Qualitative comparison of basic movement patterns of preschool age children
by Virginia Dawn Tubbs

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Physical Education
Montana State University
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Abstract:
This study was designed to examine the effect that physical education instruction had on the overall quality of basic movement patterns of three and four year old children: 1) enrolled in a preschool with a physical education program, 2) enrolled in a preschool with no physical education program, and 3) not enrolled in any type of preschool program. Assessment of the quality of basic movement patterns was accomplished by the utilization of The Ohio State University Scale of Intra Gross Motor Assessment.

This study defined preschool as a day care environment in which children attended three or more days per week and not less than four and one half hours per day. Basic movement patterns were defined as: walking, running, skipping, hopping, jumping, throwing, catching, kicking, and striking.

Descriptive statistics were computed for all variables: sex, age, preschool with a physical education program, preschool with no physical education, and no preschool enrollment.

Significant differences were revealed among the overall quality of basic movement patterns and the age of the children. The type of preschool involvement also had a significance. Those preschool children enrolled in a preschool with a physical education program generally were better performers. The sex variable was determined to have no significance among the nine items.

It was hypothesized that preschool age children may benefit from the early introduction to basic movement skills. These skills will be the building blocks for specific sport and dance skills which may later be used to participate in recreational activities.

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by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

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ABSTRACT

This study was designed to examine the effect that physical education instruction had on the overall quality of basic movement patterns of three and four year old children: 1) enrolled in a preschool with a physical education program, 2) enrolled in a preschool with no physical education program, and 3) not enrolled in any type of preschool program. Assessment of the quality of basic movement patterns was accomplished by the utilization of The Ohio State University Scale of Intra Gross Motor Assessment.

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Descriptive statistics were computed for all variables: sex, age, preschool with a physical education program, preschool with no physical education, and no preschool enrollment.

Significant differences were revealed among the overall quality of basic movement patterns and the age of the children. The type of preschool involvement also had a significance. Those preschool children enrolled in a preschool with a physical education program generally were better performers. The sex variable was determined to have no significance among the nine items.

It was hypothesized that preschool age children may benefit from the early introduction to basic movement skills. These skills will be the building blocks for specific sport and dance skills which may later be used to participate in recreational activities.

CHAPTER I

INTRODUCTION

Quality early education serves as the foundation upon which subsequent educational tenets are built. Before any school age child learns to write, that child is first introduced to and then drilled on the components of the written language and the alphabet. Mathematical facts are first introduced to children by rote memory of sequential counting. From this point, progressions of arithmetical functions continue through recognition of the numerals and the corresponding quantities. With proficiency of understanding, the student is then directed to addition, subtraction, multiplication, division, and on to higher mathematical procedures.

Beyond the basis of the written language, the student is encouraged to explore the creative combinations that are possible with the language. Poetic or prose combinations are advocated so that mastery of combinations will be experienced.

Similar arguments are beginning to appear within the study of physical education. Researchers tell us that motoric abilities are developed qualitatively at an early age (Singer, 1968; Corbin, 1973; and Briggs, 1975). The

scope of the argument of growth and maturation versus learning is narrowing the boundaries as more and more interest is being generated for the preschool age child's introduction to movement.

"Good movers" are the result of the scope of movement experience to which they were exposed at an early age. An extensive repertoire of motor skills afford an individual a broad choice of activities in which that individual may choose to participate throughout life.

Purposes

The purpose of this study was to examine the effect that a physical education program had on the quality of basic movement patterns of preschool age children. Specifically, this study was designed to examine the basic movement patterns of three and four year old children:

1. enrolled in a preschool with a physical education program,
2. enrolled in a preschool with no physical education program, and
3. not enrolled in any type of preschool.

Definition of Terms

Physical Education Program. This study defined physical education program as specific instruction in

basic movement patterns not including free play.

Basic Movement Patterns. Basic movement patterns, as defined by this study, were the general pattern of movements employed for the fundamental skills of: walking, running, hopping, skipping, jumping, throwing, catching, striking, and kicking (Wickstrom, 1977).

Preschool Age Children. For the purpose of this study, preschool age children were represented by the range of ages three years zero months to four years eleven months at the time of the data collection.

Preschool. This study referred to preschool as a day care environment in which children attended three days per week or more and not less than four and one half hours per day as licensed by the Department of Social and Rehabilitative Services (SRS) of the State of Montana.

Motor Learning. Motor learning for this investigation was described by Sage (1977) to be a permanent change in motor performance resulting from practice and not influenced by maturation, motivation, or training.

Motor Development. Motor development was used in this study to refer to a procurement of competencies necessary for movement and the succeeding motor skill acquisition.

Null Hypotheses

The following null hypotheses were tested:

1. There will be no significant differences between the preschool age males and the preschool age females in the overall quality of motor performance,
2. There will be no significant differences between the three year old children and the four year old children in the overall quality of motor performance,
3. There will no significant differences among the three groups of preschool age children and the overall quality of motor performance,
4. There will be no significant differences among the male preschool age children and the female preschool age children and the performance of each of the specific movements patterns of the OSU SIGMA, and
5. There will be no significant differences among the performances of the three groups of preschool age children and each specific item of the OSU SIGMA.

Delimitations

This study was delimited to seventy-one preschool age children residing in Bozeman, Montana. Additional delimitations of this study were the calendar period March 13, 1980 to March 28, 1980 and the selected basic movement patterns identified by The Ohio State University Scale of Intra Gross Motor Assessment (hereafter referred to as OSU SIGMA).

Limitations

This study was limited by the quality of basic movement pattern instruction offered to the preschool age children within the physical education program. The researcher considered all of the preschools having basic movement instruction as a preschool with a physical education program.

The participants of this study were limited to the first twenty-five individuals satisfying the requirements for inclusion in each of the two preschool groups and the first twenty-one individuals satisfying the requirement of not being enrolled in a preschool.

Justification of Study

The increase in numbers of single parent families

and working mothers has directly effected the number of child care facilities in the United States. Individual states are becoming increasingly aware and involved in the establishment of guidelines for maintaining quality day care environments in which parents may choose to entrust the lives of their children.

Social, intellectual, and emotional domains of the preschool child are addressed in the directives of the governing body for the State sanctioned day care provisions. Suggestions for developing these areas of a child's experience offer a diverse background from which the young individual may grow and mature. The suggestions addressing motor skill development are broad and general. Individuals involved in providing for the early experiences of the young child are left to their own ingenuity relative to movement content.

Research into the value of skilled movement pattern acquisition is copious. Montessori (1964), Piaget (1970), Kephart (1971), Espenschade and Eckert (1980), and Corbin (1980) have addressed the positive worth of movement exposure in the early years of an individual's growth and maturation. In addition, movement is a crucial ingredient in the young child's understanding of and adjustment to

the world of people, places, things, and ideas (Corbin, 1973).

Cratty and Martin (1969) also purported that basic movement patterns are highly valuable in comprising an integral part of the individual's preschool years. However, there is a lack of concern by most individuals toward the development of a training program for the enrichment of motor proficiency in children (Singer, 1973).

As additional research is completed and made public, educators may become increasingly sensitive to the importance of movement training programs as vital components of preschool curricula. This study, then, may be of interest to directors of preschools and coordinators of governing boards for preschool curricula. Also, those individuals involved in the training of early childhood educators may use the results of this investigation to augment their course of study with the inclusion of basic movement patterns.

CHAPTER II

REVIEW OF LITERATURE

Ontogenetic versus Phylogenetic Skill Acquisition

Developmental theorists have proposed that all individuals within a species acquire certain motor patterns irrespective of the environment. Harrow (1972) described those skills of a human infant which virtually unfold without the benefit of teaching as: visual tracking, reaching, grasping, crawling, creeping, and walking. Connally (1970) used the term phylogenetic development to describe the above mentioned patterns of movement which are procurred independent of learning. He explained the addition of phylogenetic abilities to be the essence of maturation.

Normal motor development has a morphological design to progress cephalo-caudally (from head to feet) and proximo-distally (from body's midline to the body's periphery). Time is the only variable inherent in the phylogenetically acquired talents (McClenaghan and Gallahue, 1978). Those abilities which were accomplished without the benefit of learning but as a function of time have been maturationally developed.

Singer (1968) and Corbin (1973) have described those

skills mastered as a result of teaching to be ontogenetically acquired. Singer (1968) purported that motor learning is usually independent of maturation. But practically speaking, maturation is related to the ability to learn. Learning and maturation are inextricably interwoven. Consequently, neither should be spoken of without reference to the other. Maturation is one factor that determines the individual potential for learning and learning defines the upper limits for performance (Singer, 1968).

Singer (1973) explained growth of an individual to be an increase of stature (height and weight) and the development of the individual to be the increasing structure and function. Singer further contended that the attainment of more complex skills (i.e. specific sport, dance, and recreational skills) and most behavioral patterns as identified by adult standards are principally the result of an interaction of maturation and experience.

McClenaghan and Gallahue (1978) supported Singer stating that an individual's biological timeclock is no longer a stable determinant of movement pattern procurement. They further fortified the argument for the relationship of learning and maturation by reporting; if an individual is deprived of environmental opportunities

and the development of mature patterns of movement is left to chance, the later proficient level of movement execution may be permanently impaired.

Growth, Maturation, and the Effects on Learning

Insufficient movement pattern experience may retard general physical development and most definitely will hinder more complex motor learnings (Harrow, 1972). In fact, many adults never achieve the mature level of execution of fundamental movement skills remaining at a very primitive stage of motor development throughout life (Halverson, 1966). Singer (1973) defined an individual's critical learning period as the level of maturation of the nervous system for any given activity of skill.

Corbin (1973) emphasized that the importance of an alertness to the critical learning periods of young children be understood in relation to their developing characteristics and abilities. He also stated that the movement ability and motor learning of the young child are woven together with growth and maturation. Consequently, planned movement experiences insure that the sensitive periods for motor learning will not be neglected (Herkowitz, 1977).

Age as a Motor Learning Variable

McCaskill and Wellman (1938), Godfrey and Kephart (1969), Harrow (1972), and Singer (1977) wrote that learning at any level will be facilitated if all relevant subordinate skills are present in the learner and that careful scrutiny must be given to the prerequsites of such learning. Their further contention was that the presentation of basic and complex skills should not be attempted until the child has acquired a readiness for such.

Flinchum (1975) declared that children do not transcend the same experiences simply according to chronological age, but rather according to critical learning periods or stages. Flinchum (1975) and Corbin (1980) agreed that there is probably no motor act that a child cannot learn by the age of six years and that generally, by this age, no new basic skills appear in the movement repetoire of children through adulthood. Rather, basic pattern development continues to improve.

Harrow's (1972) taxonomy for the psychomotor domain lists movement development in order, beginning with: reflex movement, basic movement, perceptual- motor development, physical abilities, skilled movement, and ending with creative movement. Flinchum (1975) suggested that perhaps

the optimal period for refinement of abilities through Harrow's third level, perceptual-motor movement, should occur during the first five years of life. Flinchum further contended that the preschool child is developing the basic movements upon which he or she depends for future development of motor skills.

Henry (1972) wrote that if the rate at which motor learning changes with age, the rate appears to become slower with increasing age rather than faster in older subjects. From observation, Halverson (1966), Cratty (1969), Corbin (1969), and Henry (1972) have written that the young child can do far more motorically than we know.

Sex as a Performance Variable

Noble, Baker and Jones (1972) expressed that two of the major variables effecting human learning and performance are sex and age. However, they reported that rarely is there any consistent superiority of one sex over the other at the preschool age level. Variations in performance appear to be directly correlated to the opportunity to experience, the number of siblings, and/or the number of peers which may influence performance patterns of children. Specific motivational processes which could be culturally different between the sexes

could lend itself to be considered another variable.

Herkowitz (1977) presented the proposal that cultural and social conditions may be offset if planned movement experiences are presented to the preschool age child. An early exposure to movement skills may eliminate difficulty in acquiring sport, work, and dance skills (Herkowitz, 1977). Goodenough and Smart (1938) suggested prior to Herkowitz's work that motor ability is dependent on a combination of variations: age, sex, size, strength, intelligence, and other traits. They suggested that the optimum time to examine the implications of variables upon the movement skill development appears to be during early childhood prior to social and cultural influences.

Evaluating Quality Motor Performance

When reference is made to formative evaluation of motor performance, an attempt is made to determine the degree to which a specific task is mastered. Deficiencies in the learner should be noted in order to provide assistance toward a proficient level of skill execution (Singer, 1977). Conscious movement is best understood as movement skills and the majority of scientific studies agree on seven broad areas of movement that have been delineated as component elements of all movement:

coordination, agility, strength, flexibility, speed, balance, and endurance (Frostig and Maslow, 1969).

General types of movement activities are most beneficial during the early years of a child's education (Halverson, 1966). The analysis of these general activities is a way of assessing maturation of the child and is an important method of studying the total personality. Cratty (1973) argued that movement behavior is worthy of investigation but does not need to be related to physiological-anatomical processes which accompany that behavior. He cautioned that a comprehensive approach should be taken toward the study of motor performance.

Implications for Physical Education Instruction

The preschool child is a dynamic individual with spontaneous inquisitiveness and multiple physical abilities. Movement education for the young child may consist of free play in a guided, environmentally designed play area. Guided activities are not enough to provide the situation for movement training; the learning setting must be properly directed as well, for the motor skills are the young child's special tool for experimenting and expanding the environment (Flinchum, 1975).

Children are most receptive to motor exploration

during the infant and preschool period. Therefore, movement experiences must surely be an integral element of the education of the preschool age child (Briggs, 1975). Corbin (1973) concurred that movement experiences are important responsibilities of the preschool and elementary school teachers.

From Bloom's research, Singer (1973) summarized that the preschool age and early years are highly important in the development of learning patterns and general achievement. He continued with the information that few individuals are concerned with the special training programs oriented toward enhancing the motor proficiency of young children.

The inclusion of movement education as an integral part of the preschool and elementary program should receive prime consideration in the search for new approaches toward helping children attain optimal movement potential (Corbin, 1980). He wrote that it is absurd that our best physical education programs are at the college and high school level in light of what is known concerning the influence that motor development has toward the development of young individuals.

Effect of Instruction on Preschool Performers

New abilities should be introduced to the learner in such a way that the individual performs during practice the way the individual is expected to perform in an actual situation. Following this, there is no set way for instruction. The point is that motor activity should be emphasized in early learning, especially young learners.

Although form in executing skills is unique from individual to individual, generally accepted good form is usually associated with the outstanding athlete in a given sport. The desirability of molding a beginner in the style of the champion is open to scrutiny, certainly reasons may be provided for and against such a practice (Singer, 1977). Singer reasoned that molding an individual to the form of a champion did not permit the learner to develop a personal performance style. Blankenbaker and Davis (1975) argued that movement education is an individualized approach. Consequently, there is little concern for age levels of the children involved. Instead, the children work within their own capabilities and at their own rate of speed with little concern for measuring up to specific standards.

Dauer (1972) wrote that the maturity level of children has a direct effect on the choice of method

employed for movement experience presentation. He proposed that the lower the chronological age of the learner, the more prevalent the exploratory approach. He wrote that the program should offer a wide experience in movement, so that the child will move with ease, coordination, fluency, and versatility. He also challenged early child educators to encourage children to become aware of their movement possibilities, so that in time the children will be able to move skillfully and with confidence.

Children should develop a movement vocabulary of basic skills to serve as a foundation for the more complex sport, dance, and recreational skills. The motor activities of the child become more important not only for their own sake, but for the contribution which may be made toward more complicated activities the individual may be required to perform later (Godfrey and Kephart, 1969).

Godfrey and Kephart (1969) also stated that when describing individual movement patterns and the elements and deviations pertinent to each pattern, primary consideration ought to be given to individual variability of execution. They reported that variability in an executed movement pattern referred to: change of pace, alteration to meet external environmental conditions, and the general

tenor of performance.

Movement educators need to be aware of and properly diagnose incomplete motor development early enough to correct inappropriate movement (Halverson, 1966). Halverson also stated that the purpose of using detailed information about the mature form of execution in the study of the child's movement is not to force one to conform to a pattern but rather to observe what the child does do at various developmental levels. It seems certain, according to Halverson, that with appropriate environmental stimulation and additional motor experiences, increasing numbers of children could reach first grade at mature levels of basic movement patterns than now may be true. Singer (1977) supported Halverson when he wrote that the potential role of physical education for the development of basic movement patterns in young children is virtually untapped.

Intellectual Gains from Early Movement Instruction

Previous early child developmentalists, Piaget (1970) and Montesorri (1964), were principally concerned with the contributions that motor skills made toward enhancing the learning process of cognitive skills. Concern of these theorists did not include motor abilities beyond the

contributions each had on the subsequent intellectual maturation during the preschool years.

Dauer (1972) stated that physical education can do more than develop the cognitive processes of the young child. It can show individuals how to learn. Ward (1975) reported that many educators believe that a quality pre-school motor experience can provide readiness skills for much of the future learning, cognitive and motor.

Ward also wrote that intellectual development was, at least partially, dependent on motor development and recognized that motor activity was an important factor of perception. She further pointed out unless a child has adequate mental stimulation during the preschool years, the next ten years of school work may be wasted. With this implication, she challenged early childhood educators to become involved in movement experiences as a part of the curriculum for the preschool child.

Godfrey and Kephart (1969) fortified Ward's statement with the argument that preschool education culminates in a large number of skills, attitudes, and knowledges. Many of these abilities will be required as the framework for the later activities that the public school will later present.

Summary

The physical environment is experienced both through the senses and by active manipulation. It would be incorrect to assume that most children will develop efficient and mature patterns of movement without some form of instruction. Harrow (1972) reported that the refexive movements of an individual will evolve regardless of experience. Beyond that, mature basic movement patterns are the result of carefully planned learning.

McClenaghan and Gallahue (1978), Corbin (1973), and Singer (1968) have written that an individual's timeclock is no longer to be considered a sole determinant of movement pattern development. They concurred that the acquisition of movement patterns is an interaction of growth, maturation and learning. They also contended that if an individual is deprived of motor experiences, the later proficient level of execution of said skill may be permanently impaired.

McCaskill and Wellman (1938), Godfrey and Kephart (1969), and Singer (1977) stated that specialized sport and dance skill procurement will be facilitated if the subordinate skill requirements are evident in the learner. The motor skills acquired during critical learning periods

of an individual are more easily accomplished than the chronological age at presentation.

Performance differences between male and female children have been reported to be related to the socialization processes (Corbin, 1973). By creating planned movement experiences, educators of preschool and elementary school age children may help to alleviate social and cultural implications of motor skill execution. Early and qualitative guidance of basic movement patterns may provide individuals with the background to further build sport, dance, work, and recreational skills in order to remain active and energetic throughout one's life.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine the effect that a physical education program had on the quality of basic movement patterns of preschool age children. The method in which the preschool children were assessed is presented in the following order: 1) selection of subjects, 2) instrumentation, 3) OSU SIGMA, 4) administration, and 5) analysis of data.

Selection of Subjects

A listing of licensed preschools operating within the city of Bozeman, Montana was obtained from the Community Coordinated Child Care Office (hereafter referred to as 4-C's). The researcher contacted those listed and made arrangements with the administrators to involve the three and four year old males and females as study subjects.

The 4-C's office also published a listing of day care home providers which supplied the researcher with three and four year old children not enrolled in a preschool for inclusion in this study. Permission for participation was obtained from the day care providers who made appropriate contact with the individual parents (appendix A).

It was determined by verbal conversation with the

administrators that the children had been enrolled in their respective program for at least three months.

The total number of individuals participating in this study was seventy-one: twenty-five children enrolled in a preschool with a physical education program, twenty-five children enrolled in a preschool with no physical education program, and twenty-one children not enrolled in any type of preschool program as licensed by the State of Montana.

Instrumentation

The instrument used in the qualitative assessment of basic movement patterns of preschool age children was The Ohio State University Scale of Intra Gross Motor Assessment (OSU SIGMA). The OSU SIGMA was employed to determine the level of proficiency of gross motor abilities, propulsion, and retrieving skills.

The Ohio State University Scale of Intra Gross Motor Assessment

The nine selected items of the OSU SIGMA: walking, running, skipping, jumping, throwing, catching, kicking, and striking (appendix B) were selected and utilized from the tool. Stair and ladder climbing were eliminated as items since these items were not deemed appropriate to

this particular study.

All of the items comprising the OSU SIGMA have been designed for administration to preschool age children and/or children classified as learning disabled. Verbal comprehension was not a variable to be considered in the selection of this instrument. The task instructions to the participants were limited to the phrases: "Hit the ball as hard as you can" (striking), "Throw the ball as hard as you can" (throwing), "Catch the ball" (catching), "Kick the ball as hard as you can" (kicking), "Jump as far as you can" (jumping), "Hop as high as you can" (hopping), "Run as fast as you can" (running), and "Skip as far as you can" (skipping). The simplicity of these statements does not require an extensive understanding of the language. In addition to the simplistic verbal instructions, the researcher was able to further clarify the directions by the use of visual demonstration of the various skills.

The reliability for each of the items of the instrument of this investigation were stated in terms of intra and inter-scorer reliabilities. Following are those values listed with the intra-scorer value first, then the inter-scorer value: walking, 1.000 and 1.000; running, .750 and .583; hopping, .666 and .666; throwing, .916 and

.750; catching, .916 and .916; jumping, .666 and .583; kicking, .750 and .666; striking, .833 and .833; and skipping, .916 and .833 (Loovis and Ersing, 1979).

Administration

Pilot tests were completed by the researcher under the supervision of Ms. Barbara E. Miller, instructor of Physical Education at Montana State University, Bozeman, Montana. Miller has had extensive exposure to and use of the OSU SIGMA during her involvement in the Bureau of Education for the Handicapped Physical Education Project for the Exceptional Individual. Ms. Anne K. Olson was also exposed to the execution of the OSU SIGMA under the supervision of Miller.

Administration of the OSU SIGMA was completed in Romney Gym on the Montana State University campus. Each of the seventy-one children had their individual performances recorded on a Sony Video Tape Recorder which was operated by a trained member of the Health and Physical Education staff at Montana State University. The investigator gave all instructions to all the subjects maintaining a consistent testing environment.

Following the administration of the OSU SIGMA, the researcher, Olson, and Miller were engaged in the

observation and scoring of the performances using video play back. Each of the judges simultaneously viewed the video tapes and individually determined the level of proficiency, as defined by the guidelines of the OSU SIGMA (scoresheet, appendix, C).

One week later the judges reviewed the video tapes in order to determine if any significant differences existed between the judges' first and second observations (called intra-reliability). The values of the judges are: judge 1, .7258; judge 2, .6818; and judge 3, .8997. Relationships were established among the three judges' ratings determining inter-judge reliability. Inter-reliability values for judge 1 to judge 2 was .864, judge 1 to judge 3 was .873, and judge 2 to judge 3 was .851 (inter and intra reliability values, appendix D).

The identification variables were not disclosed to Olson or Miller prior to the assessment of the skills. The researcher judge was aware of the identifiers prior to and during the assessment. The high relationship of statistical values supported the non-biased observation of the researcher judge.

Analysis of Data

Each of the nine items of basic movement patterns

had a maximum value of four and a minimum value of zero. A score of four delineated the most mature form of performance. Conversely, zero represented no activity; a score of one signified the most immature pattern of the specified skill; two signified a more mature form than that of score one; and a value of three was a level of execution quite similar to but still less mature than that of four.

The total of each of the subject's scores had the possibility of ranging from zero to 108. The three judges' scores were used to determine the summed total for each individual participant. These totals were then analyzed by the Sigma Seven Computer with Dr. Al Suvak of the Testing and Counseling Office of Montana State University supervising the programming. The following programs were used:

1. t-test--a subprogram to determine if significant differences existed between the mean scores of: a) the male and female sample, b) the three and four year old children, and c) each of the three groups of preschool age children of this study;
2. CHI-SQUARE--a subprogram to analyze the significant differences of the variances which may have existed among the male and female preschool age children for each of the items of

the OSU SIGMA, and the three groups of children and the nine specific items of the OSU SIGMA.

Hypotheses 1, 2, and 3 were tested by subjecting the raw data to the t-test program. Hypotheses 4 and 5 were tested by subjecting the raw data to chi-square analysis. All null hypotheses were tested at the .05 level of confidence.

For purposes of clarity, the preschool with physical education instruction will be referred to as group 1, the preschool with no physical education instruction will be referred to as group 2, and group 3 will refer to those preschool age children not enrolled in any type of preschool.

Following the analysis of data, a letter of explanation was written to parents and the administrators of the participating preschools (appendix E).

CHAPTER IV

ANALYSIS OF RESULTS

The purpose of this study was to determine the effect that physical education instruction had on the quality of basic movement patterns of three and four year old males and females enrolled in a preschool with a physical education program, enrolled in a preschool with no physical education program, and preschool age children not enrolled in any type of preschool program. Descriptive statistics were computed for all the variables: age, sex, and preschool enrollment or no preschool enrollment.

This study defined group 1 as those children enrolled in a preschool with a physical education program, group 2 as those children enrolled in a preschool with no physical education program and group 3 as those children not enrolled in any type of preschool program.

Descriptive Statistics

The preschool children participating in this study showed no significant differences between the sex of the individual and the overall performance of the skills of the OSU SIGMA. There were significant differences between the ages of the children and the quality of motor performance.

The four year old children performed significantly better than the three year old children in the overall performance of basic movement patterns.

The children of group 1 executed the skills of the OSU SIGMA significantly better than the children of group 2 and better than the children of group 3. There were no significant differences between group 2 performance and group 3 performance.

An examination of the specific skills of the OSU SIGMA as performed by the males and females revealed that significant differences did exist between the ability to skip and the sex of the performer. Females were capable of skipping at a more mature level than the males. Sex of the performer also had an effect on the quality of striking ability. Males were significantly better strikers.

No significant differences existed between sexes and the remaining seven items: walking, running, hopping, jumping, catching, throwing, and kicking.

Walking, jumping, and kicking revealed no significant differences among the three groups of preschool age children. There were significant differences in the overall ability of skipping and catching which were executed significantly better by group 1 than either group 2 or group 3. The

individuals of groups 1 and 2 were better performers than those individuals of group 3 in the skills of running and striking. Throwing was executed better by the children of group 3 than by either group 1 or group 2. Hopping was performed significantly better by the individuals of groups 1 and 3 than the individuals of group 2.

Hypothesis Testing

The results of the hypothesis testing of this study will be presented according to the following format:

1. Statement of Hypothesis,
2. Description of statistical method of analysis,
3. Interpretation of test statistic,
4. Results of statistical analysis, and
5. Interpretation of test statistic.

Hypothesis 1

There will be no significant differences between the preschool age males and females in the overall quality of motor performance.

This hypothesis was subjected to t-test analysis. The t-test values revealed any differences that may have occurred between the sex of the performer and the quality of the OSU SIGMA skills.

The results of the hypothesis testing are presented in

Table 1 ($\bar{X}$ for males was 24.89, $\bar{X}$ for females was 25.06, and the t-test score was .380). Since the computed t, .380, was below the critical value of 1.96, the null hypothesis was not rejected. It was concluded that no significant difference existed between sex and the overall quality of basic movement pattern performance.

Hypothesis 2

There will be no significant differences between the three year old children and the four year old children in the overall quality of motor performance.

This hypothesis was subjected to t-test analysis. The t-test value revealed any differences that may have occurred between age and the quality of motor performance.

The results of the hypothesis testing are presented in Table 1 ($\bar{X}$ for three year olds was 23.93, $\bar{X}$ for the four year olds was 26.11, and the t score was 5.23). Since the computed t, 5.23, was above the critical value of 1.96, the null hypothesis was rejected. It was concluded that a relationship did exist between the quality of movement patterns of three and four year olds. The four year olds were better performers.

Table 1 Means, Standard Deviations, and t-test Values for Males and Females, Age, and Group Identification

Variable	N	$\bar{X}$	SD	t-test
Male	108	24.89	3.24	.380
Female	105	25.06	3.20	
Age				
3 year olds	111	23.93	2.50	5.23*
4 year olds	102	26.11	3.52	
Group				
1 (preschool with P.E.)	75	26.06	3.29	3.26*
2 (preschool no P.E.)	75	24.41	2.89	
1	75	26.06	3.29	3.05*
3 (no preschool enrollment)	63	24.36	3.20	
2	75	24.41	2.89	.09
3	63	24.36	3.20	

* 1.96 critical value for t-test significant at .05

Hypothesis 3

There will be no significant differences among the three groups of preschool age children and the overall quality of motor performance.

Hypothesis 3 was subjected to the same design as Hypotheses 1 and 2. The t-test values revealed any relationships that may existed among the three groups of preschool age children and the quality of movement skills.

The results of this hypothesis are listed in Table 1 ($\bar{X}$ score for group 1 was 26.06; for group 2, 24.41; for group 3, 24.36; the t-test value of groups 1 and 2 was 3.26; of groups 1 and 3,3.05; and of groups 2 and 3, .09). The computed t of groups 1 and 2, 3.26, was above the critical value of 1.96 and it was concluded that a significant difference did exist between groups 1 and groups 2 and 3. Group 1 performed better than either group 2 or 3 in the overall quality of motor performance. The null hypothesis was rejected.

The t-test value of the relationship between groups 2 and 3 was .09 which was below the critical value of 1.96. The null hypothesis was not rejected for this relationship.

Hypothesis 4

There wil be no significant differences among the male

preschool age children and the female preschool age children and the performances of each of the specific movement patterns of the OSU SIGMA.

This hypothesis was subjected to chi-square analysis. The chi-square values revealed any relationships that may have existed between sex and the performance of each of the specific movement patterns.

The results of the hypothesis testing are presented in Table 2 (X^2 values for walking, .00; running, 3.87; skipping, 25.69; hopping, 6.62; and jumping, .00 were computed at 3 degrees of freedom. The X^2 values for throwing, 5.79; catching, 3.37; kicking, 5.01; and striking, 17.90 were computed at 2 degrees of freedom). The difference in the degrees of freedom resulted from the practice of collapsing cells. The cells of this study were collapsed on the recommendation of Dr. Al Suvak of the Testing and Counseling Office of Montana State University. Suvak supported his recommendation from the writings of Ferguson (1971). Ferguson wrote that certain types of data have a common practice of being combined in order to increase the expected cell frequencies without serious distortion.

The critical value of the items computed at 3 degrees

Table 2. Chi-Square Analysis of Judges' Ratings on Each of the Nine Specific Items as Performed by the Male and Female Population.

Proficiency Level	1	2	3	4	X^2	D.F.
Skill						
Walk (male)	0	0	0	108	.00	3
(female)	0	0	0	105		
Run (male)	7	1	76	24	3.87	3
(female)	4	4	80	17		
Skip (male)	78	10	15	2	25.69*	3
(Female)	50	4	32	16		
Hop (male)	5	51	34	12	6.62	3
(female)	3	36	37	23		
Jump (male)	0	7	92	6	.00	3
(female)	0	7	92	6		
Throw (male)		41	40	27	5.79	2'
(female)		50	42	13		
Catch (male)		59	42	7	3.37	2'
(female)		70	31	4		
Kick (male)		49	53	6	5.01	2'
(female)		62	41	2		
Strike (male)		12	66	30	17.90*	2'
(female)		22	76	7		

' chi-square computed on collapsed cells
* $P \leq .05$
Critical value 3 D.F. = 7.81
2 D.F. = 5.99

of freedom was 7.81. The X^2 value of walking, running, hopping, and jumping revealed no significant differences between the sex of the performer and the qualitative execution of the skill. The X^2 value of skipping was significant at 3 degrees of freedom, 25.69, with the females performing better. The null hypothesis was rejected.

The value for the items computed at 2 degrees of freedom was 5.99. The X^2 value of throwing, catching, and kicking revealed no significant differences between sex and the quality of skill performance. The null hypothesis was not rejected. The X^2 value of striking was significant at 2 degrees of freedom with the males performing better. The null hypothesis was rejected for this skill.

It was concluded that a relationship did exist between the sex of the performer and the skills of skipping, in which the females performed better, and the skill of striking, in which the males performed better. The remaining seven skills of the OSU SIGMA were not effected by the sex of the performer.

Hypothesis 5

There will be no significant differences among the performances of the three groups of preschool age children and each specific item of the OSU SIGMA.

This hypothesis was subjected to chi-square analysis. The chi-square values revealed any significant differences that may have occurred among the three groups of preschool age children and the performance of the skills of the OSU SIGMA.

Table 3 presents the X^2 values of each of the items and the relationships to the groups of preschool age children. No significant differences were revealed among the preschool age children and the skill of walking. Running revealed no significance between groups 1 and 2, 4.16. The relationship between groups 1 and 3, 6.29 and between groups 2 and 3, 15.80 were significant. Group 1 and group 2 performed better than group 3. Group 1 performed better than both group 2, 10.98, and group 3, 17.24 in the skill of skipping. Neither group 2 or 3, 2.89, performed better.

There were no significant differences of hopping ability between groups 1 and 3, .93. There was a difference in ability between groups 1 and 2, 11.17, with group 1 performing better. A significant difference also existed between group 2 and group 3, 8.43, with group 3 hopping better than group 2. It was concluded that group 2 was not able to hop as well as either group 1 or group 3.

Jumping revealed no significant differences in

Table 3 Chi Square Analysis of Judges' Ratings of Each Group and the Nine Items of the SIGMA

		Group 1	Group 2	D.F.
Walk	Group 2	.00		6
	Group 3	.00	.00	
Run	Group 2	4.16		2
	Group 3	6.29*	15.80*	
Skip	Group 2	10.98*		3
	Group 3	17.24*	2.89	
Hop	Group 2	11.17*		2
	Group 3	.93	8.43*	
Jump	Group 2	4.23		2
	Group 3	3.08	1.58	
Throw	Group 2	3.00		2
	Group 3	3.92	7.45*	
Catch	Group 2	9.51*		2
	Group 3	10.71*	.16	
Kick	Group 2	4.02		2
	Group 3	1.14	.80	
Strike	Group 2	.56		2
	Group 3	9.57*	12.27*	

$P \leq .05^{*}$

Critical value at 3 D.F. 7.81
Critical value at 2 D.F. 5.99
Critical value at 6 D.F. 12.59

execution by any of the three groups of preschool age children. It was further concluded that jumping was not effected by either a preschool environment or no preschool environment.

There were no differences in performance of the skill of throwing between groups 1 and 2, 3.00, and groups 1 and 3, 3.29. There were differences between the groups of 2 and 3, 7.45, with group three performing better.

Group 1 performed the skill of catching significantly better than either group 2, 9.51, of group 3, 10.71. There was no significant difference between groups 2 and 3, .16. It was, therefore, concluded that a physical education program had an effect on the quality of catching ability.

Striking was performed better by group 3 compared to group 1, 9.57, and group 2, 12.27. It was concluded that a preschool program did not have an effect on the ability to qualitatively execute the striking skill.

Discussion of Results

The results of this investigation will be discussed as they relate to published information.

Differences Between Mean Scores of Male and Female Participants and the Overall Quality of Motor Performance

Results of the t-test (Table 1) illustrated no

significant differences of the results between the males and females of this inquiry. Neither sex performed with superiority in the overall evaluation of the nine basic movement patterns of the OSU SIGMA.

Herkowitz (1978) has written about the sex role expectations and motor behavior of young children. Structural and physiological differences of males and females provide powerful explanations relating the differences of motor performance, however they are not adequate. Espenschade and Eckert (1980) stated that no distinction is generally made in the motor performances of boys and girls in most activities during infancy and early childhood due to the fact that the maturational variances are not very great.

In 1980, Herkowitz reported that there is no convincing scientific information to reveal that any activity is the sole realm of the male. Herkowitz (1978 and 1980) and Espenschade and Eckert (1980) offered the argument that socialization may be responsible for differences in motor performance of boys and girls.

They challenged adult males and females to alter their attitudes toward female participation in order that the future may see the elimination of sex role stereotyping

in physical activity. The results of this investigation suggested that males and females are capable of comparable levels of skill at early ages.

Differences Between Mean Scores of Three and Four Year Old Children

The t-test value of the three and four year old children revealed a significant difference between the ages of the children participating in this research question. The general performances of the four year old children occurred significantly different throughout the items of the OSU SIGMA (Table 1).

The obvious explanation is the full year of growth between the groups. Teeple (1978) supported the results of this investigation by her discussion of maturational rates. She wrote that the chronological age of an individual is a very strong explanation for the primary differences of performance level at an early age.

Singer (1968) expounded that maturational development determines the potential of the individual to learn. He cautioned individuals studying the attainment of motor behavior to be aware that experience and maturation are directly related. Learning cannot occur without the growth that accompanies it. This study concurs that growth is

positively correlated to motor learning.

Differences Among the Three Groups of Preschool Age Children and the Quality of Basic Movement Patterns

The mean scores and the t-test values of the three groups of preschool age children participating in this investigation revealed that the differences among the performances of those children enrolled in a preschool with physical education instruction were significantly higher than the other two groups. There were no significant differences between the overall abilities of groups 2 and 3 (Table 1).

According to Lockhart (1967), the critical learning conditions for motor skill acquisition are more than providing the playspace in which a child may experiment. She contended that the effective role of the teacher is to help the student reduce time spent in idle manipulation.

Hottinger (1980) wrote that the ability to learn motor skills comes early. Consequently, the importance of physical education programs at the preschool level cannot be over emphasized. Norms are available to indicate what the potentiality of the child if that child is given the opportunity and guidance to experience and manipulate the environment. The data of this study are

in agreement with the importance of planned learning environments toward the attainment of mature patterns.

Differences in Performance of the Nine Specific Items and the Males and Females

The chi-square analysis of the nine specific items of the OSU SIGMA and the sex of the preschool age children disclosed two skills in which the sexes differed. The skill of skipping was performed significantly better by the female population. The males executed striking significantly better than the females.

Gesell (1938), Wickstrom (1977), DeOreo and Keogh (1980), and Espenschade and Eckert (1980) described the skill of running as a natural progression of walking. The authors did not delineate either sex as having the superior ability of running performance at this particular age. The results of this study concurred.

Skipping has been described as the skill of rhythm by Espenschade and Eckert (1980). DeOreo and Keogh (1980) exposed the fact that girls generally skip before boys and and that most children are able to skip by the age of six. The proficiency of skipping by females was supported by this study.

Wickstrom (1977) defined the hop as a developmental sequence of the jump. In addition to Wickstrom, Herkowitz

(1978), Espenschade and Eckert (1980), and DeOreo and Keogh (1980) expressed the need for static balance on one foot as the prerequisite to the hop. There are inconsistent reports of the youmg child's acquisition of this skill (Gesell, 1940; Herkowitz, 1978; and Corbin, 1980).

However, beyond the age of five years, girls are reported to be better hoppers than boys (Herkowitz, 1978). This study projected that prior to age five, males and females are able to perform the skill of hopping similarly.

When assessing the developmental trends of throwing, Wickstrom, (1977), Espenschade and Eckert (1980), and DeOreo and Keogh (1980) agreed that males are more proficient beyond the age of six. Before that age, Herkowitz (1978) reported that the sexes are equivalent. The results of this study agreed.

Ball size, shape, background color, and trajectory are variables that must be considered when assessing the qualitative ability to catch (Morris, 1976). Assuming the environment to be identical, DeOreo and Keogh (1980) have reported no difference between the sexes prior to age six. Support data from this particular research were added.

Neither sex is advanced of the other in the early proficiency of kicking ability (Wickstrom, 1977). Beyond

the age of five, males proceed at a much faster rate of improvement than do females of the same age (DeOreo and Keogh, 1980). The performances of the kicking ability of males and females observed in this study agreed with the research prior to age five.

A significant difference of execution was noted between the striking skills of males and females. Social implications may be the direct influence of this result. Herkowitz (1978) wrote that parents are more apt to present their male child with an implement than they are to do the same for their female child. The early practice with an implement will ultimately give the advantage to the males. The results of this study fortified the possibility that males are better performers at striking.

Differences Among the Three Groups of Preschool Age Children and the Nine Items of the OSU SIGMA

The nine specific items of the OSU SIGMA, when analyzed by the chi-square test of significance, were not performed significantly better by any one group. No significant differences were revealed among the three groups of preschool age children and their ability to: walk, jump, and kick. The preschool age children of group 1 were better than the children of groups 2 and 3 at catching. The preschool age children of group 2 were

were better executers of the throwing skill. Children of groups 1 and 2 were better able to run and strike than the children of group 3. Groups 1 and 3 hopped better than the children of group 2. A significant difference was revealed among the skipping ability of group 1 and groups 2 and 3. Group 1 skipped better than the other two groups.

Lawther (1966), Lockhart (1980), and Malina (1980) wrote that guided experiences at the early age of a child's life will provide the child with a quality repetoire of basic movement skills upon which additional abilities will be built.

The ramifications of motor development at an early age facilitates "better movers" in the public schools when peer pressure is greatest (Ridenour, 1978). Sport, dance, and leisure skills when developed early prevent delays in the sport specific programs offered in the public school and recreation programs (Ridenour, 1978).

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The primary purpose of this study was to examine the effect that a physical education program had on the overall quality of basic movement patterns of three and four year old males and females. Specifically, assessment of the quality of the basic movement patterns was accomplished by the use of The Ohio State University Scale of Intra Gross Motor Assessment. Administration was to three and four year old males and females enrolled in a preschool with a physical education program, enrolled in a preschool with no physical education program, and those not enrolled in any type of preschool as licensed by the State of Montana.

The instrument of this study, The Ohio State University Scale of Intra Gross Motor Assessment, was administered to each of the 71 preschool children: 35 females and 36 males. Age, sex, preschools with physical education, preschools with no physical education, and no preschool enrollment were the variables identified to determine if significant differences existed in the basic movement pattern performance of the individuals participating in this inquiry.

There were significant differences between the males

and females of this investigation as they performed the skills of skipping and striking. Males were better strikers and the females performed the skill of skipping with more maturity than the males. Significant differences also existed between the age of the participants and the overall ability to execute the skills of the OSU SIGMA. The four year old children were able to perform the abilities with greater quality than the three year old individuals.

The general examination of the items of the OSU SIGMA revealed that the children enrolled in a preschool with physical education instruction to be better performers than those children enrolled in a preschool with no physical education program and those children not enrolled in any type of preschool. Relating the performances of those children of preschool age enrolled in a preschool with no physical education program and the children not enrolled in a preschool, there were no significant differences between these two groups in the overall skill ability according to t-test results.

Conclusions

Based on the results of this study, the following conclusions were made:

1. Significant differences existed between the

quality of basic movement patterns and the age of the performer,

2. Significant differences existed between the children enrolled in preschools offering a program with physical education and the children enrolled in a preschool environment with no physical education and the children not attending a pre-school environment when investigating the general scores of basic movement pattern execution,
3. There was no significant difference between the quality of basic movement pattern and sex of the performer. Differences of performances were revealed by the females when executing the skipping skill and by the males when executing the striking skill,
4. Significant differences in performance were exposed through the specific investigation of the specific items of the OSU SIGMA and the preschool involvement. Group 1, physical education program, was better able to perform the skills of: skipping, and catching. Group 1 and 2 (no physical education) performed striking and running better than group 3 (no preschool enrollment). Throwing was performed better by the children of group 2 than by either

group 1 or group 3. Groups 1 and 3 were better performers of the skill hopping than those of group 2.

Recommendations

The following recommendations for further research are offered:

1. Design and administer an investigation to a larger population and a broader geographical area in order to substantiate the effect of instruction on the basic movement patterns of preschool age children,
2. A longitudinal study of a similar form may be of interest to the field of physical education as well as other allied fields to investigate the future activity (high school athletics, recreational endeavors) participation of the sample,
3. Investigation of correlation of quality motor performance and the effect that may be associated with a positive self-esteem,
4. Future cognitive learning abilities, as influenced by early motor learning, might be investigated to determine if a relationship exists, and
5. Design and administer a preschool curriculum to

control the quality of early motor instruction within the preschool period of an individual's development.

APPENDIXES

APPENDIX A

INTRODUCTION LETTER AND PARENTAL PERMISSION FORM

February 29, 1980

Dear Parents:

As a master's candidate at MSU, I am currently undertaking a project to identify the motor ability of 3 and 4 year old children. This project is designed to determine the effect that a day care/preschool environment has on the motor ability of children. I am involving children attending and not attending day care/preschool. I would like very much to include your child in this study. It will involve your child arriving at Romney Gym on the MSU campus and participating in activities such as: walking, running, hopping, skipping, jumping, throwing, catching, kicking, and striking.

Your child will be observed individually and returned to the custody of the day care provider or yourself for the return to the center or your home. Individual observation of your child should not take more than fifteen minutes total.

Let me assure you that your child, in no way, will be involved in any testing that may prove physically or emotionally threatening. You are welcome to discuss any concerns you may have with me or with your day care provider prior to giving your consent. It is also your right to terminate your child's participation at any time.

I feel that this project will benefit the Bozeman Day Care Association as well as you, the parent. I hope that you will allow your child to participate. The results of this study will be available to you upon its completion.

Sincerely

Ginny Tubbs

587-5957

Please return permission form by March 17, 1980.

My child, _____ has my permission to participate in the filming of physical activities at Romney Gym. I understand that the schedule will be arranged individually and that the results will be available to me at the completion of this study.

_____

Signature of Parent/Guardian Date

APPENDIX B

THE OHIO STATE UNIVERSITY SCALE OF INTRA GROSS MOTOR ASSESSMENT (OSU SIGMA)

CLEVELAND STATE UNIVERSITY
CLEVELAND, OHIO 44115

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION, AND RECREATION
COLLEGE OF EDUCATION

(216) 687-4870

April 3, 1980

Ms. Virginia Tubbs
3271 Sawmill Road
Bozeman, Montana 59715

Dear Ms. Tubbs:

After conferring with Dr. Walter Ersing, we have agreed to grant you permission to reproduce pages 17-27 from the manual, Assessing and Programming Gross Motor Development for Children, for use in your thesis. Granting of said permission is contingent upon receipt of two (2) copies of the completed research project (after I told Dr. Ersing about my request, he agreed he would like a copy also). I hope you find these conditions satisfactory.

Good luck with the final data analysis, I am anxiously awaiting the results. Say "hi" to Barbara.

Sincerely,

E. Michael Loovis

E. Michael Loovis, Ph.D.
Assistant Professor

EML/mc

cc: Walter P. Ersing

O.S.U. SIGMA

SKILL OF Walking

TEST EQUIPMENT: Wall, Bench, Rail in a stationary position NOTE: Examiner cannot be used!

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When assisted from an all 4's position by the examiner, NOTE: Examiner may take hands but should not pull child up.	When from an all 4's position and within arms reach of a wall, bench, rail, etc.,	Same	When from an all 4's position,
PERFORMANCE	The child is capable of maintaining an erect standing posture either assisted, unassisted, or a combination of both for a minimum of ten seconds in two out of three trials.	The child demonstrates the following behaviors in two out of three trials: a. assumes a standing position either with assistance from support objects or independently, b. walks sideways always leading with the same leg for a distance of approximately five feet but maintains continuous contact with object.	The child demonstrates the following behaviors in two out of three trials: a. assumes a standing position independently, b. walks forward at least ten steps with arms raised to approximately shoulder level and feet spread wide, c. touches support object once.	The child demonstrates the following behaviors in two out of three trials: a. assumes a standing position independently, b. walks forward totally unassisted with a gait characterized by arm and leg opposition, i.e., right arm and left leg swing forward together and vice versa, in a straight path for a distance of fifteen feet.
	McGraw, 1940	Angle, 1972 Breckenridge and Murphy, 1969 Gesell and Amatruda, 1974 Shirley, 1933	Bayley, 1935 Gesell, 1940 Shirley, 1933	Burnett and Johnson, 1971 McGraw, 1940

O.S.U. SIGMA

SKILL OF Running

TEST EQUIPMENT: None

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position and with the examiner approximately twenty-five feet in front of him,	Same	Same NOTE: This behavior is best observed from behind.	Same NOTE: This behavior is best observed from the side.
PERFORMANCE	The child walks with a rapid or increased pace for at least five feet in two out of three trials. Characteristics of this behavior are quick up and down movements of the knees. Burnett and Johnson, 1971 Espenschade, 1967 Halverson (Personal Interview), 1975	The child attempts to run and demonstrates the following behaviors in two out of three trials: a. holds arms in a slightly bent position with hands at approximately waist level and moves them back and forth partially across the front of his body, b. moves arms in opposition (right arm forward when left leg is forward), c. swings knee outward when bringing leg forward to give appearance of toeing out, d. requires a broad base of support when running, i.e., feet appear to land outside of hips. Wickstrom, 1970	The child runs and demonstrates the following behaviors in two out of three trials: a. holds arms in a clearly bent position with hands just below shoulder level and swings them across in front of his body and then back and away just below shoulder level, b. moves arms in opposition to the legs (right arm forward when left leg is forward), c. swings knee under hip when bringing leg forward, d. swings leg backwards across mid-line of body before moving leg forward (NOTE: trunk may twist back and forth to assist in crossing the mid-line during the backward swing of leg). Wickstrom, 1970	The child runs and demonstrates the following behaviors in two out of three trials: a. moves arms, held at approximately right angles, in opposition to the legs (right arm forward when left leg is forward) with large movements forward and backward along side of body, b. swings leg forward causing the heel to pass close to the buttock; the knee is raised to approximately waist level, c. swings forward leg well ahead of body before foot lands on the floor, d. places foot of forward swinging leg on the floor in a nearly flat manner and in a straight line, e. runs with total non-support--both feet off the floor together. Fortney, 1963 Wickstrom, 1970

O.S.U. SIGMA

SKILL OF Skipping

TEST EQUIPMENT: None

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position and with the examiner approximately 25 feet in front of him,	Same	Same	Same
PERFORMANCE	The child cannot skip but will likely demonstrate any of the following behaviors in two out of three trials: a. running, b. hopping, c. leaping--take off made from one foot and landing on the alternate foot, d. galloping--combination of walk and leap.	The child attempts to do 4 or more consecutive skips while doing a normal walking or running pattern and demonstrates the following behaviors in two out of three trials: a. performs skip more often than not on the same leg though not necessarily consecutively, b. holds arms sidewards and slightly bent with hands at approximately chest level.	The child skips 4 or more times consecutively and demonstrates the following behaviors in two out of three trials: a. alternates feet, b. does not use arms in opposition, if at all, c. does skipping pattern slowly, and it appears segmented (the child may walk or run for brief periods).	The child skips 4 or more times consecutively and demonstrates the following behaviors in two out of three trials: a. alternates feet, b. uses arms in opposition (right arm forward when left leg is forward), c. executes skip with ease and good coordination.
	Cutteridge, 1939	Wellman, 1937	Godfrey and Kephart, 1969 Cutteridge, 1939 McCaskill and Wellman, 1938 Wellman, 1937	Godfrey and Kephart, 1969 Cutteridge, 1939 Sinclair, 1973 Wellman, 1937

O.S.U. SIGMA

SKILL OF Hopping

TEST EQUIPMENT: None

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position with the feet parallel and next to each other,	When in a standing position supported on one leg with the other foot held just a few inches above the floor,	Same	Same
		NOTE: Child may use either foot but may not hold the foot. Ask child to hop as "high" as he can!		
PERFORMANCE	The child, using a simultaneous two foot take off and landing, jumps at least three consecutive times in two out of three trials either straight up and down or forward in a broad jump fashion.	The child attempts to hop and demonstrates the following behaviors in two out of three trials: a. raises both arms sideways, usually to chest level (NOTE: arm on side of non-support leg may be straight; arm on side of support leg may be bent), b. raises non-support leg with knee out to side as high as possible simultaneous with arm movement, c. straightens knee and ankle of support leg to rise up on toes when attempting to hop but support foot does not leave ground.	The child attempts to hop forward across the floor and demonstrates the following behaviors in two out of three trials: a. holds both arms bent at elbows sidewards at approximately shoulder level, b. holds bent non-support leg off the floor with knee at approximately waist level, c. lifts foot of support leg off the floor and quickly returns it.	The child hops forward across the floor on one foot two or more times by coordinating the following behaviors in two out of three trials: a. swings arms upward to aid in lifting body off the floor, b. lifts the bent non-support leg upward simultaneous with arm swing, c. straightens support leg to lift body off the floor.
	Gutteridge, 1939 McCaskill and Wellman, 1938 Wellman, 1937	Halverson et al., 1973	Halverson et al., 1973	Halverson et al., 1973

O.S.U. SIGMA

SKILL OF Jumping (Broad J.)

TEST EQUIPMENT: Step 8" high; Piece of Paper 8"x11" (Alternatives--Tape, Rope, etc.)

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position on the edge of an object or step approximately 8" high, NOTE	When in a standing position with his toes touching the 11" side (length) of an 8"x11" piece of paper (test sheet), Encourage child to jump as far	Same past the paper as possible!	When in a standing position with his toes touching the 8" side (width) of an 8"x11" piece of paper (test sheet),
PERFORMANCE	The child, using a simultaneous two foot take-off and landing, independently jumps down from the step in two out of three trials. Gutteridge, 1939 Hellebrandt et al., 1961 Wellman, 1937	The child jumps the width (8") of the paper and demonstrates the following behaviors in two out of three trials: a. uses two foot take-off which looks more like a two foot jump in place, b. maintains arms at the sides in a bent manner during the jump. Hellebrandt et al., 1961	The child jumps the width (8") of the paper and demonstrates the following behaviors in two out of three trials: a. uses a two foot take-off and lands on either one foot or two feet together or spread, b. swings arms either backward or sideward to approximately shoulder level at start of jump (NOTE: arms remain in this position until end of jump), c. brings arms along side of or in front of body in landing to assist with balance, d. maintains balance without touching the hands to the floor at end of jump. Hellebrandt et al., 1961 Wickstrom, 1970	The child jumps the length (11") of the paper and demonstrates the following behaviors in two out of three trials: a. uses two foot take-off and landing, b. swings arms backwards initially then forward and overhead during push-off of jump, c. drops arms to a position in front of body in landing to assist with balance, d. maintains balance without touching the hands to the floor at end of jump. Hellebrandt et al., 1961 Seefeldt et al., 1972 Wickstrom, 1970

O.S.U. SIGMA

SKILL OF Throwing

TEST EQUIPMENT: 6" Rubber Playground Ball and Tennis Ball

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	Standing in front of and five feet from the examiner,	Same NOTE: Ask child to throw the ball as "hard" as he can	Standing in front of and ten feet from the examiner,	Standing in front of and fifteen feet from the examiner,
PERFORMANCE	The child throws the 6" ball in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. uses a two-handed push or throw with both arms in unison, b. no twisting of the upper body. Outteridge, 1939	The child throws the tennis ball in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. uses a single-handed throw with the arm swinging in a sidearm (right to left or vice versa) motion, and the direction of swing is either downward or flat, b. twists upper body backwards to side of throwing arm during backswing then forward to side opposite throwing arm during throw, c. no movement of feet. Wild, 1938	The child throws the tennis ball in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. uses a single-handed throw with the arm swinging in a sidearm (right to left or vice versa) motion, and the direction of swing is downward, b. twists upper body backwards to side of throwing arm during backswing then forward to side opposite throwing arm during throw, c. faces target and steps with leg on the same side as throwing arm. Wild, 1938	The child throws the tennis ball in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. uses a single-handed throw with the arm swinging in a sidearm (right to left or vice versa) motion, and the direction of swing is downward, b. twists upper body backwards and shifts weight to foot on side of throwing arm during backswing, c. steps with leg on side opposite throwing arm, d. twists upper body forward after shifting weight to foot opposite throwing arm, e. snaps wrist in process of releasing ball. Wild, 1938

O.S.U. SIGMA

SKILL OF Catching

TEST EQUIPMENT: 6" Rubber Playground Ball

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When the examiner stands five feet in front of the child and throws the ball underhand,	Same	Same	Same
	NOTE:	Ball should reach the child between the shoulders and the waist! Ball should travel in an arc--not a straight line!		
PERFORMANCE	The child attempts to catch the ball twice in three trials by extending his outstretched arms in a stiff manner in front of his body thereby causing the ball to rebound off the arms.	The child, using the hands and arms (bent at the elbows) to scoop or bring the ball into the body, catches the ball twice in three trials.	The child catches the ball and demonstrates the following behaviors in two out of three trials: a. holds arms bent at the elbows in front of the body, b. uses hands in opposition to one another, i.e., a "clapping" motion, and attempts to trap ball.	The child catches the ball and demonstrates the following behaviors in two out of three trials: a. holds arms bent at the elbows at the sides of body, b. uses hands in a cupped fashion such that: 1. on throws above the waist the thumbs are nearly touching and 2. on throws below the waist the little fingers are close together.
	Wickstrom, 1970	Gutteridge, 1939 McCaskill and Wellman, 1938 Seefeldt et al., 1972 Wellman, 1937 Wickstrom, 1970	Gutteridge, 1939 McCaskill and Wellman, 1938 Seefeldt et al., 1972 Wellman, 1937 Wickstrom, 1970	McCaskill and Wellman, 1938 Wellman, 1937 Wickstrom, 1970

O.S.U. SIGMA

SKILL OF Kicking

TEST EQUIPMENT: 6" Rubber Playground Ball

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position with a ball approximately 6" in diameter placed in front of but not more than two feet away from him,	Same NOTE: Ask child to kick the ball as "hard" as he can.	When in a standing position with a ball approximately 6" in diameter placed in front of but not more than five feet away from him,	When in a standing position with a ball approximately 6" in diameter placed in front of but not more than ten feet away from him,
PERFORMANCE	The child walks up to the ball, makes contact with a stiff-leg and continues with the walking/running pattern in two out of three trials. Kick appears as part of walking/running pattern and shows no attempt to swing the kicking leg. Gesell, 1940 Wickstrom, 1970	The child walks up to and kicks the ball forward in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. uses a stiff-leg swinging primarily from the hip with little or no bending of the knee, b. moves the arms and trunk only slightly, if at all. Wickstrom, 1970	The child runs up to and kicks the ball forward in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. swings the bent kicking leg backwards and then forward with a simultaneous straightening of the leg, b. holds arm opposite from kicking leg out to the side approximately shoulder level, c. returns kicking leg to a position next to the support leg after executing kick. Wickstrom, 1970	The child runs up to and kicks the ball forward in the direction of the examiner and demonstrates the following behaviors in two out of three trials: a. swings the bent kicking leg backwards and then forward with a simultaneous straightening of the leg, b. uses both arms held out to the sides of the body to maintain balance, c. leans slightly backward as kick is performed, d. maintains balance on non-kicking leg during kicking action and follow through, e. steps forward onto kicking leg only after kicking action and follow through are completed. Wickstrom, 1970

O.S.U. SIGMA

SKILL OF Striking

TEST EQUIPMENT: Plastic Bat 20" to 36" long depending on size of child and 6" Playground Ball suspended by a string approx. 4' long which is attached to a stick

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
TEST CONDITIONS	When in a standing position, holding a plastic bat 20" to 36" long, and facing a ball 6" in diameter suspended by a string to waist level,	Same NOTE: Ask child to hit the ball as "hard" as he can!	Same	Same
PERFORMANCE	The child strikes the ball and demonstrates the following behaviors in two out of three trials: a. uses only one arm, the bat being positioned on or near the shoulder, b. swings in either an overhand (chopping) motion or a sidearm motion (right to left or vice versa). Halverson and Roberton, 1966	The child strikes the ball and demonstrates the following behaviors in two out of three trials: a. uses both arms, the bat being positioned on or near the shoulder, b. swings in an overhand manner with a downward (chopping) motion, c. bends forward at the waist (the feet do not move). Wickstrom, 1970	The child strikes the ball and demonstrates the following behaviors in two out of three trials: a. uses both arms, the bat being positioned in front of and adjacent to the shoulder, b. shifts body weight in direction of swing (this is a rocking motion; it is not a step), c. swings in a sidearm motion (right to left or vice versa), but arc of swing is flat (horizontal) or downward. Wickstrom, 1970	The child strikes the ball and demonstrates the following behaviors in two out of three trials: a. uses both arms, the bat being positioned in front of and adjacent to the shoulder, b. shifts body weight by stepping in direction of swing - "STEP", c. twists hips and upper body during and following the shifting motion - "TURN", d. swings in a sidearm motion (right to left or vice versa), but arc of swing is flat (horizontal) or slightly upward - "SWING". NOTE: Items "b"-"c"-"d" are swiftly merging movements which can be observed as STEP-TURN-SWING. Sinclair, 1973 Wickstrom, 1970

APPENDIX C

SCORE SHEET FOR THE OSU SIGMA

Skill	Level I	Level II	Level III	Level IV
Walking	10 sec. stand	Cruising	One support	Opposition walk
Running	Rapid walk	Wide base, wide arms	Egg beater	Non-support
Skipping	Hop/run/ gallop/ leap	Same side skip	Segmented/ alternate skip	Alternate skip
Hopping	Jump	Toe rise	Leg lift	Body lift
Jumping	Jumps down	Jump in place/ no arms	Improper arm action	Jump/ proper arm
Throwing	Two arm push	Arm only/ no foot action	Homolateral	Opposition throw
Catching	Arm stretch	Scoop	Vice squeeze	Cup fashion
Kicking	Part of walk	Stiff leg	Knee action	Knee action/ follow-through
Striking	One hand/ chopping action	Two hand/ waist bending	Rocking swing	Twisting swing

****

APPENDIX D

Table 4 Correlation Coefficients Between Scores of Each Judge for First and Second Test (intra-reliability)

Judge 1	.7258
Judge 2	.6818
Judge 3	.8997

Reliability was computed in the following manner:

1. The scores of the first test were summed and the scores of the second test were summed for each judge.
2. Pearson Correlation Coefficients were determined for each judge between the first and second test.

Table 5 Correlation Coefficients Among the Judges for First and Second Tests (inter-reliability)

	Judge 1	Judge 2
Judge 2	.864	
Judge 3	.873	.851

Reliability was computed in the following manner:

1. The nine subtests were summed for each judge for each individual for both the first and second test.
2. Pearson Correlation Coefficients were computed among the judges for the first and second test.

APPENDIX E

EXPLANATION OF RESULTS TO PARENTS

May 5, 1980

Dear Parents:

You have no doubt been waiting to hear the results of the work we have been doing in the area of motor development of preschool age children. All of the data have been collected and analyzed. Before you read your child's scores you will want to know the background information:

A total of seventy-one preschool age children participated.

The basic movement pattern test we used was designed to determine the level of proficiency of walking, running, skipping, hopping, jumping, throwing, catching, kicking, and striking.

The analysis of data of preschool age children enrolled in a preschool offering a physical education program and those attending a preschool with no physical education program were compared to those preschool age children not attending any preschool.

I sincerely appreciate your interest and willing cooperation in this project. If you have any further interest in the results of your child's performance on the skills please feel free to contact me.

Sincerely,

Ginny Tubbs
Physical Education
Specialist
587-5957

_____
your child's program

skill	score	average
walking	_____	_____
running	_____	_____
skipping	_____	_____
hopping	_____	_____
jumping	_____	_____
throwing	_____	_____
catching	_____	_____
kicking	_____	_____
striking	_____	_____

Four being most mature, one being least mature.

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