 21).

8. Development: "A continuous, cumulative process" (Berdine and Blackhurst, 1985, p. 102).

9. Skill: "Movements that are dependent on practice and experience for their execution, as opposed to being genetically defined" (Schmidt, 1982, p. 20).

10. Ability: "A hypothetical construct that underlies performance in a number of tasks or activities. It is a relatively stable trait that is largely unmodifiable by practice" (Schmidt, 1982, pp. 395-396).

CHAPTER II

SELECTED REVIEW OF RELATED LITERATURE

The review of literature related to this study encompasses the following areas: a) mental retardation, b) the educable mentally retarded (EMR), c) balance and the mentally retarded child, and d) transfer effects on EMR individuals.

Mental Retardation

Years ago education for mentally retarded children was done in an isolated setting either in special schools or in residential homes. The purpose of the educational program was to "take care" of the mentally retarded youngsters without offering an opportunity for them to develop and grow. Today's education for mentally retarded children has changed drastically. The last 20 years have brought significant improvement in the education, care, public awareness, and management of individuals with retarded development (Hutt and Gibbs, 1979). Public schools are in charge of the education of mentally retarded children, taking care of what is probably the most important purpose of special education: "mainstreaming" the mentally retarded individuals into regular classes. Actually, educational programs for the mentally delayed population offer them the opportunity to grow and develop intellectually, socially, and motorically up to their individual, personal potential. Government, community, and school programs are directed to create a learning environment that will help the mentally handicapped children to develop academic, social, self-help, and vocational skills that will increase their independent functioning and allow them to participate as a valuable member of society.

Mental retardation is a label used to identify a deficit in adaptive behavior and intellectual functioning in children at an appropriate age (Hutt and Gibbs, 1979). Many definitions have been used throughout the years in an attempt to accurately describe the term "mental retardation". The definition most widely accepted was established in 1983 by the American Association of Mental Deficiency, AAMD:

> Mental retardation refers to significantly subaverage general intellectual functioning resulting in or associated with concurrent impairments in adaptive behavior and manifested during the developmental period (Berdine and Blackhurst, 1985, p. 347).

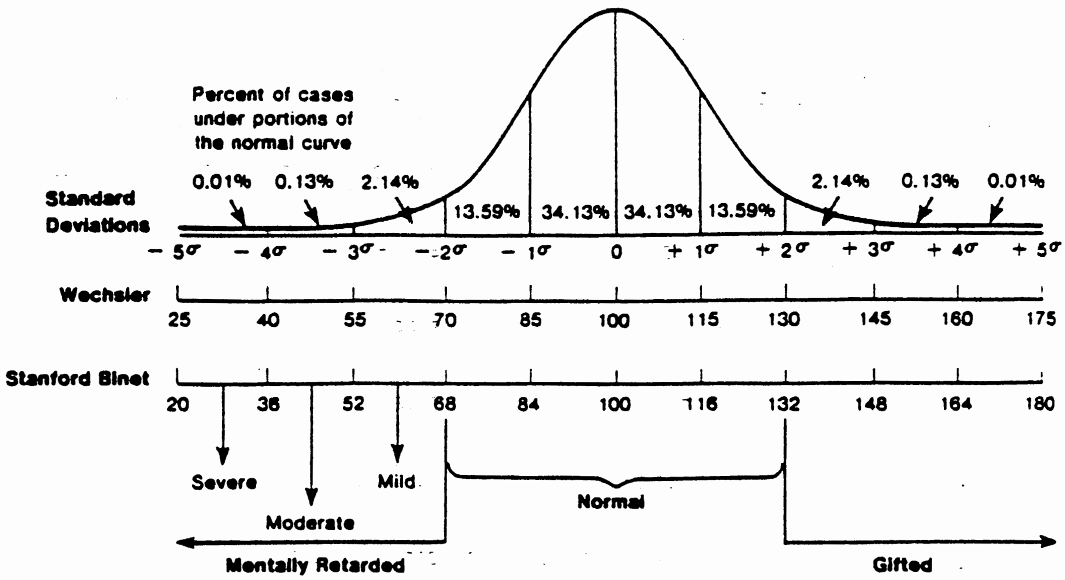
It is very important to emphasize that in order to classify an individual as mentally retarded, he/she must, during the developmental period, have subaverage general intellectual functioning, in conjunction with associated impairments in adaptive behavior (Folio, 1986) (see Figure 1).

Subaverage general intellectual functioning is usually measured by a standardized individually administered intelligence test. "An intelligence test (IQ) samples a small portion of the full range of an individual's skills and abilities" (Heward and Orlasky, 1980, p.34). As it is defined by the AAMD, significant subaverage general intellectual functioning refers to an intelligence test score that falls two standard deviations below the average score on a standardized intelligence test (Berdine and Blackhurst, 1985, p. 349). As seen in Figure 2, statistics show that approximately 3% of the total population falls into the category of individuals whose IQ scores are below 68 or 69 (Berdine and Blackhurst, 1985).

Adaptive Behavior	Intellectual Functioning: Retarded	Intellectual Functioning: Not Retarded
Retarded	Mentally Retarded	Not Mentally Retarded
Not Retarded	Not Mentally Retarded	Not Mentally Retarded

(Source: Blackwell, M. <u>Care of the Mentally Retarded</u>. Boston, Massachusetts: Little, Brown and Co., 1979.)

Figure 1. Intellectual Functioning



(Source: Claudine, S. <u>Adapted Physical Education and Recreation: A Multidisciplinary Approach</u>. 2nd Ed. Dubuque, Iowa: William C. Brown Publishing Co., 1981.)

Figure 2. Theoretical Distribution of IQ Scores Based on the Normal Curve.

Associated impairments in adaptive behavior refers to the effectiveness or degree with which an individual meets the standard of personal independence and social responsibility expected of peers of the same age and social group (Grossman, 1983). Adaptive behavior may also refer to the ability to adjust and make decisions appropriate to the environmental demands. As Berdine and Blackhurst (1985) state, adaptive behavior is "what people do to take care of themselves and to relate to others in daily living" (p. 352).

Some of the cases of mental retardation are recognizable at birth, but the majority of the cases are identified in early childhood and school years. The identification of a mentally retarded child in the early years of life is usually done by careful observation by parents and teachers. The developmental delays in communication and sensorimotor skills are probably the first indicators of possible mental retardation. Although a high number of mentally retarded individuals follow a normal developing pattern, they usually develop at slower rates than the average individuals.

The two major tools used to classify mentally retarded individuals are their ability to learn and IQ scores. They are usually grouped by their degree of educability into one of four classes: educable, trainable, severe, and profound.

Educable mentally retarded (EMR) or mildly retarded individuals have IQs which fall between 52 and 68 (Stanford-Binet scale) and they can achieve skills up to the fourth grade. These children are very difficult to discriminate from normal children in the early developmental stages. As the children grow older, the quality of the global performance is emphasized and refined in normal children while the EMR show some inferiority in their global performance (Hutt and Gibbs, 1979).

Trainable mentally retarded (TMR) or moderately retarded individuals have IQs between 36 and 51, and they can achieve skills involving self-care, communication, and socialization. They will not benefit from a traditional school program. The TMR are identified in the preschool years, and usually other handicapping conditions and physical abnormalities will accompany the mental retardation problem (Folio, 1986).

The severely mentally retarded (SMR) have IQs between 20 and 35 and they can achieve some self-care and language development skills. These individuals are usually identified at birth or shortly thereafter. Almost all SMR have other handicapping conditions that will accompany the mental retardation problem (Heward and Orlansky, 1980).

The profoundly mentally retarded (PMR) have IQs of less than 20 and they are completely dependent on someone else for a daily existence (Heward and Orlansky, 1980). These children are identified at birth and they have significant central nervous system damage accompanied by other handicapping conditions. They may respond to very limited training based on self-help. This group of children is mostly found in institutions rather than public schools (Valletutti and Sems-Tucker, 1984).

The size of the mentally retarded population in the United States, as stated before, is estimated to be about 3% of the total population. In Table 1 Jordan (1976) presents an estimation of 1, 2, and 3 percent of the mentally retarded population in the United States is speculated between 1980 and 2020. Of these, 75% fall in

TABLE 1

PROJECTED INCIDENCE OF MENTAL RETARDATION

Year	1% Incidence	2% Incidence	3% Incidence
1980	2.23 million	4.46 million	6.69 million
1990	2.45 million	4.90 million	7.35 million
2000	2.62 million	5.24 million	7.86 million
2010	2.74 million	5.58 million	8.37 million
2020	2.94 million	5.88 million	8.82 million

(Source: Jordan, T. The Mentally Retarded. 4th Ed. Columbus, Ohio: Charles E. Merril Publishing Co., A Bell and Howell Co., 1976.)

the EMR classification, 20% are TMR, and 5% are SMR or PMR (Berdine and Blackhurst, 1985).

Etiology

Mental retardation is not a disease, it is a condition that may or may not be caused by disease (Drowatzky, 1971). The causes of mental retardation can be attributed to a single factor or a combination of factors that affect normal human growth and development. Although most of the causes of mental retardation are unknown, about 10% have been identified and categorized into two groups, biological and environmental (Berdine and Blackhurst, 1985).

Biological causes are grouped, in relation to the time frame, into prenatal, perinatal, and postnatal conditions (Seaman and DePauw, 1982). Causes due to prenatal conditions can be inherited or genetic in nature or may be due to conditions during pregnancy that cause mental retardation. Inherited or genetic conditions may include: a) dominant gene disorders such as tuberous sclerosis, and neurofibromatosis which result in severe retardation; b) recessive gene defects which may cause disorders in metabolism and nutrition such as phenylketonuria or PKU, galactosemia, Tay-Sachs, cretinism, and microcephaly; or c) chromosomal aberrations, which refer to improper cell divisions caused by gene maturation, radiation, drugs, or virus. The most common chromosomal abnormality is Down syndrome which is caused by: an extra chromosome 21; translocation (a portion of chromosome 21 is attached to other chromosomes, usually number 15 or 22; or mosaicism, where some cells have the normal number of chromosomes, 46, and other cells have 47 or 45 chromosomes (Moore and Moore, 1977). Conditions during pregnancy may include: a) prenatal and maternal infections such as rubella and syphilis which have the most serious consequences during the first three months of pregnancy (Heward and Orlasky, 1980); b) maternal diseases, which may cause several complications during pregnancy such as serious kidney disease or diabetes mellitus (Berdine and Blackhurst, 1985); c) intoxication, which implies factors such as Rh incompatibility, drugs, alcohol, tobacco, and exposure to radiation during pregnancy; d) gestational disorders which refer to atypical gestation time (either too short or too long); and e) unknown prenatal conditions which refer to congenital cerebral defects such as microcephalus (small head) and hydrocephalus (Seaman and DePauw, 1982). Perinatal conditions occur when, during the process of birth, the infant is subjected to physical trauma and injury. Trauma and injury can be attributed to a prolonged labor caused by the baby's improper position at the time of birth, or because the mother's pelvis is too narrow for the infant's head (Moore and Moore, 1977). Asphixia, which refers to the lack of oxygen to the infant, may occur and can be caused by compression of the umbilical cord or several other problems (MacMillan, 1982). Also a low birth weight may cause mental retardation. Postnatal conditions include such factors as: meningitis, which refers to the inflamation of brain tissues, thus leading to mental retardation during childhood; brain injuries due to accidents or child abuse; and lack of oxygen to the brain as a result of gas poisoning (Kirk, 1972).

Environmental causes are related to the influence of appropriate environmental stimulation. The term environmental is used when there is no evidence of disease or trauma causing mental retardation (Seaman and DePauw, 1982). Environmental deprivation accounts for 80 to 90 percent of the total cases of mental retardation (Berdine and Blackhurst, 1985). A disadvantaged environment is believed to be the cause for most of the mild cases of mental retardation while most of the severe cases are attributed to medical causes (Heward and Orlasky, 1980). Mental retardation cases attributed to environmental influences are more likely to occur among the most disadvantaged classes of society (Valletutti and Sims-Tucker, 1984). Environmental mental retardation has its major impact during the early formative years of life (Hutt and Gibbs, 1979). The following conditions may be components of a disadvantaged environment: (1) inadequate nutritional conditions; (2) inadequate verbal, sensorimotor, and emotional stimulation; (3) inadequate interpersonal experiences and social interaction; (4) inability to cope and handle stress; (5) and inadequate attention (Hutt and Gibbs, 1979). Nevertheless, there is a discernable separation of medical and environmental causes of mental retardation, both of which are believed to work together toward amelioration or acceleration of the mental retardation condition.

The Educable Mentally Retarded Individual

The educable mentally retarded (EMR) individual is also referred to as mildly retarded. The EMR child is not identified until she/he enters school and very often not until the second or third grade when more complicated and highly organized skills are required (Kirk and Gallagher, 1979). A mildly retarded individual is likely to score two standard deviations below the mean when taking a standardized individual test of intelligence, and presents associated impairments in adaptive behavior by the age of 21 years. The IQ range of an EMR person will usually fall between 52 and 68, Stanford-Binet scale (Moore and Moore, 1977). The characteristical mental age reached by this individual fluctuates between 8 and 12 years old as reported by Kalakian and Eichstaedt (1987). They also are below average in language and motor development (Seaman and DePauw, 1982). Some of the educational settings for the mildly retarded children are usually shared with the normal children, but usually the academic subjects are learned in small and separate special class settings. Art, music, and physical education may be learned with the rest of the school children, unless other specifications are made. These individuals have the potential to develop in academic subjects and achieve up to the 6th grade level by their late teens.

The educational programs for the EMR population are directed to the development and acquisition of academic, vocational, social, and recreational skills. The physical and motor appearance of EMRs is so close to the normal individuals' that the majority of the the EMR children are never recognized as such outside of the school or after they finish school (Heward and Orlansky, 1980). Educable mentally retarded individuals "often have educational characteristics similar to those in normal developing children, although they may differ in their rate of skill acquisition, ability to attend to task, memory, generalization transfer of recently acquired skills, and language development" (Berdine and Blackhurst, 1985, p. 370).

Socially, the EMR population has the capability of becoming individually independent and socially adjusted. If mildly retarded individuals are trained appropriately, they can gain occupational skills that will make them economically independent under periodical supervision (Heward and Orlansky, 1980).

Regardless of the similarities and/or differences observed among EMR children, the child's uniqueness must be kept in mind by educators and personnel dealing with this special population. Each mentally retarded child, just like any other child, possesses a unique potential which will be manifested through individualized behaviors and performances in the child's life. Although EMR individuals are very unique, they also show some common characteristics as a group (Hutt and Gibbs, 1979). The group characteristics attributed to the EMR population can be classified into three different categories: 1) intellectual/learning characteristics; 2) affective/personality characteristics; and 3) physical/motor characteristics.

Intellectual/Learning Characteristics

The limited capacity to learn may be the most noticeable difference between educable mentally retarded and nonretarded children. The mildly retarded children usually develop the same cognitive process as their nonretarded peers, but at different rates and quality levels (Masters, Mori, Lange, 1983) These children have very short attention spans, and they are not very alert to relevant cues. Because of their inability to discriminate new significant cues, they tend to focus on old specific ones. Some EMR individuals will not be able to work on more than one task at a time and extra practice and a larger number of repetitions will often be required to master a task. The mildly retarded group lacks the ability to ask relevant questions, and as a result they do not gain needed information to solve general problems. These children frequently fail to use or apply the outcomes of previous learning in subsequent learning tasks (Berdine and Blackhurst, 1985).

Poor memory is also a general characteristic of the EMR population. Short-term and long-term memory are inferior in EMR individuals when compared with nonretarded individuals of comparable chronological age (Hutt and Gibbs, 1979, p. 88). The mildly retarded population is not efficient at transferring abstract information, and has difficulty in employing appropriate learning strategies. They are not able to memorize nonserial information, because they have trouble transferring information from sensory storage to short term memory. In general, the memory of EMR children is limited in strategies and capabilities (Berdine and Blackhurst, 1985). Mental retardation is the principle cause of speech defects when no other disorder of the central nervous system is present. Language development among the EMR population is delayed and limited which often causes causes voice disorders and stuttering (Hutt and Gibbs, 1979).

Affective/Personality Characteristics

Research evidence is very poor when referring to affective and personality characteristics of educable mentally retarded individuals. MacMillan (1977) states "frequently laundry lists of personality characteristics of the mentally retarded are present with little documentation to support the existence of these attributes" (p.48). Affective and personality characteristics in the mildly retarded population may be affected by the following situations: socioeconomic background; opportunities for social development; nature of school placement and school experience; personal adjustment; and the attitudes of others toward this population. EMR individuals are usually afraid of new situations and this induces higher levels of anxiety. As a group, mentally retarded children are more anxious than nonretarded children (Singer, 1980). Higher levels of frustration and aggression are other characteristics that may be present and are usually attributed to the inability of mentally retarded persons to demonstrate and communicate their feelings (Masters, Mory, and Lange, 1983). The lack of desire to participate in new situations because of bad past experience is underlined by the fear to fail again. EMR children will show their unwillingness to participate in activities where they have failed before, unless they have been taught how to handle these situations. A poor self concept is a very common characteristic of this group. Mildly retarded individuals usually do not like the way they look, what they do, and how they are accepted by their nonretarded peers (Heward and Orlansky, 1980).

Physical/Motor Characteristics

A large number of mildly retarded children are very difficult to discriminate from the average children in physical appearance and motor development. The EMR children, specially in the upper ranges, have the physical appearance of normally developed children (Hutt and Gibbs, 1979). Usually these children will not have facial or other physical marks that will distinguish them from their nonretarded peers, although a few children may be overweight because of the lack of motor activity. As the severity of the retardation increases the physical and motor differences are more obvious (Drowatzky, 1971). Motorically speaking, EMR children "tend to be more similar to their chronological age peers in physical and motor performance than in any other single respect" (Kalakian and Eichstaedt, 1987).

There is no existing evidence about a close relationship between IQ and motor performance among nonretarded individuals (Singer, 1980). "There is a considerable doubt about the relationship of academic achievement and intelligence test scores with physical status in average individuals" (Singer, 1980, p. 236). On the other hand, evidence has been found by Bruininks (1974), Rarick (1970, 1973), Howe (1959), and Sloan (1950-51) that show a high relationship between motor proficiency and IQ levels among the mentally retarded population when compared with nonretarded children. As the IQ drops, so does the motor performance of the EMR children. When referring to physical fitness, mildly retarded children achieve lower scores than normal children of the same chronological age (Drowatzky, 1968). Rarick, Weddop, and Broadhead (1970) conducted a study using the American Association for Health, Physical Education, and Recreation (AAHPER) Youth Fitness Test, which was modified to use with EMR children. The conclusion of the study showed that the mean scores of the mildly retarded children were significantly lower than non-retarded children. The achievement of motor skills among EMR children is also lower. Studies directed by Rarick (1976), Cratty (1967), Sengstock (1966), and Stevens and Heber (1964) indicate differences between the scores of normal and retarded children in motor ability parameters as measured by the Lincoln-Oseretsky Motor Development Scale and other standardized tests.

Due to the fact that subnormal children develop more rapidly in the maturation aspects than those aspects that depend on learning, the locomotor development in EMR children is more advanced than any other system. Generally speaking, the mildly retarded children will follow an average motor development pattern with slight differences in quality and rate (Kalakian and Eichstaedt, 1987). The differences of rate and quality in the motor domain among EMR children can usually be reduced by providing an early and adequate stimulation and training program. The earlier the motor deficiencies are detected and an adequate program is implemented with these children, the better chances the children have to improve their general motor integration and developmental rate (Folio, 1986). Although the mildly retarded children usually have a parallel motor development to the nonretarded children, the EMR children may have deficiencies in such areas as equilibrium, locomotion, complex coordination, and manipulative dexterity (Sherril, 1982, Seaman and DePauw, 1982). Some of these deficiencies may be attributed to the lack of stimulation, experience, and social interaction, rather than the disability itself. It is important to keep in mind that some of the mildly retarded children will not participate in spontaneous play, so they must be taught and trained to engage in playing activities. Perhaps the greatest need of the EMR children is to successfully participate in group play (Fait, 1971). The motor domain, according to Kalakian and Eichstaedt (1987), provides the mentally retarded children with the best avenue for achievement and success. The physical and learning characteristics of each mentally retarded child must be specified in order to develop an individualized educational program that will fully serve the needs of each child.

How Educable Mentally Retarded Individuals Learn

As it was stated before, the primary consideration that needs to be taken into account is that the EMR child usually runs two to four years behind the academic and motor development of normal children (Kalakian and Eichstaed, 1987).

Mentally retarded persons have short attention spans and have trouble attending to significant cues while performing a task. These individuals show overselectivity or perseveration, meaning that they only have the capacity to focus on one or two specific cues when performing a given task. The mentally retarded population requires a larger number of repetitions of the same task before it can be mastered. After a task has been mastered they can perform at similar rates as nonretarded individuals (Berdine and Blackhurst, 1985). Mentally retarded persons have trouble recalling nonserial information. This happens because their organizing strategies are limited. They also experience delays in the transmission of information from sensory storage to short term memory which causes delays in the motoric responses (Folio, 1986). Because speech and language development are related to mental age (Seaman and Depauw, 1982), mentally retarded individuals show a greater incidence of speech problems than normal individuals. Mentally retarded individuals do follow the same learning patterns as non-retarded children, but what is different is the quality and quantity of the learned material. The limited ability to learn should be maximized by providing a stimulating learning environment that will fully meet the individual needs of the mentally retarded child.

Balance and the Mentally Handicapped

Balance is a basic component of most fundamental human movements. Without the ability to balance, people would not be able to perform even the most basic daily movements such as sitting, crawling, standing, walking, or running.

Balance is defined as the ability to maintain body position (Singer, 1980, p. 202). The most common types of balance are dynamic and static. Static balance has been defined as the ability to maintain any stationary position upright or inverted. Dynamic balance is the ability to maintain equilibrium when moving from point to point (Gallahue 1982, p. 282). Balance is a very important ability for the human performance which relies on the successful integration of a number of anatomical and neurophysiological systems (Harriet, 1983). Balance requires complex interactions among the kinesthetic, tactile, visual, vestibular, and motor systems. The kinesthetic system has its input in human balance by telling the individual internally where in the space his or her limbs are located. It also carries out information from stimulation of receptors in muscles, tendons, and joints of the body into and out of a balanced position (Harriet, 1983). On the other hand, the tactile system helps the individual to determine where his or her body ends and space begins as well as discriminate textures.

Visual stimulation helps the individual to judge and to make adjustments for distances, depths, and relationships (Eason, Smith, Carol 1983). The vestibular system is a vital one because it houses the receptors of dynamic and static balance. This system has two major structures: 1) The semicircular canals that respond to changes of the head in angular acceleration and are responsible for the individual's dynamic balance and 2) The utricle which responds to linear acceleration and is responsible for the individual's static balance (Harriet, 1983). The vestibular system is very sensitive to the head position and the speed at which the head changes position. Since static and dynamic balance are controlled by two different structures it is possible for an individual to have good static balance and poor dynamic balance and vice versa. If the vestibular system is not working correctly, some muscular disorders can occur and would affect balance performance. Muscle tone is directly affected by the vestibular system. Too much or too little muscle tone may be a result of vestibular dysfunction (Seaman and DePauw, 1982).

The vestibular system is structurally completed at birth, and in terms of balance, seems to be developed early in life (Gallahue, 1982). The job of the vestibular system is to react to head position, changes in speed or direction of the head, and total body movement (Harriet, 1983).

Balance first appears in the individual as a primitive reflex by the end of the first year of life (Kalakian and Eichtaedt, 1987). If this reflex fails to develop at the proper time the child will not be able to reach the movement patterns expected, and this will limit further movement development. Later this primitive reflex should be suppressed by reactionary and voluntary movements, becoming a motor sensory response. If this suppression is to fail it might cause delays and/or lack of mastering balance skills. As the individual develops, the ability to maintain balance is repeatably and accurately used until it becomes a purposeful motor movement. It then becomes a component of motor patterns like crawling and walking (Seaman and DePauw, 1982). In general, the ability to balance would depend on how well the individual's motor development occurs, heredity factors, and environmental experiences (Singer 1980).

There are three important factors that affect balance: Center of gravity, line of gravity, and base of support. Since the human body has an asymmetrical shape, the center of gravity is constantly changing during movement. The line of gravity is an imaginary line that extends vertically through the center of gravity to the center of the earth. The base of support is the part of the body that comes into contact with the supporting surface. These three elements interrelate and determine the degree of body stability in space (Gallahue, 1983, p. 53). In order to put information together from systems and factors that underlie human balance, the individual must be able to transmit and interchange that information. If everything works appropriately, balance can be mastered after the information has been processed by the systems, but if one of the connections and/or systems doesn't do its job, the individual might have problems keeping his or her balance. Balance is an ability required to perform simple and sophisticated skills, however, the ability to balance is different and unique in each individual (Rarick 1976).

The mentally retarded individual has trouble keeping balance. In general, this is attributed to the fact that mentally retarded children usually have deficiencies in the development of balance skills. This may be due to the lack of stimulation and experience and/or to the fact that they are behind two to four years in their motor development (Sheril 1981). This problem could also be related to a disorder in one or more of the systems that control balance, or to miscommunication between systems.

Research supports the idea that mentally retarded individuals do not balance very well in comparison to normal children. Early in 1959, Howe concluded in his research with 43 mentally retarded children ages 6 to 12 that only two of them were able to balance on one foot for one minute. The majority could balance for little more than 20 seconds. Cratty (1967) stated that about 80% of mentally retarded children could balance on one foot with their arms folded across their chest for about five seconds. A year later in a study conducted by Keogh (1968) it was found that educable mentally retarded children had the biggest problem performing in balance tasks and body-part perception. Drowatzky (1971) stated that moderate correlations are generally obtained between chronological age and motor ability and between mental age and motor ability of the retarded child. However, the most marked differences in motor ability between the normal and retarded child are found when comparing them in their ability to balance. In another investigation, Rarick, Dobbins, and Broadhead (1976) concluded that the motor development of retarded children runs two years behind the normal rate. However when the scores of balance skills were compared they found that the mentally disabled child performed three years behind the normal child. Sherril (1981) reports that the mentally retarded child does not balance very well. She attributes this to the concept that balance is related to intelligence, and the mentally retarded have low IQ's. Rider (1983) conducted a study with 31 mentally handicapped and 31 non-handicapped students. He found no differences in static balance on left or right legs, but the total balance time between the two groups was significantly different. This confirmed prior work related to ability to balance between retarded and normal children.

The mentally retarded individual has problems performing skills where static or dynamic balance is required. This has been attributed to the lack of stimulation and/or experience or to a disorder in one or more of the systems that interact to keep body balance (Seaman and DePauw, 1982); to the delay in the motor development in mentally handicapped individuals (Rarick, Dobbins, Broadhead, 1976); and/or the possible relationship existing between intelligence and the ability to balance (Sherril 1981).

Transfer of Learning

For the last few decades there has been little interest from researchers in doing studies related to transfer of motor skills. This has become a concern of educators, especially when knowing that transfer of learning is so closely related to a large number of problems associated with motor learning (Schmidt and Young, 1987). Those few research papers related to transfer of a motor skill have a lot of unanswered questions such as: a) which skills should be taught together in order to find transfer, b) which elements should the skills have in common, and c) how long must the practice time on the old task be before trying the new task. Cratty (1984) stated that one of the biggest problems in conducting a study related to transfer of a motor skill is that the skills selected for the study are only distantly related or are not related at all. The results obtained from the study, therefore, show little or no transfer from skill to skill.

It is important to remember that what makes transfer so important to educators and trainers is the assumption that whatever the students learn in the practice sessions, they should be able to use in real-life situations. This assumption becomes more critical as the practiced task more closely resembles the real-life situation.

Transfer of learning is a phenomenon that has been defined as the gain or loss in the capability for responding in the criterion task as a result of practice or experience on some other task (Schmidt and Young, 1987). The effects that a learned experience could have on the learning of a new skill can be positive, negative, or neutral. If the skill that was previously practiced promotes the learning of the criterion task, it is referred to as positive transfer. However, if the previously practiced skill inhibits the learning of the new skills, then it is referred to as negative transfer. If the previously practiced skill has no effect on the criterion skill, then it is referred to as zero transfer (Singer, 1980).

There are many conditions that underlie the results of transfer of learning, but only three will be discussed in this review. The first condition relates to the similarities of the components of the skills and/or the context in which the skills are performed. The higher the degree of similarity between the components parts, the greater the amount of positive transfer that can be expected to occur. It is easier to find transfer between a volleyball serve and a tennis serve than between the tennis serve and the racketball serve. The second condition refers to the complexity and organization of the motor skill. The complexity of a motor skill is determined by the number of component parts pertaining to the skill. The way that the parts of the skill interrelate (organization of the skill) is also very important in determining the amount of transfer to expect. The third condition is the amount and type of previous experiences. This includes any experiences which were before the training of the learned skill as well as those which come from the training (Magill, 1989).

The three conditions described above determine to which extent the transfer will occur and in which direction. The amount of practice and the variability of the the practice will also influence the transfer (Singer, 1980, and Schmidt and Young, 1987). It has been confirmed that the more practice, the more transfer occurs (Singer, 1980). Schmidt and Young (1987) believe that there is a shift of abilities required by the skill as the skill is practiced. Cognitive abilities seem to become less important, while other more motoric abilities come into play.

Negative transfer does not commonly occur in motor skills, and if it does it is temporary and easily changed by increasing the amount of practice. This idea is related to the concept that negative transfer effects are essentially cognitive rather than motoric. A situation where negative transfer is likely to occur is when two tasks have opposite elements, or when a new and different response is required for an old stimulus.

Positive and negative transfer effects can be identified by performing the learned skill in a novel situation. It could be by learning the steps of how to scuba dive out of the water and then do it in the water. Just by changing the conditions under which a task is to be performed can be thought of as altering the task somewhat. Another way of knowing if transfer has occurred is by changing the speed of the learned skill. A good example is the speed change in the pursuit rotor experiments. A third possibility is to perform a different task from the one already practiced, where the new task has some common elements of the practiced one (Magill, 1989, and Schmidt and Young, 1987).

There are two basic types of transfer. Intratask transfer means the training task is the same one as the criterion task, but the conditions of performing the two tasks are different. On the other hand, intertask transfer involves two different tasks. The training task and the criterion tasks are different, but they are performed under the same conditions (Lersten, 1967).

Transfer of Learning and the Mentally Retarded Individual

Transfer of learning has been an assumed subject in the school system, not only in regular instruction but also in the area of special education. It is likely that a high percentage of special educators have never studied about the theory of transfer of learning and its importance when training special students. Educators assumed that whatever they teach to the special students will be sufficient enough to send them out of school and for them to successfully respond to new situations on the basis of what they learned at school. The mentally handicapped individual is one of the special students who could benefit from transferring information to new situations. The value of transferring survival and/or occupational skills mastered at school is very high for mentally retarded individuals because hopefully those skills will make these individuals self-sufficient economically and socially.

In the last few decades, only a very few studies have been conducted regarding the ability to transfer motor skills among mentally retarded individuals, and the problem seems to be that transfer of training studies create more questions than answers to the problem. Researchers keep finding new information that cannot be explained and many times they must rely on speculation or assumptions.

Probably the strongest support that the mentally retarded population is able to transfer information comes from the series of studies conducted by Clarke and others from 1961 to 1966. In a series of four different studies, Clarke and others found significant amounts of transfer in the areas of task expectancy, perceptual, and conceptual discrimination. Also noted was that mentally retarded individuals are best able to transfer information from task to task when the tasks are more complex. In other words, the greater the difficulty of the tasks, the greater the transfer between them. To the contrary, in another study the authors found that the mentally disabled population transfers information better when identical stimulus elements are not involved, the tasks are very similar, and the motor movements involved are extremely simple (Clarke and Cooper, 1966).

Clarke and Blakemore (1961) found out from a study conducted with mentally retarded children and adults that transfer of learning is inversely related to age. From these results it was assumed that there are more novel tasks for children than for adults who have already had a great deal of transfer earlier in life. However, they believe that the mentally retarded individual can transfer learned information to a new situation. On the other hand, Spradlin, Cotter, and Baxley (1973) conducted a study with a group of EMR adolescents in order to determine if transfer could occur among stimulus class and response class conditioning. The results obtained from this study showed transfer of learning, but there was a question about whether this transfer might be limited in the more severely retarded. The researchers believe that the phenomenon of transfer of learning exhibited in this study could be limited based on the individuals' disability.

Minsky, Spitz, and Bessellies (1986) believe that retarded persons have an inability to transfer the newly acquired strategies to novel ones even though the situations are similar. Their study suggests that retarded individuals find it difficult to transfer trained strategies when the transfer task is quite different from the trained one. They found some transfer between trained and new tasks, but it was not significant.

Turnure and Thurlow (1973) conducted a study with EMR individuals where transfer of learning failed to occur. They believed that other conditions interfered with the prior studies and that EMR could experience transfer of learning. They attribute the failure of the studies to show transfer to: a) the subjects, who were individuals with histories of institutionalization (this has been proven previously to have detrimental effects on the learning performance of retarded individuals); b) the elements of the trained and criterion tasks did not connect well enough to enable transfer of information; and c) the duration and interval of the practice sessions were not appropriate to promote transfer in mentally retarded subjects. In a later study, Turnure and Thurlow (1973) corrected the errors mentioned above. They conducted a study with three groups (control, experimental I, experimental II) of EMR children. One of the experimental groups was submitted to the training of an elaboration task for a day and then was tested the second day on transfer to a paired-associated criterion task. The group showed low amounts of transfer. However, the other experimental group practiced the elaboration task for two days and on the third day was tested on a paired-associated criterion task. The group showed significant transfer of learning from one task to the other. The results of this study confirmed that EMR children could transfer verbal elaboration techniques to a standard paired-associated task.

An interesting study was conducted by Smith and Tunick (1969) to test for transfer of discrimination from visual to tactual-kinesthetic (active touch), and tactual-kinesthetic to visual sense modes. A group of six institutionalized EMR individuals was trained to see if cross-modal transfer could occur. The study involved two-choice discrimination transfer from the visual to the tactual-kinesthetic modes and conversely from tactual-kinesthetic to the visual. The study was looking for whether the information gained from one sense could be used to solve a problem requiring the use of another sense, and if the information could be transferred in terms of dimensions (tactual) or cues (visual), or both. The results showed clear evidence of cross-modal transfer when the cues were identical for visual and tactual-kinesthetic sense, but no dimensional transfer was found. When the cues were identical for the two senses, transfer occurred. When the dimensions were relevant for both sense modes but the cues were not identical, cross-modal transfer did not occur. In other words, dimensional cross-modal transfer did not occur while a high level of cue transfer did occur. They concluded that retarded children can transfer discrimination across sense modes, but whether they can transfer information in terms of dimensions is unclear from this research.

Borkowski and Varnhagen (1984) did a study with 12 EMR children where they were taught anticipation (to remember correctly the order of reading events within a passage) and paraphrase (being able to repeat what has been read in one's own words) strategies in order to determine if self-instructional training facilitated strategy maintenance and generalization in contrast to traditional training. No differences were found between the self-instructional and traditional training in any of the variables, but all children significantly improved in their generalization test. This means that they were able to transfer information from the learned task to solve a novel problem in the generalization test. It was also suggested that in order to achieve strategy generalization, retarded children must learn to detect similarities between training and transfer tasks and then apply the most appropriate available strategy.

Bilsky, Whittemore, and Walker (1982) conducted a study with mentally retarded adolescents where recall transfer with a new word list was the subject of study. The authors stated that attempts to facilitate recall by training normal children and retarded individuals to utilize categorical list structure have been largely unsuccessful. For example, Clarke, Clark, and Cooper (1970) and Burger et al. (1978) did find transfer in their studies while Whittemore and Bilsky (1977) did not. In general, there has been limited evidence of recall transfer among mentally retarded individuals. However, the results of this study showed that the mentally retarded individuals who were trained achieved a criterion of perfect recall transfer after fewer trials than untrained retarded subjects.

A study by Sidman and Cresson (1973) investigated whether SMR individuals had the capability of transferring auditory comprehension to visual comprehension. It was suggested that this particular group might have the capability of transferring information from auditory to visual comprehension, but they just have not been taught effectively. This study involved two SMR institutionalized

Down syndrome adolescents. The results yielded cross-modal transfer from auditory-visual to visual-visual stimulus equivalences.

In summary, opinions seem to be divided and study results inconsistent. There have been studies conducted with mentally retarded individuals that support that transfer effects are common among this population. On the other hand, some studies have failed to show any transfer. It seems that results are very much dependent on environmental factors and the specific learning situations surrounding the transferable tasks.

CHAPTER III

METHODS AND PROCEDURES

The procedures used in this study are described in terms of:

a) Selection of subjects

b) Instrumentation

c) Equipment and elaborated material

d) Research design

e) Operational procedures

f) Statistical analysis

Selection of Subjects

The director of the research department and the head of the special education division of the city schools in Durham, North Carolina were contacted by the author in order to obtain permission to direct this study. The author followed all the regulations and policies established by the Institutional Review Board (IRB) at Oklahoma State University. A signed consent form was received from the IRB approving the conduction of this research. A list of the educable mentally retarded classes was obtained and the author contacted the teachers at each school. Four schools that had EMR children agreed to participate in the study. A letter was sent to the students' parents explaining the study rationale and measuring procedures. Parents were asked to sign the letter and send it back if their child was to participate in the study.

The number of subjects was 41 EMH children whose ages ranged from six to 15 years old, and the population was predominantly black.

Instrumentation

The data-gathering instrument used was The Hughes Basic Gross Motor Assessment (BGMA). This test was selected because it is designed to assess gross motor performance in children who seem to have minor motor dysfunctions. The BGMA also judges the quality of performances, letting the testor know how well the child performs the motor skill. The BGMA is recommended to be used as a pretest/posttest tool to monitor improvement gained. The test was developed primarily for use in educational environments by physical education teachers, special education teachers, and others in related fields. This test has standard procedures based on gross motor performances demonstrated by 1260 normal school children ages five years six months to twelve years five months. Reliability of the test was determined at a coefficient of .97 using the test-retest method. Content, construct, and concurrent validity were established for the BGMA. The BGMA includes eight subtests: standing balance on one leg, stride jump, tandem walking, hopping, skipping, target throwing with bean bags, yo-yo, and ball handling tasks. Two of the eight subtests were used in this study: static balance on one foot and tandem walking. Static balance measures "postural stability reactions which maintain the body in the upright position without movement through space. Sensory input is proprioceptive, visual, and vestibular" (Hughes, 1979, p. 17). Tandem walking measures "postural ability in motion, equilibrium control constantly keeping the body center of gravity over a changing base of support in movement" (Hughes, 1979, p. 18).

Scores for the BGMA test are determined on the basis of quality of performance. A good performance without any of the deviations listed on the scoring sheet receives a score of three. Each deviation subtracts one point from the score for that subtest, and three or more deviations result in a score of zero.

The following adaptations were made for this study:

1) The score. An error score was added to record the times that the child touched or got off of the equipment during the performance.
2) Equipment. Participants were asked to perform static and dynamic balance on a balance beam, tire(s), and a ladder.
3) The form score and the error score were added to determine the total score for each skill.

Equipment and Elaborated Material

1) Balance Beam: The balance beam was constructed from two 2" X 4" X 8 ft boards. One was laid flat on the ground and formed the base. The other was attached on its edge to the base. This resulted in a two-inch wide by eight-foot long

walking surface which was six inches from the ground.

2) Ladder: The ladder was also constructed from 2" X 4" boards. The ladder was 12 feet long and 14 inches wide, with rungs every 12 inches. The rungs were constructed such that the two-inch edges were facing up.

3) Tires: The tires consisted of used 14 inch automobile tires. When used for dynamic balance 10 of these tires were placed in a circle, with each tire touching another.

Research Design

The pretest-posttest control group design with three groups was used. The use of existing groups was the only feasible way to conduct the study due to previous school commitments and conflicts with instruction hours. The 41 participants were equally pretested in dynamic and static balance skills. The treatments were randomly selected for the established groups by writing the names of the groups and schools on small pieces of paper. The schools were put in one bowl and the Control, Experimental Group I, and

Experimental Group II in another bowl. The researcher took a paper from each bowl and paired the name of the school with the study group. The papers were then returned to their respective bowls and another drawing was done. If a school or group was chosen that had previously been chosen, it was put back into the bowl and another paper was selected until all schools were matched with groups. The number of participants in each group was as follows: Control Group, 12; Experimental Group I, 15; and Experimental Group II, 14. The Experimental Group I practiced dynamic balance skills during six weeks. The Experimental Group II practiced static balance skills during six weeks. The Control Group engaged in an arts and crafts program during the same six weeks. After the six weeks the Control Group was posttested on the same dynamic and static balance skills previously used in the pretest situation. The Experimental Group I was posttested only on the static balance skills, while the Experimental Group II was posttested only on the dynamic balance skills.

Operational Procedures

After the signed letters from the parents were collected by the author, the pretest session was scheduled to one day per school. The testing took place either in the school gym, the school auditorium, or outside of the school if it was necessary. The testing area was set up prior to the subjects' arrival. The setting consisted of three different stations which were used to or measure static and dynamic balance. The groups were told that they were going to play some games with no reference to the word "testing". Each student was directed to each station and tested individually by the author. All the class was present when testing the participants. The children not being tested remained seated and quietly observed. The testor made sure that the child fully understood the nature and demands before the test was administered. All of the pretesting and posttesting procedures were videotaped for further analysis at a later date.

Overall, four persons were involved in the study procedures: the testor, the person who videotaped the tests, the arts and crafts instructor, and the teacher in charge of the class. The testor signaled the beginning and ending of each timed testing period so that it could be monitored with the video camera.

Testing Operational Procedures

Each child was tested first in the static balance skills in the following order: balance beam, tire, and ladder. When done the child was tested on the dynamic balance skills starting at the balance beam, next with the 10 tires placed in a circle, and finally the ladder. No rest period in-between activities was necessary.

The operational procedures of the pretest are described as follows:

A) Static Balance Test:

1. The testor placed the child beside the balance beam and asked him or her to stand for five seconds on one foot and then five seconds on the other foot. The testor then placed a sticker on the preferred foot and indicated that that foot would remain on the ground and the other would be raised.

2. The testor stood on the balance beam and said, "Let me see if you can bend your knee like this

and stand on one leg. Make sure your arms are at your sides" (Hughes, 1979).

3. Then the testor helped the child to get on the balance beam.

4. The child was asked to raise the leg and was helped to put his or her arms at the side.

5. The testor said, "Please keep your arms at your sides like this".

6. The child was asked to rest, and the testor asked if there were any questions.

7. The child was instructed to be ready, and when the "go" was called to assume the explained position until the testor said "stop". The testor used a stop-watch to time a 10-second period and started timing as soon as the child reached the test position.

8. The testor then took the child to the next station.

9. The testor stood on a tire, raised one foot , and kept her arms at her side while she said, "Let me see if you can bend your knee like this and stand

on one leg. Please make sure you arms are at your sides like this."

10. Next the testor helped the child to get on the tire and asked him/her to raise the designated leg and put his/her arms at his side.

11. The child was asked to rest, and the testor asked if there were any questions.

12. The child was then instructed to be ready, and when the "go" was called to assume the explained position until the testor said "stop". The testor used a stop-watch to time a 10-second period and started timing as soon as the child reached the test position.

13. The child was then placed beside the ladder while the testor said, "Let me see if you can stand on two feet on the marks of the ladder like this. Please make sure you keep you arms at your sides like this."

14. The testor helped the child to get on the ladder and assume the explained position.

15. The child was asked to rest, and the testor asked if there were any questions.

16. The child was then instructed to be ready, and when the "go" was called to assume the explained position until the testor said "stop". The testor used a stop-watch to time a 10-second period and started timing as soon as the child reached the test position.

B) Dynamic Balance Test

1. The testor place the child beside the balance beam.
2. The testor assumed the correct position on the balance beam and said, "Please watch me as I walk on the balance beam. I touch the heel of one foot to the toes of the other foot as I walk on the beam to the end. Please keep you arms at your sides" (Hughes, 1979, p. 57).
3. The testor helped the child to assume the ready position on the balance beam, making sure the arms were at the sides.
4. The child was instructed to wait for the "go" and then walk down the balance beam to the end.

5. If the child got off the balance beam, he/she was helped to reassume the position and continue from the point at which he/she left the beam.
6. The testor then took the child to the circle of tires.
7. The testor stood the tires and said, "Please watch as I walk on the tires. I start where two tires touch each other and step to where the next tires touch like this. Please keep your arms at your sides and when you get to the marked tire, get off."
8. The testor asked if there were any questions.
9. The testor helped the child to assume the right starting position, and at the "go" signal, the child performed the specified task. While the child walked around the tires, the testor walked beside him/her.
10. If the child got off the tires, the child was helped to reassume the position and continued from that point.
11. The child was then positioned beside the ladder.

12. The testor assumed the starting position on the ladder and said, "Please watch me as I walk on the marks of the ladder all the way to the end. Please keep your arms at your sides."
13. The child was helped to assume the starting position and at the "go" signal began the task.
14. If the child got off the ladder, he/she was helped to get back on at that position and continued down the ladder to the end.
15. The testor walked beside the child during the task.

The performance was video-taped and later evaluated by the testor.

Scoring Procedures

Two scores were recorded from the performance of the children. The "Form Score" was based on the quality of the performance, and the "Error Score" was based on the number of times that the child touched or in any was got off the equipment. The criterion considered on the form score are specified on the score sheet as shown in Table 2. A good form performance without any of the listed

TABLE 2

SCORE SHEET FOR STATIC AND DYNAMIC BALANCE TESTING

NAME________________ SCHOOL________________ GROUP____________ BIRTHDATE__________

AGE AT TIME OF TEST________ I.Q.________ RACE____________ SEX_____

TESTING PRETEST DATE________ PRETEST SCORE____________ TESTING POSTTEST DATE________ POSTTEST SCORE____

DOMINANT FOOT________

STATIC BALANCE						DYNAMIC BALANCE					
BALANCE BEAM		TIRE		LADDER		BALANCE BEAM		TIRE		LADDER	
FORM SCORE a. Leans flexed leg against supporting leg. b. Excessive arm movement. c. Excessive body sway. d. Shifts to maintain balance by jumping on supporting leg.		FORM SCORE a. Leans flexed leg against supporting leg. b. Excessive arm movement. c. Excessive body sway. d. Shifts to maintain balance by jumping on supporting leg.		FORM SCORE a. Excessive arm movement. b. Excessive body sway. c. Shift to mantain balance by jumping on supporting legs		FORM SCORE a. Turns feet out. b. Turns feet in. c. Large steps. d. Excessive arm movement. e. Moves fast.		FORM SCORE a. Excessive arm movement. b. Moves fast. c. Excessive body sway.		FORM SCORE a. Excessive arm movement. b. Moves fast. c. Excessive body sway.	
PRETEST	POSTTEST	PRETEST	POSTTEST	PRETEST	POSTTEST	PRETEST	POSTTEST	PRETEST	POSTTEST	PRETEST	POSTTEST
ERROR SCORE PRETEST: POSTTEST:		ERROR SCORE PRETEST: POSTTEST:		ERROR SCORE PRETEST: POSTTEST:		ERROR SCORE PRETEST: POSTTEST:		ERROR SCORE PRETEST: POSTTEST:		ERROR SCORE PRETEST: POSTTEST:	
TOTAL SCR.	TOTAL SCR.	TOTAL SCR	TOTAL SCR	TOTAL SCR	TOTAL SCR.	TOTAL SCR.	TOTAL SCR.	TOTAL SCR	TOTAL SCR	TOTAL SCR.	TOTAL

deviations received a score of three. Each deviation resulted in the loss of one point from the total score for that child. Points scored for the form score were as follows: 3=good, 2=fair, 1=poor (Hughes, 1979, p. 13). The error score was accumulative, and an error mark was put down for each time that the child touched or got off the equipment during the performance of each skill. The error score recording was scored as follows: three points for no error, two points for one error, one point for two errors, and zero points for three or more errors. The total form and error scores were added for all the static balance skills, and likewise for the dynamic balance. These totaled scores were recorded on the worksheet.

After the three groups were pretested, the researcher randomly assigned the groups to Control, Experimental I, and Experimental II. The Experimental Group I practiced the same dynamic balance skills used for the pretest. The Experimental Group II practiced the same static balance skills used for the pretest. The Control Group participated in an unrelated recreational activity. This recreational activity was arts and crafts, and included 18 projects. The three groups practiced the skills in 30 minute sessions, three times a week for six weeks. The Experimental Groups were divided into subgroups of three and each subgroup practiced each skill six times during each session. This resulted in each child practicing each skill 108 times throughout the six weeks.

After the six-week practice ended, the author posttested the three groups. Experimental Group I was posttested on the same static balance skills used in the pretest, Experimental Group II was posttested on the same dynamic balance skills used in the pretest, and the Control Group was posttested on both the static and dynamic skills. The testing procedures for the posttest were exactly the same as for the pretest. The posttest scores were recorded on the same worksheet as the pretest scores.

Statistical Analysis

Since this study involved a pretest and posttest situation, the approach selected for determining the statistical significance of pretest-posttest change was a two by two analysis of variance for repeated measures. This form of analysis concentrates on whether the difference between the pretest and posttest means of the

Experimental Group is significantly different than the difference between the pretest and posttest for the Control Group.

If a significant F-ratio was found at the 0.05 significance level for the interaction effect, the Newman-Keuls multiple range test was used to determine where the significant mean differences occurred.

CHAPTER IV

RESULTS AND DISCUSSION

Results

A two-by-two analysis of variance for repeated measures was used to treat the data gathered in the study. The dependent variables were the balance beam, tire(s), ladder, and total scores. The occasions on which the measure of the dependent variable was administered (pretest and posttest) were considered as one factor in the analysis of variance, and the experimental and control treatments were the other factor. In this analysis, the marginal means for the groups were considered ignoring time (group variance), the marginal means for the time were considered ignoring groups (time variance), and the interaction variance (GxT) was determined. A statistically significant F-ratio for the interaction effect would indicate that the pretest-posttest difference for the Experimental Group was reliably greater or less than for the Control Group. If this occurred, the null hypothesis was rejected.

The results of the data analysis are presented as follows:

1) Transfer from dynamic to static balance
   a) Beam analysis
   b) Tire analysis
   c) Ladder analysis
   d) Total score analysis
2) Transfer from static to dynamic balance
   a) Beam analysis
   b) Tire analysis
   c) Ladder analysis
   d) Total score analysis

<u>Transfer From Dynamic to Static Balance</u>

The Experimental and Control Groups were pretested and posttested on static balance and the Experimental Group practiced the dynamic balance program. A significant difference between the groups in the posttest would suggest that transfer has occurred from dynamic to static balance.

The four dependent variables were the beam, tire, ladder, and total scores.

Beam Analysis (see Table 3). This analysis shows that the marginal mean for the Experimental Group was significantly different from the Control Group (ignoring time), and the marginal mean for the pretest was significantly different from the posttest (ignoring group). The interaction effect (GXT) was, however, not significant and therefore no transfer effects occurred from dynamic to static balance on the balance beam.

Tire Analysis (see Table 4). The analysis indicates that the marginal mean for the Experimental Group was significantly different from the Control Group (ignoring time). Neither the marginal means for the times (ignoring groups) nor the interaction effect (GXT) were significant. Therefore, no transfer from dynamic to static balance on the tire was indicated.

Ladder Analysis (see Table 5). The analysis shows that the marginal mean for the Experimental Group was significantly different from the Control Group (ignoring time), but the marginal means for the times (ignoring

TABLE 3

BALANCE BEAM ANALYSIS FOR TRANSFER
FROM DYNAMIC TO STATIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	2.83	4.13	3.56
Posttest	3.42	5.53	4.59
Marginal Means	3.12	4.83	4.07
N	12	15	27

Analysis of Variance

Source	SS	d.f.	MS	F
Group	38.91	1	38.91	10.26**
Error	94.79	25	3.79	
Time	13.11	1	13.11	9.86**
G X T	2.22	1	2.22	1.67
Error	33.26	25	1.33	

** Significant at the 0.01 level

TABLE 4

TIRE ANALYSIS FOR TRANSFER FROM
DYNAMIC TO STATIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	1.83	3.93	3.00
Posttest	1.42	4.80	3.30
Marginal Means	1.62	4.37	3.15
N	12	15	27

Analysis of Variance

Source	SS	d.f.	MS	F
Group	100.22	1	100.22	22.45**
Error	111.59	25	4.46	
Time	0.68	1	0.68	0.38
G X T	5.49	1	5.49	3.10
Error	44.32	25	1.77	

** Significant at the 0.01 level

TABLE 5

LADDER ANALYSIS FOR TRANSFER FROM
DYNAMIC TO STATIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	4.33	5.33	4.89
Posttest	4.25	5.73	5.07
Marginal Means	4.29	5.53	4.89
N	12	15	27

Analysis of Variance

Source	SS	d.f.	MS	F
Group	20.55	1	20.55	7.92**
Error	64.92	25	2.60	
Time	0.33	1	0.33	0.41
G X T	0.78	1	0.78	0.96
Error	20.26	25	0.81	

** Significant at the 0.01 level

group) were not significant. The interaction effect was also not significant. This analysis found that no transfer from dynamic to static balance on the ladder occurred.

<u>Total Score Analysis</u> (see Table 6). In the total score analysis the marginal mean for the Experimental Group was significantly different from the Control Group (ignoring time), and the marginal mean for the pretest was significantly different from the posttest (ignoring group). The interaction effect (GXT) was also significant, which indicates that there were significant differences among the four means in the design. A post-hoc test (the Newman-Keuls multiple range test) was used to compare the pairs of means in order to determine which means differ from one another. This test indicated that the following pairs of means were significantly different from one another:

9.00 vs. 13.40

9.00 vs. 16.07

9.08 vs. 13.40

9.08 vs. 16.07

13.40 vs. 16.07.

Therefore, the Experimental Group showed significant transfer effects from the pretest to the posttest. It can

TABLE 6

TOTAL SCORE ANALYSIS FOR TRANSFER
FROM DYNAMIC TO STATIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	9.00	13.40	11.44
Posttest	9.08	16.07	12.96
Marginal Means	9.04	14.73	12.20
N	12	15	27

Analysis of Variance

Source	SS	d.f.	MS	F
Group	431.93	1	431.93	17.84**
Error	605.32	25	24.21	
Time	25.21	1	25.21	8.07**
G X T	22.25	1	22.25	7.12*
Error	78.12	25	3.12	

* Significant at the 0.05 level
** Significant at the 0.01 level

hence be concluded that the dynamic balance practice produced significant transfer from dynamic to static balance. The amount of transfer is given by the following formula using gain scores for each subject (gain score = posttest minus pretest score):

$$\frac{\text{exp. grp.} - \text{cont. grp.}}{\text{exp. grp.} + \text{cont. grp.}} \times 100 = \frac{2.67 - 0.83}{2.67 + 0.83} \times 100 = 53\%.$$

Transfer From Static to Dynamic Balance

For this analysis the Experimental and Control Groups were pretested and posttested on dynamic balance and the Experimental Group practiced static balance. Therefore, any significant difference at the posttest could be attributed to transfer effects from static to dynamic balance. The four dependent variables were beam, tire, ladder, and total scores.

Beam Analysis (see Table 7). The group marginal means (ignoring time) were significantly different from one another. The time marginal means (ignoring group) were not significantly different from one another. The interaction effect (GXT) was also not significant, and therefore no

TABLE 7

BALANCE BEAM ANALYSIS FOR TRANSFER FROM STATIC TO DYNAMIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	3.42	4.86	4.19
Posttest	3.42	5.50	4.54
Marginal Means	3.42	5.18	4.37
N	12	14	26

Analysis of Variance

Source	SS	d.f.	MS	F
Group	40.12	1	40.12	8.64**
Error	111.44	24	4.64	
Time	1.34	1	1.34	4.21
G X T	1.34	1	1.34	4.21
Error	7.61	24	0.32	

** Significant at the 0.01 level

transfer was found from static to dynamic balance on the balance beam.

<u>Tire Analysis</u> (see Table 8). The marginal mean for the Experimental Group was found to be significantly different from the Control Group (ignoring time). The marginal means for time (ignoring group) were found not to be significant, nor was the interaction effect (GXT). Therefore, no transfer was indicated from dynamic to static balance on the tire(s).

<u>Ladder Analysis</u> (see Table 9). The marginal means for the groups (ignoring time) were significantly different from one another. The means for the times as well as the interaction effect were not significant. No transfer was shown to have occurred from dynamic to static balance on the ladder.

<u>Total Score Analysis</u> (see Table 10). In this analysis both the marginal means for the groups (ignoring time) and the marginal means for the times (ignoring group) were found to be significantly different. The interaction effect was not shown to be significant, and therefore no

TABLE 8

TIRE ANALYSIS FOR TRANSFER FROM
STATIC TO DYNAMIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	2.08	4.07	3.15
Posttest	2.25	4.86	3.65
Marginal Means	2.17	4.46	3.40
N	12	14	26

Analysis of Variance

Source	SS	d.f.	MS	F
Group	68.22	1	68.22	10.93**
Error	149.80	24	6.24	
Time	2.93	1	2.93	2.93
G X T	1.24	1	1.24	1.24
Error	24.01	24	1.00	

** Significant at the 0.01 level

TABLE 9

LADDER ANALYSIS FOR TRANSFER FROM
STATIC TO DYNAMIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	3.42	5.00	4.27
Posttest	3.67	5.50	4.65
Marginal Means	3.54	5.25	4.46
N	12	14	26

Analysis of Variance

Source	SS	d.f.	MS	F
Group	37.71	1	37.71	7.72*
Error	117.21	24	4.88	
Time	1.82	1	1.82	1.56
G X T	0.20	1	0.20	0.17
Error	27.88	24	1.61	

* Significant at the 0.05 level

TABLE 10

TOTAL SCORE ANALYSIS FOR TRANSFER
FROM STATIC TO DYNAMIC BALANCE

	Means		
	Control Group	Experimental Group	Marginal Means
Pretest	8.67	13.93	11.50
Posttest	9.33	15.86	12.84
Marginal Means	9.00	14.89	12.17
N	12	14	26

Analysis of Variance

Source	SS	d.f.	MS	F
Group	448.76	1	448.76	10.94**
Error	984.18	24	41.01	
Time	21.76	1	21.76	5.95*
G X T	5.14	1	5.14	1.41
Error	87.80	24	3.66	

* Significant at the 0.05 level
** Significant at the 0.01 level

transfer from dynamic to static balance was indicated in the total score analysis.

The results for dynamic to static balance showed no significant evidence of transfer for any of the dependent variables in this analysis.

Discussion

Two hypotheses were tested in this study concerning the effects of learning in EMH individuals. The first hypothesis states:

> There would be no significant difference in the posttest scores of static balance skills between EMH children who practice tasks involving dynamic balance and those who practice unrelated recreational tasks.

The Experimental Group I (which engaged in the dynamic balance program) did not perform significantly better in static balance skills than the Control Group in three out of four dependent variables. This is shown by the non-significant F-values for the interaction effect (G X T) in Tables 3-5. The hypothesis for the above three variables was therefore accepted. However, a significant F-value was found in the interaction effect for the dependent variable of total score (Table 6), and so the hypothesis was rejected in this case.

The results of the study show for the first three dependent variables (beam, tire, ladder scores) that the practice of dynamic balance skills is not an important factor for increasing the score in the performance of static balance skills. However, when all of the scores for each specific variable were added and the total score was analyzed (fourth dependent variable), the results indicated that practicing a dynamic balance program is an important factor for increasing the score on the general performance of static balance skills. The analysis using this variable suggests that a transfer of 53% was found from dynamic to static balance. The results of the study concerning the above hypothesis are therefore divided. Three out of four dependent variables, in general, support the findings of Minsky, Spitz, and Bessellieu (1986), Turnure and Thurlow (1973), and Whittemore and Bilsky (1979), which state that EMH children have trouble transferring recently learned skills to new situations. On the other hand, the results obtained from the total score variable support the findings of Clarke et al. (1961, 1962, 1964, 1966), Smith and Tunick

(1969), and Borkowski and Varnhagen (1984), which state that EMH children can transfer recently learned skills to new situations. It is important to note two points: First, the results from the total score variable were more significant and sensitive to interpretation, since the scales for the three individual variables were very small; Secondly, the above studies were used for comparison only in very general terms. These studies are not closely related to the type of skills investigated in this thesis research and neither are the circumstances or times spent on the treatment. The author was not able to find any past study which could be directly compared to the research in this thesis.

The second hypothesis states that:

> There would be no significant difference in the posttest scores of dynamic balance skills between EMH children who practice static balance tasks and those who practice unrelated recreational tasks.

The non-significant F-values obtained from the G X T interactions (Tables 7-10) indicate that the Experimental Group II (who engaged in the static balance program) did not perform significantly better in the dynamic balance skills than the Control Group did for any of the dependent variables. Therefore the above hypothesis was accepted for all of the dependent variables used. These results differ from those found by Clarke et al. (1961-1966), Sen and Patnaik (1973) and Bhalla and Sen (1975), where they concluded that EMH individuals could transfer learned information to new situations. These results agree with those of Smith and Tunick (1969), and Basselieu (1986).

CHAPTER V

CONCLUSIONS

Summary

The purpose of this study was to investigate the possible transfer of learning from dynamic balance to static balance skills and from static balance to dynamic balance skills among educable mentally handicapped children.

The subjects for this study included 41 retarded males and females at the educable level (EMH) from the city school system of Durham, NC. The IQ of these children ranged from 50 to 75, with the chronological age range of six to 15 years. Before each of the subjects was included in the study, a signed permission letter was collected from his/her parents.

A pretest-posttest design with three groups was used: The Control Group, and Experimental Groups I and II. The tests used were slightly modified from the Hughes Basic

Gross Motor Assessment test (1979), and the subjects were evaluated on a balance beam, on tires, and on a ladder placed horizontally on the floor. The Control Group was pretested and posttested on both dynamic and static balance, and practiced arts and crafts in-between. The Experimental Group I was pre- and posttested on static balance and practiced dynamic balance while Experimental Group II was pre- and posttested on dynamic balance and practiced static balance in-between. All subjects were administered the tests individually and under very similar circumstances. The pre- and posttest performances were videotaped and scored by the researcher. The analysis of variance for repeated measures was used to analyze the data for possible significant transfer effects.

Findings

The data collected in this study led to the following findings:

1. A significant difference was found in the total score variable at the posttest between the Control Group and Experimental Group I. However, there was no significant difference in

the posttest static balance scores between the Control Group and Experimental I for the other three dependent variables.

2. There was no significant difference in the posttest scores in dynamic balance between the Control Group and Experimental Group II for any of the dependent variables evaluated.

Conclusions

Based on the findings and limitations of this study, the following conclusions were reached:

1. Educable mentally handicapped children could have a general improvement in static balance by practicing dynamic balance skills.
2. Educable mentally handicapped children do not increase their ability to maintain dynamic body balance by practicing static balance skills.

Recommendations

Further research in this area is recommended. The literature review showed that results and opinions are divided. While some authors have found that EMH individuals can transfer already learned skills to new situations (Smith and Tunick, 1969, and Borkowski and Varnhagen, 1984), some other ones have not (Turnure and Thurlow, 1973, and Bassellies, 1986). When transfer of learning has been mastered by the EMH group, it has been under specific and limited circumstances. The same statement is true for the non-retarded population. The confusion in positive and negative results lies in the lack of standardized norms under which to conduct the studies. Before the researchers can agree with results from studies and generalizations can be made, a standardized procedure must be established. These procedures should include population (institutionalized vs. non institutionalized), the similarities and differences existing between the transferable skills, and the length and variability of the treatment.

There is a need for further research in the area of transfer of learning with mentally retarded populations, especially in the motor area. The author was unable to find a single previous investigation where transfer effects on motor skills were related to balance. It is very important to investigate transfer of learning in educational settings with the mentally disadvantaged because, except for the first months of life, new learning problems are usually solved in terms of previously acquired knowledge and strategies (McGoech and Iron, 1952).

A careful selection of the tasks involved in an experiment of transfer of learning must be done. As Smith and Young (1987) suggested, similarities and differences among tasks which do and do not transfer to each other must be evaluated before a study is conducted.

Transfer of learning studies involving mentally retarded individuals need to include larger numbers of individuals so results can be generalized.

In general, further research is recommended in the transfer of learning area to cover the unanswered questions and to tie the loose ends of experiments related to this topic. Much is still unknown about what causes transfer of learning in both normal and retarded individuals. Since the overriding goal of any study done with mentally handicapped individuals is to provide the training needed for them to become productive and independent members of our society, the phenomenon of transfer of learning will continue to be an important topic for future research.

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