THE RELATIONSHIP OF AGE INTERVAL AND SIBLING DYAD COMPOSITION ON THE PERFORMANCE OF SELECTED MOTOR TASKS

By

DIANE C. TUNNELL

Bachelor of Science
Northeastern Oklahoma State University
Tahlequah, Oklahoma
1975

Master of Science
Northeastern Oklahoma State University
Tahlequah, Oklahoma
1976

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Thesis Approved:

Steve W. Mayo
Thesis Adviser

Betty Abercrombie

Lowell Caneday

John D. Hardin

Norman N. Durham
Dean of the Graduate College

DEDICATION

This dissertation is dedicated to my son, Bradley Steven Tunnell, for without his unconditional hugs and eight-year-old words of encouragement this project would not have been completed.

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CHAPTER 1

INTRODUCTION

Leading motor development researchers contend that many genetic and environmental factors influence motor skill development during early childhood (Erbaugh & Clifton, 1984). Physical growth is an example of genetic influence and sibling relationship is an example of an environmental factor (Malina, 1980). Sex-role expectations also influence the movement behavior of young children. There has been speculation about sex differences in such motor skills as kicking, throwing, catching, and skipping seen in early childhood (Ridenour, Herkowitz, Clark, Teeple & Robertson, 1978). Socialization processes are apparently responsible for many of the performance differences between young boys and girls.

Structural and physiological differences between the sexes provide powerful explanations for many of the differences in gross motor performances of adolescent males and females; however, they do not totally explain the consistent differences seen in early childhood (Herkowitz, 1978).

When one looks at the anatomical and structural differences in children ages five and six one will find there is little difference. There are virtually no differences in the weight of boys and girls between the ages of 4 and 11 (Herkowitz, 1978). Boys and girls between two and six years of age also show few differences in the proportional growth of the body segments which should account for differences in performance.

The height and weight growth characteristics of boys and girls in elementary schools provide little explanation for their differences in physical skills (Herkowitz, 1978).

Something other than anatomical differences must play a role in the development of particular motor skills. Society's cultural patterns and sex-role expectations have associated certain skills to certain genders (Herkowitz, 1978). Males have been characterized as better in skills such as throwing, kicking and catching, while girls tend to excel in areas less aggressive such as hopping, skipping, and balancing. Socialization processes begin playing a very important role from the moment the child is brought home from the hospital. It was concluded by Goldberg and Lewis (1969) that as early as one year of age, males spend significantly more time in gross motor activities than females. This is probably due to society's cultural patterns.

It has also been determined through previous research that many learning behaviors have been acquired by imitating peers, siblings, and other symbolic models (Thomas, Pierce & Risdale, 1976). East and Hensley (1982) concluded that kindergarten children were most influenced by the parent of the same sex.

Older siblings may also influence the motor development of younger children in particular skills. A study was conducted by Erbaugh and Clifton (1984) with regard to sibling relationships of preschool age children and gross motor skills, they found that the older sibling would usually initiate the task, while the younger sibling would usually imitate the performance of the older sibling. In addition, the younger male sibling of the mixed dyad imitated his older sibling twice as often as the other sibling dyads. Hall and Lee (1981) did a study showing

the relationship of sex and birth order with respect to children's goal setting and actual performance. Their results indicated that the first born boys performed better on the gross motor task of ring tossing than first born girls or later born children of either sex. However, they did indicate that there was little literature at that time indicating how sex and birth order interact to affect the motor performance of young children.

Since an older sibling can be a major social influence, the sex of the older sibling may determine which skills are practiced. Studies done by Abramovitch, Corter, and Pelper (1980), showed several factors that also influenced social development. These were: age within a dyad, sex composition of the dyad, sex of the individual, and age interval of the dyads. The research done in the area of motor development and sibling relationships indicates that there are definite influences from older siblings, but the extent of these influences is not totally known or understood. Most of the research has focused on sibling interaction in the home or play environment and dealt with social behaviors. Little research has been done in the area of gross motor skills.

Statement of the Problem

The purpose of this study was to see if there was a relationship in composition of sibling dyads on the performance of selected gross motor skills.

1. The first subproblem was to determine the relationship between dyad composition at three different age intervals with respect to motor skill development.

A. Older male - younger male: twelve to thirty, thirty-one to fifty-four, and fifty-five or more months apart.

B. Older male - younger female: twelve to thirty, thirty-one to fifty-four, and fifty-five or more months apart.

C. Older female - younger male: twelve to thirty, thirty-one to fifty-four, and fifty-five or more months apart.

D. Older female - younger female: twelve to thirty, thirty-one to fifty-four, and fifty-five or more months apart.

2. The second subproblem was to determine if dyad composition and age interval within the composition had an effect on the performance of selected gross motor skills.

Hypotheses

The following hypotheses were tested at the .05 level of significance. Each of the stated hypotheses was examined to see if there was a relationship between dyad composition and three different age intervals among the dyads. It was hypothesized that:

1. There are no significant differences between the means for the same-sex and mixed-sex dyads on the Modified Hughes Basic Gross Motor Assessment scores.

H_0: $\mu ss = \mu ms$ ss = same-sex dyad

H_1: $\mu ss \neq \mu ms$ ms = mixed-sex dyad

where H_0 is the null hypothesis

H_1 is the research hypothesis

2. There are no significant differences between means for the genders on the Modified Hughes Basic Gross Motor Assessment scores.

H_0: $\mu m = \mu f$ m = younger male sibling

H_1: $\mu m \neq \mu f$ f = younger female sibling

3. There are no significant differences among the means of the groups which compose the age intervals on the Modified Hughes Basis Gross Motor Assessment scores.

H_0: $\mu 1 = \mu 2 = \mu 3$ 1 = age interval 12-30 months

H_1: $\mu 1 \neq \mu 2 \neq \mu 3$ 2 = age interval 31-54 months

3 = age interval 54+ months

4. There are no significant differences in interaction among the factors of gender, age, and dyad composition.

H_0: $\mu ij = \mu g$ ij = row and columns

H_1: $\mu ij \neq \mu g$ g = group/population

5. There is no significant correlation on the prediction of the mean scores on the Modified Hughes Basic Gross Motor Assessment and Hughes Basic Gross Motor Assessment.

H_0: $rmh = rh$ mh = Modified Hughes

H_1: $rmh \neq rh$ h = Hughes Basic

Delimitations

This study was delimited by the following:

1. A panel of experts was consulted to establish the validity of two subtests of the Hughes Basic Gross Motor Assessment.

2. Only first year kindergarten students ages five years, zero months to six years, five months, who have only one older sibling in their immediate family were used in this study.

3. The researcher used a Modified Hughes Basic Gross Motor Assessment to test the children.

4. The study was conducted in Stillwater, Perry, and Pawnee Public Schools.

5. Only students who have no known motor dysfunctions were included in the study.

6. The subjects were tested within the first semester of the 1986-87 school year.

Limitations

1. The subjects were not randomly selected for this study.

2. There was no control on influences such as environment, parental sibling or peer influences.

Assumptions

The following basic assumptions were accepted:

1. Students will perform to the best of their ability on all tests.

2. Students will be able to physically perform the skills required as explained and demonstrated by the tester.

Definitions

In order to understand the terms used in this study, the following definitions are provided.

Dyad. "Two persons in a continuing relationship in which they interact upon each other" (Guralnik, 1978, p. 436). For this study, the two relating persons must be immediate family siblings.

Fundamental movement pattern. "Observable performance of basic locomotor, manipulative, and stablizing movements" (Gallahue, 1982, p. 16).

Motor skill. The ability to perform to a level of proficiency on certain tasks that are characterized by age and basic abilities. It encompasses sensory integrative and decision making processes (Gallahue, 1982).

Modified Hughes Basic Gross Motor Assessment. This test contained all of the original tests of the Hughes Basic Gross Motor Assessment that were to be used for kindergarten children plus two more subtests: overhand throwing at a distance of 15 feet and jumproping.

CHAPTER 2

REVIEW OF LITERATURE

The learning and refinement of skillful performance in motor activities is one of the major developmental tasks undertaken during childhood (Malina, 1980). Research has shown that many factors play a part in the development of fundamental gross motor skills. Both genetic and environmental factors have major roles and it is hard to separate one from the other. Genetic factors include body size, gender, and age. Environmental factors include child rearing practices, sex differences in siblings, socialization processes, birth order, and personality (Malina, 1980).

The purpose of this study was to see if there was a relationship between dyad composition and the acquisition of certain gross motor skills. This review includes: (a) genetic factors including body size, gender, and age, (b) environmental factors including child rearing practices, socialization processes, birth order, sex differences in siblings, and sibling interaction, and (c) fundamental motor patterns of kindergarten age children including hopping, skipping, throwing, catching, and balancing.

Genetic Factors

Fundamental motor skills that appear during infancy and early childhood develop sequentially and in a uniform pattern, but the rate of

their development varies from child to child (Gallahue, 1982; Malina, 1980). Variation in the rate of motor development may be due to many factors that occur within the biological framework of the individual. These factors may include body size, gender, and age. A study conducted in 1942 by Vickers, Poyntz and Baum indicated a greater similarity in motor performance behaviors of siblings and twins than the behaviors of unrelated children (Malina, 1980). This is significant since the similarities of motor performance of siblings and twins could be attributed to similar physical characteristics and close proximity of age. Body size, physique, and composition have been shown to have some relationship to the development of motor skills.

Early childhood, two to six years of age, is an important phase of growth and development. By the time children end their kindergarten school year they should have developed most of the fundamental motor patterns they need to build a foundation for more complex motor skills (Corbin, 1980; Gallahue, 1982). At this age both boys and girls are approximately the same height and weight, although boys tend to be slightly taller and have more muscle mass than girls of the same age (Corbin, 1980; Gallahue, 1982; Herkowitz, 1978). During the kindergarten year few differences are shown in the proportional growth of their body segments which would account for motor performance differences (Herkowitz, 1978). In a related study, Walker (1962) compared the behavior of mesomorphic boys and girls. Although similar in physique, the mesomorphic girls tended to channel their activities into social areas while the boys channelled their energies into more gross motor activities. The physiological differences in early childhood are quite small and provide minimal explanation for the differences that exist in physical skills

at the same age period. It is true that structural and physiological factors can contribute slightly to differences in gross motor performance, but a more dominate factor, one of several environmental factors, seems to be that of the socialization processes of children.

Environmental Influences

The environment in which a child finds himself or herself is a major consideration for his or her future development (Singer, 1973). A child's environment is a vast network of factors which interrelate and seem to have a bearing on his or her development. The child's family, siblings, and peer groups all play a vital role in molding the child's later years. Within each of the above mentioned substrates a child must have the ability to function and adapt. This ability to function and adapt will affect his or her gross motor performance.

Child Rearing Practices

Several studies have examined how the family affects a child's motor development. The family is probably the first and foremost socialization factor the child will know in the early years of life. The family has an enormous influence on the child's development of physical skillfulness and attitudes regarding motor activities (Herkowitz, 1980). The amount of physical control and physical mobility the parents allow is apparently influential in the acquisition of motor skills between the ages of two and six years (Herkowitz, 1980).

Fling and Manosevitz (1972) demonstrated that parents discourage boys more than girls in cross sex play activities. Herkowitz (1978) found that a parent of the same sex as the child encourages more sex-

typing of activities than a parent of the opposite sex. She found that boys were encouraged to play more with toys that required more gross motor involvement while girls were encouraged to engage in more quiet and less physical activities. Goldberg and Lewis (1969), watching the interaction of 13-month old boys and girls with their mothers, found that as early as one year of life, boys spend more time in gross motor activities while girls of the same age spend more time in fine motor activities. They also determined that boys are more vigorous in their play while girls show more dependent behavior and are quieter in their play. They believed that since parents are predominately responsible for the socialization processes of their children, parental behavior acquires a reinforcement value which influences a child to behave in a manner that will result in reward from the parents. Schnabel-Dickey (1977) analyzed the effects of child-rearing attitudes on the performance of jumping and throwing tasks of preschool children. The Maryland Parent Attitude Survey was used to measure general child-rearing attitudes displayed by the parents and the motor tests of jumping and throwing were administered to children between the ages of three and five years. Her results indicated that throwing skill was most often negatively correlated to maternal disciplinarian attitudes and positively correlated to mothers' indulgent and protective attitude. Jumping was positively correlated in maternal disciplinarian attitudes. She concluded that mothers played a more dominant role than fathers in the motor development of their preschool children.

Socialization Processes

Greendorfer and Lewko (1978) studied the influence of parents and peers on siblings and found that parents, especially fathers, were the most significant influencing agent upon the sport socialization of the child. East and Hensley (1982) studied the socialization influences upon the overhand throwing performance of kindergarten through third grade males and females and concluded that the children were most influenced by the parent of the same sex. Greendorfer (1980) concluded in a study done with regard to toys and play behavior that parents tended to lead females away from activities that relied heavily on competition and aggression.

These studies tended to show that the parental influence on the child in early life may tend to mold the child's attitudes for certain activities.

Berndt and Bulleit (1985) studied the interactions of preschoolers and their peers at school and home in regard to sibling status. They indicated that children's behavior towards their siblings might be expected to differ from their behavior towards their peers because patterns of social behavior are strongly affected by the age of the interacting children. They found that preschoolers with older siblings were more aggressive and prosocial in their behavior at home than children with no older siblings.

Birth Order

A child's position in the family in relation to birth order is also another factor that will influence motor development (Malina, 1980). Some data suggest that first born children perform slightly better on

motor tasks earlier in life than their younger siblings (Bayley, 1965; Malina, 1980; Solomons & Solomons, 1964). They concluded that this was generally related to a greater maternal indulgence and stimulation of first born children as compared to later born children. Clark, Wyon, and Richards (1969), in a study describing play behavior of nursery children, indicated that first born children spent more time alone and engaged in more non-specific play activities than younger siblings.

Minnett, Vandell, and Santrock (1983) observed seven and eight year old children with their siblings at school without their parents being present. They concluded that first born children, especially the girls, were more likely to teach and praise their younger sibling while second born children seemed more joyful (Cicirelli, 1972; Minnett et al., 1983). Koch (1955) did a study looking at the relationship of personal-social characteristics and three variables: sex of the subject, sex of the sibling, and position of the subject in a dyad. The subjects were five and six years old with the sibling being two to four years older or younger. She concluded that first born children tended to be more emotional and given to more anger and violence when experiencing defeat in competitive activities. Children from opposite-sex sibling pairs and children with an older brother were seen as more self-confident and friendlier towards other children. Koch also noted that first borns in opposite-sex pairs were rated higher in leadership qualities.

Age Interval

Age interval in dyad composition plays a role in the development of the child. Minnett et al. (1983) noted that siblings spaced less

than two years apart are more likely to possess similar abilities and share common interests than siblings spaced three to four years apart. They also saw more aggression displayed with close spaced siblings while widely spaced siblings displayed more affection and positive behavior toward each other. Cicirelli (1975) found that younger siblings showed a greater tendency to accept direction when the other sibling was four years older rather than two.

Abramovitch, Corter, and Lando (1979) observed same-sex dyads in the subject's home for two one-hour periods to see what interactions took place. The younger sibling was approximately 20 months old and the age interval between siblings was either (a) one to two years or (b) two years five months to four years. In their results they concluded that the males were more physically aggressive than females, younger siblings imitated their older siblings more often, and the interval between siblings had little effect on the amount of interaction. They also found that the older girls were more often likely to engage in nurturant behavior and seemed to act like "little mothers" (1979, p. 1001). They found no difference or effect of interval between dyads or sex. Children imitated their older siblings just as much when they were only a year older or three years older. The most dramatic conclusion of the study was that across all behaviors, interval had almost no effect on the patterning of interactions. They were not able to find any appreciable difference with regard to spacing of the siblings.

Sex Differences in Siblings

Many young children spend the majority of their early childhood years in the company of their siblings and by doing so they often acquire

their first exposure to social experiences with other children (Abramovitch, Corter & Pelper, 1980; Dunn & Kendrick, 1981). No doubt there are effects due to sibling interaction but the extent and the importance of the effects of interaction have not been studied systematically (Dunn & Kendrick, 1981). Their studies with siblings have pointed out some new perspectives in the areas of developmental and social communications, however they indicated additional research needed to be conducted.

Evidence for sex differences in young children's behavior toward their siblings is conflicting. In Lamb's (1978) study, older female siblings directed more social behavior towards infant siblings than older males, but first born males touched their younger siblings more than first born females. Dunn and Kendrick (1981) found no sex differences among older male or female siblings towards their younger counterparts.

In 1980, Abramovitch et al. conducted another study using mixed-sex dyads. They used the same variables with the younger sibling averaging twenty months of age and the interval of the siblings being either one to two years (noted as small) or two years five months to three years five months (noted as large). The results of this study were quite similar to their previous one. Older siblings were more likely to initiate antagonistic behavior and younger siblings in both dyad compositions were more likely to initiate imitative behavior. In both studies, girls were more prosocial than boys. The only major difference they found in the two studies was that in the same-sex dyads the older boys were more physically aggressive than the older girls. However, no significant sex differences on any measure of aggression were found in the mixed-sex

dyads. As seen in other studies, this study showed that age interval did not influence or affect interaction.

Sibling Interaction

Thus far it has been seen that a sibling can make some difference in the child's attitude and the way he or she plays. Evidence shows that sibling interaction is qualitatively different from parent, child, and peer interaction (Cicirelli, 1975; Minnett et al., 1983). Sibling interaction will also vary widely with birth order, sex of child, sex of sibling, and age spacing between siblings (Minnett et al., 1983).

Much of the research on sibling interaction has been conducted with both siblings being under the age of five. Research is needed to determine how siblings affect a child's gross motor performance in kindergarten.

Erbaugh and Clifton (1984) conducted a study titled "Sibling Relationships of Preschool-Age Children in Gross Motor Environments." Their research described behaviors and interactions of preschool age siblings in two gross motor environments. Their conclusions were: (a) younger siblings usually watched older siblings perform tasks longer than older siblings would watch young siblings, (b) younger siblings did not work as long on tasks as older siblings, and (c) younger males of mixed dyads imitated their older siblings twice as often as younger siblings of other groups. In this study, as with Abramovitch et al., age interval between the siblings failed to influence sibling movement behaviors and interactions.

Fundamental Motor Skills of Kindergarten Children

Research has shown that the preschool years are the years of most rapid growth in the physical and intellectual development of an individual and that the environment plays an important role in the shaping of the child (Hottinger, 1980). It is during this period that motor development experts place great emphasis on the development of fundamental motor patterns (DeOreo & Keogh, 1980). Experiences provided during these years are the primary factors affecting the acquisition of mature motor patterns (East, 1983). Children should begin to learn fundamental motor tasks in early childhood and continue to refine them through the elementary years. When looking at the development and refinement of certain motor tasks we see that there is definitely a developmental sequence taking place (DeOreo & Keogh, 1980).

Hopping and Skipping

Girls perform better than boys on skills that seem to require basic footwork tasks such as hopping on one foot or skipping (DeOreo & Keogh, 1980). Even though both boys and girls are usually skipping and hopping by the time the child reaches age five or six, studies have shown that girls are more graceful and perform better (DeOreo & Keogh, 1980). A study conducted by Caroline Sinclair (1971), "Movement and Movement Patterns of Early Childhood," noted similar results in the areas of skipping and hopping. Sinclair noted that girls outscored boys at age five in hopping and skipping but not at age six. Keogh (1970) found similar results for hopping. Keogh concluded that girls performed better at all ages, but that there was little discrepancy in performance between the ages for five and six years.

Throwing

In the area of throwing, Espenschade (1960) studied the throwing patterns of children from ages five through seventeen years. This study showed that at all ages the boys threw further than the girls. Morris et al. (1982) also concluded that boys were superior to girls at all ages in throwing for distance. These tests did not consider the accuracy of throwing. Some studies tested accuracy and the results indicated that boys still performed better than girls at all age levels (DeOreo & Keogh, 1980; Wickstrom, 1970). In Sinclair's (1971) study, boys outscored girls at both ages five and six in the area of throwing.

Catching

Children's proficiency in catching seems to develop at a slower rate than for throwing (Wickstrom, 1970). Testing for catching has proven to be quite difficult due to the variables involved such as size of ball, distance from thrower, and method of throwing (Wickstrom, 1970). Hoadley (1941) conducted a test for catching using a throwing machine and balls of three different sizes. She concluded that at the first grade level there were no significant sex differences in catching balls of any size (Hoadley, 1941). But Singer (1973) states that research has shown that boys ages five to seven perform better than girls of the same age on catching tests. Morris et al. (1982) support this conclusion. In their study, boys performed slightly better than girls from ages three to six.

Balancing

Tests for balance performance have proven difficult to measure in the past. The body responds to several different types of balance and the complexity of studying a specific aspect is often difficult (DeOreo & Keogh, 1980). Morris et al. (1982) concluded that girls were by comparison better than boys in the balance tests at age six. Cratty and Martin (1969) in an earlier study concluded similar sex differences in static balance as early as age five.

Summary

This review of literature examined selected genetic and environmental factors that could influence children's gross motor performance. The literature indicates that while there are structural and anatomical differences in children five and six years old, these differences play a minimal role in explaining motor performance differences. It is hard to make any conclusions in this regard since few studies have compared the physical components of children under the ages of seven or eight years.

The literature indicated that the social network of the child plays a significant role in gross motor skills performance. Parents, peers, and siblings all influence the child's attitude for play behavior and activities in which he or she chooses to participate. Research in the area of sibling interaction among kindergarten children with respect to spacing, dyad composition, and performance on gross motor skills was somewhat limited and many times the results were inconclusive. Little research has been done in the area of gross motor skills with kindergarten children. More research is needed to see if there is a

relationship in composition of sibling dyads on the performance of gross motor skills.

CHAPTER 3

METHODS AND PROCEDURES

Introduction

The purpose of this study was to see if there was a relationship in sibling dyad composition and the performance on selected motor skills. It was also the purpose of the study to see if dyad composition and age interval within the composition had an effect on the performance of selected gross motor skills.

The procedures were divided into two sections: (a) preliminary procedures, and (b) operating procedures. The preliminary procedures were (a) selection of subjects, (b) selection of an instrument, and (c) selection of a panel of experts. The operational procedures consisted of the collection of data and the treatment groups.

Preliminary Procedures

Selection of Subjects

The subjects selected were first year kindergarten students in the Stillwater, Pawnee, and Perry Public Schools. The subjects were deliberately selected from school records of family history with the following criteria: (a) only two siblings per immediate family, and (b) the younger sibling was a kindergarten student. The parents were sent a consent form (see Appendix A) to sign for student participation.

This form included a brief statement explaining the proposed research project and some personal data to be filled out and signed if the parent consented to the student participating in the research project. Seventy-six students participated in the study.

Selection of Instrument

The Hughes Basic Gross Motor Assessment tool was used in the study and can be found in Appendix B. It is an evaluation tool designed to yield information about gross motor performance and strength of children ages six to twelve years believed to have minor motor deficiencies (Hughes, 1975). It was selected because it had developmental considerations and performance expectations based on observations of a large population of normal children ages five to twelve years. It also had validity/reliability data based upon principles of measurement, standard procedures, a scoring system which considered the quality of movement, a minimum of equipment required, and a reasonable length of time to complete individual evaluations. There were two subtests deleted from the original assessment since they pertained to students older than kindergarten age and two other tests were included that the researcher felt were necessary to have a complete assessment of the students.

The Hughes Basic Gross Motor Assessment contains six specific subtests for kindergarten age children: (1) static balance, (2) tandem walk, (3) hopping, (4) skipping, (5) target throwing, and (6) ball handling skills.

The six subtests contained the following motor tasks:

1. The static balance subtest involved the child standing in the

18 inch square on one leg for 10 seconds while the opposite leg was held at a 90^{o} angle.

2. The tandem walking subtest involved the child walking forward on a taped line 10 ft long in a heel-toe fashion and then walking backward on the taped line in a heel-toe fashion.

3. The hopping subtest involved the child hopping with a taped rectangle first using the left foot for six hops and then the right foot for six hops.

4. The skipping subtest involved the child skipping from one end of the 10 ft rectangle to the other and back to the starting position.

5. The target subtest involved the child, using the underhand throwing pattern, tossing six beanbags into an 18 inch square from a distance of 6 ft.

6. The ball handling skills subtest involved the child catching a 7 inch diameter, rubber playground ball thrown directly to the child from a distance of 8 ft. The second part of this subtest had the child throwing the same ball back to the examiner with an underhand toss using two hands. This procedure was repeated six times. The third part of this subtest had the child bouncing and catching the same ball to himself or herself six times.

The two subtests that were added were (a) rope jumping, and (b) overhand throwing.

1. The rope jumping subtest involved the child turning a rope and jumping over it five times while remaining in a 24 inch square.

2. The overhand throwing subtest involved the child throwing a tennis ball using the overhand throwing pattern to the examiner from a distance of 15 ft.

A panel of experts evaluated the two subtests in order to insure their validity.

Panel of Experts

Once the two subtests were developed for testing purposes, the researcher selected a panel of experts to determine the subtests' validity. Five individuals were selected for the panel because of their expertise in the area of elementary physical education or fundamental skills analysis. All five of the individuals responded. The individuals were Dr. Steve Moyer, elementary education specialist, Oklahoma State University; Dr. Sandy Gangstead, sport pedagogy specialist, Oklahoma State University; Dennis Cyr, elementary physical education instructor, Sangre Ridge Elementary School, Stillwater, Oklahoma; Angie Cyr, elementary physical education instructor, Westwood Elementary School, Stillwater, Oklahoma; and Dr. Linda McElroy, elementary physical education instructor, Skyline Elementary School, Stillwater, Oklahoma.

Each individual was sent a letter with an evaluation form asking them to evaluate the two subtests that were added to the original test and used in collecting data. It was agreed prior to distributing the subtest that three negative responses to a criterion would warrant a change in the criterion. The panel agreed that the modified criteria for overhand throwing was acceptable but the ropejumping criteria was not specific enough and needed to be modified for a more complete description. The next step was to revise the ropejumping subtest to include suggestions from the panel. The revised evaluation form was again sent to the panel for their approval. The letter and evaluation form can be found in Appendix C.

Dr. Steve Moyer, elementary physical education specialist at Oklahoma State University, was consulted on the changes that should be made. He suggested several modifications to the criteria which were incorporated into the final version. The final revision was agreed upon by the panel and used in the study.

Operational Procedures

Collection of Data

The researcher had previously been trained in the use of the Hughes Basic Gross Motor Assessment instrument and participated in extensive use of the tool prior to the actual research project. The training included several classroom hours of studying each of the subtests and understanding the criteria and then working with students in administering the tool. Any problems that arose were discussed and solutions were found.

Students were tested individually within a large rectangle 10 ft x 18 ft which was outlined on the floor with tape. In addition, an 18 inch square, the target for one subtest, was taped at one end of the rectangle. Another 24 inch square was taped adjacent to the rectangle for the jumproping subtest (see Appendix B). The score sheet contained the eight subtests below which are found lettered deviations that the examiner was likely to observe in the child having performance difficulties. Each deviation had a value of one point. A score of three indicated that a child had performed the task without deviation. The subtests scores were added to obtain a total score.

The protocol for administration of the Hughes Basic Gross Motor Assessment was as follows:

1. The test was explained as "easy games" with no reference to the word test.

2. The examiner demonstrated to the child each task and made certain that the child clearly understood the task.

3. The students were then asked to perform the task. If the child performed incorrectly or questioned the task, the researcher explained an additional time, the student performed again and the second score was recorded. Although the child was not to repeat the task over and over, it was the examiner's obligation to elicit the child's best possible performance.

4. Comments such as "good try," "you were close," or "good work" were utilized to provide support for a child having difficulty with a particular subtest.

The researcher tested each subject individually and scored him or her according to the criteria of the research tool.

Research Design and Statistical Analysis

A comparative survey was used to determine the effects of the older sibling gender within the dyad on selected gross motor skills. Further comparisons were made considering the factor of age. The independent variables were the age interval and the gender of the older sibling. The dependent variables were the scores from the instrument that were completed by the researcher. The statistical analysis used a 3 x 2 x 2 ANOVA with age at three levels, gender at two levels, and

dyad composition (either male or female) at two levels. The level of significance that was used for this study was .05.

CHAPTER 4

RESULTS AND DISCUSSION

The purpose of this study was to see if a relationship existed in the composition of sibling dyads and age interval within the dyads on selected gross motor skills.

In order to investigate the relationship, 76 first year kindergarten children were deliberately selected from school records of family history with the criteria: (a) only two siblings per immediate family, and (b) the younger sibling was the kindergarten student. The Modified Hughes Basic Gross Motor Assessment was administered to each subject individually and the results were recorded. The results of the various subgroups were then compared to see if any differences occurred. This chapter is divided into the following sections: (a) analysis of hypothesis of data, and (b) discussion of results.

Analysis of Hypothesis of Data

Five hypotheses were tested for significance at the .05 level in this investigation. Each of the stated hypotheses was examined to see if a difference occurred between the selected groups and to see if an interaction existed within the groups.

Hypothesis 1

The first hypothesis stated that there would be no significant difference between the means for the same-sex and mixed-sex dyads on the Modified Hughes Basic Gross Motor Assessment scores. The means, standard deviations, standard error, separate T, and 2-tail probability are presented in Table 1.

Table 1

Mean Scores of Same-Sex and Mixed-Sex Dyads

Group	Mean	Standard Deviation	Standard Error	Separate T	2-Tail Probability
Female-Female[a] Dyad	30.59	4.29	1.04		
Male-Male[a] Dyad					
----------				1.71	0 .09
Female-Male[a] Dyad	28.47	5.11	0.66		
Male-Female[a] Dyad					
----------				df = 30.40	

Note. [a]Indicates sibling sex.

As noted in Table 1, there was no significant difference found between the same-sex dyad composition and the mixed-sex dyad composition.

Therefore, the first null hypothesis could not be rejected. The mean scores did not reveal a significant difference, and the standard deviations were not significantly different.

Hypothesis 2

The second hypothesis stated that there would be no significant difference between the means of the younger boys and the younger girls in each dyad on the Modified Hughes Basic Gross Motor Assessment. The means, standard deviations, pooled T, and 2-tail probability are presented in Table 2.

Table 2

Mean Scores of Younger Males and Younger Females

Group	Mean	Standard Deviation	Pooled T	2-Tail Probability
Younger males (subjects)	29.58	5.48		
			1.05	0.295
Younger females (subjects)	28.37	4.51		
			df = 67.96	

As noted in Table 2, there was no significant difference found between the younger male and younger female subjects on the mean scores

of the Modified Hughes Basic Gross Motor Assessment. Therefore, the second null hypothesis could not be rejected.

Hypothesis 3

The third hypothesis stated that there would be no significant difference among the means of the groups which compose the age intervals on the Modified Hughes Basic Gross Motor Assessment scores. Tables 3 and 4 are presented to show the results of the test.

Table 3

Age Intervals Mean Scores

Groups	Mean
12-30 months difference	28.32
31-54 months difference	29.76
55 and up months difference	29.25

Note. Age difference in months.

As noted in Tables 3 and 4, there was no significant difference found among the age intervals on the mean scores of the Modified Hughes Basic Gross Motor Assessment. Therefore, the third null hypothesis could be rejected.

Table 4

Analysis of Variance of Mean Scores

Source of Variation	Sum of Squares	Degrees of Freedom	F Ratio	F Probability
Main effects	14.660	2	0.289	0.750
Age difference (between)	14.660	2	0.289	0.750
Explained	14.660	2	0.289	0.750
Residual (within)	1855.125	73		
Total (error)	1869.789	75		

Hypothesis 4

The fourth hypothesis stated that there would be no significant difference in the interaction effects among the factors of gender, age, and dyad composition. Tables 5, 6, 7, and 8 are presented.

In Table 6, the mean scores of the first and last age interval do not indicate a significant difference. The second age interval mean scores while not showing a significant difference do suggest that the influence of the older sibling on gross motor performance is stronger in the males than females.

While the analysis of variance did not show any significant difference, Table 7 does reveal that the subject with a female sibling 12-30 months apart performed slightly better overall. The age group

from 31-54 months apart was not different; however the last age group showed that the subjects with female siblings did slightly better than the middle group but not as well as the first group.

Table 5

Analysis of Variance of Mean Score by Subject Sex, Sibling Sex, and Age Intervals

Source of Variation	Sum of Squares	Degrees of Freedom	F Ratio	F Probability
Main effects	98.70	4	0.979	0.425
Age difference	23.97	2	0.476	0.624
Subject sex	36.60	1	1.450	0.233
Sibling sex	54.44	1	2.160	0.147
2 way interaction	129.84	5	1.030	0.407
Agediff x Subsex	69.36	2	1.380	0.260
Agediff x Sibsex	44.39	2	0.880	0.419
Subsex x Sibsex	3.96	1	0.160	0.693
3 way interaction	54.03	2	1.070	0.348
Agediff x Subsex x Sibsex	54.03	2	1.070	0.348
Explained	282.58	11	1.020	0.440
Residual (error)	1587.21	63		
Total	1869.79	74		

Table 6

Mean Scores of Age Interval by Subject Sex

	Age Intervals		
Subject Sex	12-30 months	31-54 months	55-HI months
Males	28.75	31.60	29.85
Females	27.92	27.88	29.80

Table 7

Mean Scores of Age Intervals by Sibling Sex

	Age Intervals		
Sibling Sex	12-30 months	31-54 months	55-HI months
Males	26.18	29.50	28.36
Females	30.00	28.91	30.08

As noted in Tables 5, 6, 7, and 8, there was no significant difference found among the factors of gender, age, and dyad composition on the Modified Hughes Basic Gross Motor Assessment. Therefore, the fourth null hypothesis could be rejected.

Table 8

Mean Scores of Age Interval x Subject Sex and Sibling Sex

Groups	Age Intervals		
	12-30 months	31-54 months	55-HI months
Male-Male[a] Dyad	25.67	31.14	28.83
Male-Female[a] Dyad	31.83	32.67	28.86
Female-Male[a] Dyad	26.80	28.22	27.80
Female-Female[a] Dyad	28.63	27.50	31.80

Note. [a]Indicates sibling sex.

Hypothesis 5

Hypothesis five stated that there would be no significant correlation on the prediction of mean scores on the Hughes Basic Gross Motor Assessment and the Modified Hughes Basic Gross Motor Assessment. Table 9 shows the groups, means, standard deviations, correlation, and 2-tail probability.

As noted in Table 9, there was a highly significant correlation between the Modified Hughes Basic Gross Motor Assessment and the Hughes Basic Gross Motor Assessment. Therefore, the Modified Hughes Basic Gross Motor Assessment is scored on similar values and accurately measures the same tasks as the Hughes Basic Gross Motor Assessment. The difference in the means was due to the modifications implemented. On the Hughes

Table 9

Mean Scores of Hughes Basic Gross Motor Assessment and Modified Hughes Basic Gross Motor Assessment

Group	Means	Standard Deviation	Correlation	2-tail Probability
Modified Hughes	28.95	4.99		
			.96	<.01
Hughes Basic	26.75	4.21		
			df = 75	

Basic Gross Motor Assessment a total of 33 points is possible and on the Modified Hughes Basic Gross Motor Assessment a total of 39 points is possible. Even with the two additions to the original test the predictions of the tests were almost identical. Therefore, hypothesis five was rejected.

Discussion of Results

The researcher believed there would be a difference among the different dyad compositions and age intervals of the dyads. When looking at the results it can be seen that various dyad compositions tended to show a minimal relationship, but the results were not consistent throughout the study. These findings would indicate that dyad composition or age interval between the dyads do not influence the ability to perform selected gross motor tasks.

The reasons for the minimal differences have been supported in the literature by Gallahue (1982), Corbin (1980), Abramovitch et al. (1980), Ridenour et al. (1978). They believe that the skills that were selected by the researcher should be developed by the time the child reaches the kindergarten age and that there is minimal influence from the sibling in regard to these skills. While it has been shown that siblings do influence each other in social aspects (Abramovitch et al., 1980), they do not play a major influence on the ability to perform certain gross motor tasks.

The researcher also believed that the modifications to the Hughes Basic Gross Motor Assessment would make a significant difference in the overall mean scores of the selected groups; however the analysis did not show any significant difference.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to see if there was a relationship among dyad composition and age interval among the dyads on selected gross motor skills.

First year kindergarten children with one older sibling were selected for the study. There were 76 subjects tested. The Modified Hughes Basic Gross Motor Assessment tool was used for measuring certain gross motor skills. Each child was tested individually according to the test criteria and the scores were recorded.

The data collected in this study were analyzed for statistical significance at the .05 level. Each of the stated hypotheses was examined to see if a difference occurred among the factors of gender sibling composition, and age interval among the dyads. The data yielded the following findings:

1. There was no significant difference between the means for the same-sex and mixed-sex dyads on the Modified Hughes Basic Gross Motor Assessment scores. Hypothesis one was not rejected.

2. There was no significant difference between the means of the younger boys and the younger girls on the Modified Hughes Basic Gross Motor Assessment. Hypothesis two was not rejected.

3. There was no significant difference found among the means of the groups which composed the age intervals on the Modified Hughes Basic Gross Motor Assessment scores. Hypothesis three was not rejected.

4. There was no significant difference found in the interaction effects among the factors of gender, age, and dyad composition. Hypothesis four was not rejected.

5. There was a positive correlation found betwen the mean scores of the Hughes Basic Gross Motor Assessment and the Modifed Hughes Basic Gross Motor Assessment. Hypothesis five was rejected.

Conclusions

In consideration of the results and within the limitations imposed by the design of this study, the following conclusions are warranted:

1. Even though the literature supports the assumption that siblings do influence each other in areas of social and emotional growth as far as gross motor skills are concerned, there is minimal difference in influence by sex or age interval.

2. The Modified Hughes Basic Gross Motor Assessment was used because the researcher believed the modifications of jump roping and overhand throwing were sex-related skills. These modifications did not significantly alter the Hughes Basic Gross Motor Assessment, but interval variation was noted on the two modifications. The mean score for the boys in the rope jumping was .47 and the mean score for the girls was .85. The standard deviations were .77 for boys and .94 for girls. Pooled variance estimate T value was -1.89 and degrees of freedom was 74. Two-tailed probability for this test was .06. In the overhand throwing, the mean score for the boys was 1.94 and .95 for the girls. Standard

deviation for the boys was .95 and the girls was .84. Pooled variance estimate T value was 4.82 with degrees of freedom being 74. Two-tail probability was less than .01.

3. As supported in the literature, siblings were found to have no direct influence in acquiring or failure to acquire gross motor skills even when considering age interval and sibling sex.

4. When looking at individual subtests and comparing younger males to younger females, the researcher found significant differences in three of the subtests as shown in Table 10.

Table 10

Significant Subtests by Subject Sex

Subtest	Mean	Standard Deviation	T Value	Degree of Freedom	2-tail Probability
Skipping	M = 2.14	1.22	3.66	74	.01[a]
	F = 2.87	0.33			
Target Throwing	M = 2.42	0.73	3.67	74	.01[a]
	F = 1.82	0.65			
Overhand Throwing	M = 1.94	0.95	4.82	74	.01[a]
	F = 0.95	0.84			

Note. [a]Indicates significance at .01.

5. The modifications to the Hughes Basic Gross Motor Assessment did not alter the original criteria but added more elements the researcher believed to be valuable when assessing motor skills. The modifications did not alter the time frame of the test from the original times allowed.

Recommendations

With reference to the purpose, methods, procedures, and results of this study, recommendations for further research in this area are as follows:

1. A study similar in design to the present study be conducted but compare "only" children to children with an older sibling.

2. A study similar in design to the present study be conducted to look at the difference in the individual test items on the Modified Hughes Basic Gross Motor Assessment as opposed to the composite score among the factors of gender, sibling composition and age interval.

3. The rope jumping criteria should be modified to be more consistent with the abilities of kindergarten children. Appendix B lists the criteria that was validated by a panel of experts. After administering the subtest, the researcher believes it should be modified as follows:

3.1 The subject should be able to hold the rope with his or her arms at the sides or with the hands at shoulder level with bent elbows. The researcher found that approximately 50-70% of the subjects preferred this second method.

3.2 The style of jump should be modified to include a skip jump as well as the two foot jump. Several subjects received a 2A because they did not demonstrate a two foot jump.

4. The researcher believes that the overhand throwing criteria is valid and should remain the same. This modification was added because it was believed that it would demonstrate sex-performance differences. The Hughes Basic Gross Motor Assessment addressed the issue of using hand/foot opposition when throwing as a deviation, and it was deleted in the original test due to the short distance (6-8 ft) the ball was to be thrown. The researcher also felt that by extending the distance to 15 or 20 ft and using the overhand throwing pattern, this deviation was acceptable.

5. Other motor development studies be done using the Modified Hughes Basic Gross Motor Assessment.

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APPENDIX A

PARENTAL CONSENT FORM AND RESEARCH PROPOSAL REQUEST

RESEARCH/REQUEST PROPOSAL

Purpose of intended study: The purpose of this study is to see if there is a relationship in the composition of sibling dyads on the performance of selected gross motor skills.

Specific objectives: The researcher will identify students who fit the criteria listed below and they will be administered the Hugher Basic Gross Motor Assessment Test to identify whether or not there are influences from an older sibling with respect to the tests listed on the instrument.

The researcher will first need to identify the students who qualify for the research by looking at the forms necessary that will provide the researcher with the following criteria: age of the child at test time, older siblings (how many, the ages, and the gender), whether the student is a first year kindergarten student and whether the child has any known motor dysfunctions.

Target population: The study will be limited to first year kindergarten students, ages five years, six months to six years, five months of age who fit the criteria of having only one older sibling, one, two or three years older than the subject.

Research conditions: The researcher will need approximately 15 to 20 minutes of time per child. The researcher can test two students at a time which will cut down on the actualy time to conduct the research. The total time in the specific school will depend on the number of children that fit the criteria listed. The researcher is planning on not more than two days per school.

The space required is minimal. The researcher will need an area of about 20 feet long and 6-8 feet wide. Most hallways will work. The researcher will have her own equipment and will not need any from the school. The study does require that masking tape be put on the floor for the testing period to help the students with distance.

Instrumentation: Enclosed is a copy of the Hughes Basic Gross Motor Assessment and the criteria the researcher will be looking for is listed on the sheet. The researcher will administer the test according to the instructions and scoring will also be done accordingly. The researcher does have a copy of the complete test manual if further clarification is needed.

Confidentiality procedures: The students will only be identified in the research paper as groups. There will not be any individualization or names appearing in the research paper. The only time the researcher will need to know the names is to identify the students at the beginning of the test and once the testing procedures are over all names will be discarded. Only the researcher and the people she receives the names from initially will know the specific students.

Research design: The study will use a comparative survey to determine the effect of the older sibling within a dyad on the selected gorss motor skills. A 3X2X2 ANOVA will be used with age at three levels, gender at two levels and dyad composition at two levels. A .05 significant level will be used.

Utilization of results: The results of this study will be used to complete the requirements of the researcher's dissertation. It can also provide the school with information regarding a student's ability in performing certain motor skills which are necessary for motor development.

Dear Parents:

My name is Diane Tunnell and I am presently a student at OSU, working on a Doctorate degree emphasizing curriculum in elementary physical education. I have eight years experience in public schools, six of which is at the elementary level. I am conducting research in the area of gross motor skills of kindergarten children. Stillwater Public Schools has granted permission for data collection in their school system.

I will be testing children on six areas of skills that they should be able to do by the time they enter school. The gross motor skills included would be skipping, catching, throwing, rope jumping, hopping and balancing. The evaluation instrument will help identify children who possess certain gross motor abilities and can aid the physical education instructor in working with children with deficiencies. Names will not be used in the final paper, only the results of the total group of children will be reported.

Enclosed is an information sheet for you to complete if your child may participate. The research will take approximately 15 minutes per child and will be conducted during their Physical Education class so no special arrangements on your part will be necessary. On the following page you will find qualifications needed for participation in the study. Please read them carefully and fill out the form completely.

Thank you for your time and cooperation. I am looking forward to working with these children.

Sincerely,

Diane C. Tunnell
School of Health, Physical Education and Leisure Science

QUALIFICATION FOR PARTICIPATION IN RESEARCH STUDY

1. The child must be a first year kindergarten student.

2. The child's birthday must be after February, 1980 and prior to April, 1981.

3. The child must have only one older sibling in the immediate family who is also enrolled in grades first through sixth.

If your child meets ALL of the above qualification and you give permission for your child to participate please fill out the information below.

Child's Name:_____

Age:_____ Sex:_____

Birthday:_____

Older Sibling's Sex:_____

Age of Older Sibling:_____

Birthday of Older Sibling:_____

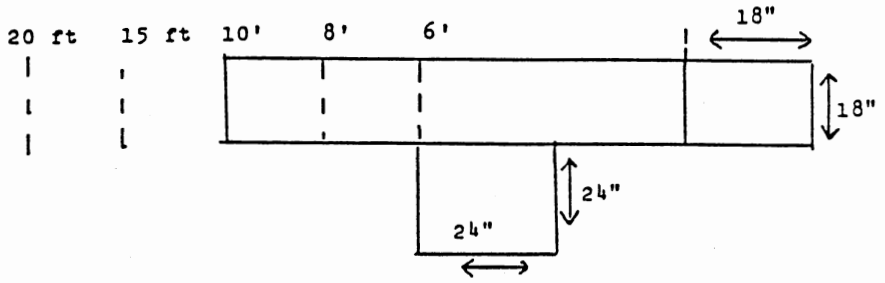
Grade of Older Sibling:_____

APPENDIX B

MODIFIED HUGHES BASIC GROSS MOTOR ASSESSMENT

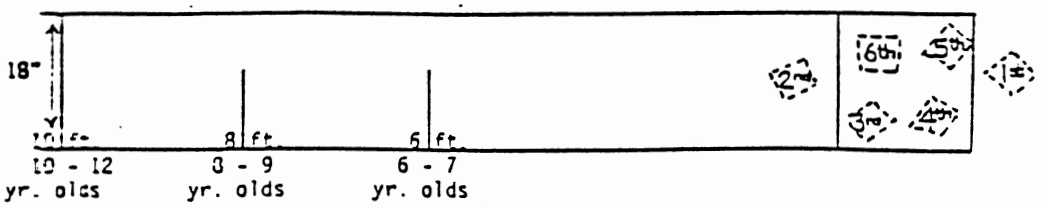
FLOOR DESIGN AND EVALUATION SHEET

Modified HUGHES BASIC GROSS MOTOR ASSESSMENT
FLOOR DESIGN

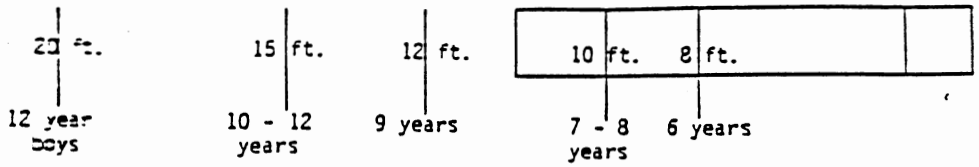


The following information directly from the BGMA Manual may be useful during test administration:

Area markings for Target Task:



Area markings for Ball Skill Task:



WORKSHEET

Modified HUGHES BASIC GROSS MOTOR ASSESSMENT

NAME: _____ SCHOOL: _____ BIRTHDATE: _____ AGE AT TIME OF TEST: _____

TESTING DATE: _____ REFERRED BY: _____ TOTAL SCORE: _____

(1) STATIC BALANCE				(2) ROPE SKIP		(3) TANDEM WALK		(4) HOPPING		(5) SKIPPING	(6) TARGET			(7) Throw 1 HAND		(8) BALL HANDLING SKILLS		
a. Leans flexed leg against supporting leg				a. Improper foot jump		a. Turns feet out		a. Shuffle hops		a. Shuffle skips	a. Poor adjustment			a. poor coordin		CATCH	THROW	DRIBBLE
b. Excessive arm movement				b. Not continuous		b. Turns feet in		b. Poor rhythm		b. Poor rhythm	b. Lacks ease & coordination			b. lack strength		a. Stiffly extends arms & catches on chest	a. poor coordination	a. Uneven push on ball
c. Excessive body sway				c. Not proper revolu rate		c. Large steps		c. Excessive arm movement		c. Excessive arm movement	c. Uses two hand.			c. poor aim		b. Poor position of fingers	b. Lacks strength	b. Poor timing or rhythm problems.
d. Shifts to maintain balance by jumping on supporting leg				d. out of		d. Excessive arm movement		d. Cannot stay between lines		d. Hops with one leg held behind	d. Hurls overhand			d. no opposit		c. Eyes do not follow ball	c. Poor aim	c. Unable to coordinate hands
				e. improper positio		e. Looks back								e. no extensio		d. One side catch only		
						f. Moves fast												
						g. Can't stay on line												
ARMS DOWN		ARMS CROSS																
L	R	L	R	/	F	FWD	BKWD	L	R		U	/	F	H	F			

OBSERVATIONS:
GAIT: _____
PREFERRED HAND FOR FINE MOTOR ACTIVITIES: _____
MIDLINE: _____
POSTURE: _____
OTHER OBSERVATIONS:
- Ill-fitting clothing
- Unusual size for age
- Temporary injury
- Appears weak
- Hyperextends joints
- Moves total body
- Very right or left handed
- Tremor-like movements
- Tongue out excessively when working
- Tense or rigid movements
- Associated movements
- Spatial Orientation problems
- Motor planning problems
- Eye problems
- Overtries
- Distractible or poor attention
- Delayed response
- Giggly or covers up with silliness
- Lacks visual fixation
- Refuses to try or resentful
- Can't follow directions
- Talks incessantly
- Seems pressured or anxious
- Says I can't
- Immature responses
- Touches everything or everybody SEEMS SHY
- Perfectionistic
- Improves with practice

Scoring
3 = No Difficulty
2 = one observed
1 = two observed
0 = three or more

COMMENTS

APPENDIX C

ROPE JUMPING CRITERIA

INDIVIDUAL ROPE JUMPING CRITERIA

To administer the rope jumping test the tester will use a beaded rope the appropriate length for the student. The student is expected to jump the rope 5 times in succession meeting the following conditions during the test:

1. The students must turn their own rope.
2. The two ends of the rope must be held in the following fashion: one end in the right hand and one end in the left hand and the rope must be turned so as to permit the hands to remain on their respective sides.
3. The student will start the test with the rope behind their feet and turn it in a forward motion.
4. The rope must pass under the feet and over the head with each revolution.

CRITERIA FOR GRADING THE ROPE JUMPING:

A. The student will take off and land with both feet together while jumping.

B. The students will be able to have a continuous turn of the rope, jumping either one or two jumps per turn at a rate of at least one revolution per one-two seconds.

C. The student will be able to stay in a 24x24 inch square

D. The student will be able to jump the rope five times in succession.

The students will be scored using the follwing scale.
Points: 0---three or more observed difficulties, 1---two observed difficulties, 2---one observed difficulty, 3---no difficulty.

EXAMPLE: If the student jumps the rope five times but does not meet the first criteria they will receive 2A, indicating that the child completed the task with one deviation. In a separate box I will record the number of times the child actually jumped. The child will receive two trials prior to testing and will receive two chances on the test.

Please write any suggestions or comments you have on the back of this form. Thank you.

NAME: _____

PLACE OF EMPLOYMENT: _____

OCCUPATION: _____

LENGTH OF EMPLOYMENT: _____

DEGREES HELD AND INSTITUTIONS: _____

_____

VITA

Diane C. Tunnell

Candidate for the Degree of

Doctor of Education

Thesis: THE RELATIONSHIP OF AGE INTERVAL AND SIBLING DYAD COMPOSITION ON THE PERFORMANCE OF SELECTED MOTOR TASKS

Major Field: Higher Education

Minor Field: Health, Physical Education and Leisure Services

Biographical:

Personal Data: Born in Muskogee, Oklahoma, September 2, 1952, the daughter of the late Ned and Willie Catlett. One son, Bradley Steven Tunnell, born May 3, 1979.

Education: Graduated from Muskogee High School in 1979; received the Bachelor of Science in Education, degree in Health, Physical Education and Safety from Northeastern Oklahoma State University, Tahlequah, Oklahoma, December 1975; received the Master of Science degree in Junior College Education from Northeastern Oklahoma State University, Tahlequah, Oklahoma, July 1976; completed requirements for the Doctor of Education degree at Oklahoma State University in July 1987.

Professional Experience: High school physical education teacher, Neosho High School, Neosho, Missouri, 1976-1978; high school tennis coach for Neosho High School, Neosho, Missouri, 1976-1978; elementary physical education instructor, Maple Park Elementary School, Wagoner, Oklahoma, 1978-1984; adjunct instructor, Northeastern Oklahoma State University, Tahlequah, Oklahoma, 1982-1983; counselor/program director/ infirmary supervisor/aquatic coordinator, assistant camp director, YMCA Camp Takatoka, Chouteau, Oklahoma, summers 1971-1974, 1979-1981, and 1983-present; graduate teaching associate in the School of Health, Physical Education and Leisure Sciences, Oklahoma State University, Stillwater, Oklahoma, 1984-present.

Professional Organizations: American Alliance for Health, Physical Education, Recreation and Dance; Oklahoma Association for Health, Physical Education, Recreation and Dance; Phi Epsilon Kappa; Council for National Cooperation in Aquatics.