1970

The Effects of a Movement Education Program on the Perceptual-Motor Development of Kindergarten and Grade One Students

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THE EFFECTS OF A MOVEMENT EDUCATION PROGRAM ON THE PERCEPTUAL-MOTOR DEVELOPMENT OF KINDERGARTEN AND GRADE ONE STUDENTS

A Thesis

Presented to

the Graduate Faculty

Central Washington State College

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

By

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June, 1970

APPROVED FOR THE GRADUATE FACULTY

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ACKNOWLEDGEMENTS

The writer wishes to express her sincere thanks to Dr. Jean Putnam, whose creative inspiration and encouragement made this project possible. Thanks also to Drs. Richard Covington and Robert Irving, who served as committee members.

A special note of thanks is due to Drs. Everett Irish and Robert Smawley, who were of great assistance in statistical interpretation, and to Dr. Betty Hileman, whose support and reassurance continually inspired the writer.

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CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS

The acquisition of perceptual-motor skills has recently been stressed as an important phase of the young child's development (1,3,15). Research evidence has indicated the importance of perceptual-motor development, and many types of perceptual training programs have been implemented in the primary grades. The primary concern at this time seems to be how the perceptual-motor development effects the total development of the child, and what types of programs seem best suited for young children. A number of researchers have indicated an interest in the relationship which exists between a child's perceptual-motor development and his academic success (1,14,15), but very few studies have concerned themselves with the effectiveness of various types of training programs by which the perceptual-motor abilities could be developed, or what kinds of programs are most suitable for the young child in a regular elementary school atmosphere.

I. THE PROBLEM

Statement of the problem. It was the purpose of this study to investigate the effectiveness of a basic movement education program, presented by a physical ed-

ucation specialist, on the acquisition of perceptual-motor skills of kindergarten and grade one students.

Hypothesis. It is the intent of this study to test the following null hypothesis: There is no significant difference in perceptual-motor development as reflected by the Purdue Perceptual-Motor Survey between kindergarten and grade one students who received a program in movement education, and kindergarten and grade one students who received no special movement program.

Basic assumptions.

1. That the amount, if any, of previous perceptual-motor training was equally distributed among both control and experimental groups.

2. That the effects of all school and after school activities were equal among both control and experimental groups.

Importance of the study. Among educators and reseachers interested in how young children learn, the development of motor attributes and the effect it has on the total learning process of the young child, both the immediate and the future, has become a topic of much research and discussion. The need for children to develop a wide range of basic locomotor and perceptual-motor skills, such as balance, coordination, laterality and directionality, in preparation for the learning of more specific skills has

been recognized by many authorities (3,6,15).

It is becoming more and more evident that young children are not getting the movement experiences in today's society that were once taken for granted. Activities that were once a normal part of growing up are, in many cases, never experienced by today's young children. Climbing and balancing activities such as tree climbing or rail walking are almost non-existent for today's pre-schoolers. The use of wheeled vehicles and large outside toys has been limited to small spaces such as patios and driveways because of dangerous traffic conditions. Even opportunities for common locomotor movements such as running, jumping and skipping are severely limited by small yards and lack of open play space in many urban communities. Imaginative and creative play is successfully being stifled by toy manufacturers who have produced toys that restrict and discourage original activity on the part of the child. If children do not have the opportunity to build a sufficient movement background outside of the formal education system, then it may be necessary to include training of motor skills early in the child's educational program.

The results of studies done in relation to how young children learn may indicate a new role for physical education in the elementary school (29,30,33,34). There may be desirable goals to be considered in addition to the present aims of physical education in the elementary school, which

are stated by many authorities as being the development of fitness, strength, proper growth, and social awareness (16). A well-balanced movement education program for young children would not only help them build a basic background of motor activities to prepare them for more advanced motor skills, but could also be designed to develop perceptual-motor skills that may contribute to the total learning capacities of the child.

At the present time the perceptual-motor training being offered in some of the public schools is an outgrowth of the Kephart studies with the slow learner (14). The programs were designed after the perceptual training programs used with slow learners and rely mainly on conditioning and repetition. They may require from twenty to thirty minutes a day and can involve as many as seven or eight people to administer the program to a group of kindergarten or first grade students (35,36). Although the perceptual-motor skills of the children are being improved by the programs, many teachers and administrators are finding the programs impractical. Parents or other laymen in the community must be depended on for help, and it may be impossible to schedule either time or facilities in the already over-crowded and under-staffed schools.

In contrast to the above ideas some physical educators maintain that many activities employed in the perceptual-motor training programs are also found in good

physical education programs and that the physical education specialist may be the best equipped person on the teaching staff to supervise gross motor activities (32). Cratty has linked many of the perceptual-motor elements with physical education activities (3,4).

The immediate aim of this study was to contribute to the existing information being collected pertaining to how normal children develop gross perceptual-motor skills. The results could possibly aid in the planning of a more enriching physical education program in the primary grades, and might possibly assist in the integration of perceptual-motor training into the total school curriculum.

II. DEFINITION OF TERMS

Movement education: may be considered that phase of the education program which deals with the development of basic movement patterns, psycho-motor and perceptual-motor development. Basic principles and concept of movement are stressed in addition to the traditional skill development programs of physical activities.

Perceptual-motor skills: refers to those skills which are dependent upon the process of input information being interpreted and becoming meaningful information influencing ones movement output.

Perceptual-motor training: refers to the process

of educating children to see and react to their environment accurately, rapidly and completely.

Co-ordination: the ability to integrate movements of different kinds into a harmonious pattern. Co-ordination is composed of two main parts; laterality and directionality (20).

Laterality:

> Awareness of left and right, etc., within one's own body; also differentiating between one's own left side and one's right side. Laterality develops earlier than "directionality" and serves as its underpinning (20,p.134).

Directionality:

> Awareness of left, right-front, back-up, down- etc., in the world around you. This awareness stems from the internal sense of direction developed earlier, known as "laterality" (20,p.133).

Balance: the ability of the body to adjust the center of gravity in relation to any base of support, stationary or moving.

Body-image:

> The body scheme or total sensory impression of one's own body and its relationship to space and the world around it. Self-concept or self-picture of one's own body in space (10,p.303).

Physical education specialist: a member of a teaching staff who has had professional preparation in the field of physical education, possessing either a major or minor in elementary physical education and having been hired to teach primarily in the field of physical education.

CHAPTER II

REVIEW OF THE LITERATURE

In the search for truth and knowledge in any field of study, one must begin with an understanding of the basic fundamental facts of the field before going on to solve the more complex problems. To understand the perceptual-motor development and the patterns of motor learning in children, a knowledge of total motor development in the young child must be gained. Therefore the literature reviewed falls into two main categories. The first was a review of the literature concerning the very nature of perceptual-motor development. The studies that relate to the main stages of motor and perceptual-motor development are of prime importance in this section. The second section of the literature reviewed works that relate perceptual-motor development with the physical education program. Research indicating the existence of such a relationship, and programs in the physical education curriculum contributing to perceptual-motor development are included in this section.

I. THE NATURE OF PERCEPTUAL-MOTOR DEVELOPMENT

Human movement behavior is made up of several integral parts or phases. Cratty (3) lists them as verbal-

motor, perceptual-motor, fine-gross and simple-complex, with the difference between them being qualitative. As learning takes place, a motor act may shift from one portion to the next on the same continuum. Movement behavior of young children depends largely on the sensory-motor "feel" or kinesthesis. Since physical ability of the young child is almost inseparable from the other elements that determine total behavior, early development is often referred to as a process of perceptual-motor functioning. As the child grows older it becomes easier to separate one phase of behavior from another, and categorize perception according to a specific kind of sensory input.

Kephart (14) indicates that the basic motor development in the young child is not just a part of his behavior, but is the base from which all behavior evolves. By moving within his world, exploring and manipulating his own body in relation to things around him he is developing his sensory-motor process. Information is supplied by his senses, then it must be interpreted and analyzed before it becomes meaningful information and can be used to influence his behavior. Through exploratory and manipulative movements a child generates perceptual information and begins to relate such information to influence his behavior. It is only through movement that a child correlates input information with output behavior, and perceptual information becomes meaningful. As the child perfects the sensory-

motor process and learns to match sensory data to motor data, he builds up a plastic, adaptive perceptual-motor process that later will allow him to fit his behavior to the demands of the situation (13). The child's early motor encounters with the environment form the basic structure from which more complex perceptual-motor schemata can be developed. The more complex schemata would not depend on additional motor activity (18).

Smith and Smith (24) did extensive studies with children from 3.5 months to eight years of age. Their studies showed that children between ten and eighteen months could exercise some environmental control through generalized postural orientation motions, but could not make specific responses to control the environment. By the eighteenth to twenty-sixth month the child may add the second stage of movement, transport, to adapt to a situation. Space organized movements were more elaborate, and he could cope better with the stimuli in his environment. The more specific articulated types of control movement generally appear after the age of two years. Smith and Smith feel that the maturation necessary for the development of perceptual-motor schemata complex enough to equip the child with behavior patterns that will allow him to articulate and control the environment develop after the first year of life and are quite clearly defined by eighteen months to two years.

A comparison of studies made on "cradled" Hopi Indian children, and children suffering from maternal deprivation seems to support these theories. Indian children that had been restricted from large locomotor movements until around one year of age learned to walk almost as soon, and with the same amount of control as children who had been free of external confinement. They showed no arrest in behavioral patterns or the development of intelligence (17). An investigation of several cases of children suffering from maternal deprivation showed that children who had been severly restricted to play pens or cribs until the age of three or four showed several extreme movement and perceptual deficiencies. Some could not even stand, and indicated no desire to alter the environment through movement. Even after treatment the development of movement was labored and clumsy, and the children displayed marked learning deficiencies. Often it took until the age of six or seven for the children to have sufficient perceptual-motor schemata to control their bodies in relation to their environment (7,30). These studies seem to support the theory that the second year of life is a critical period for the building of a basic perceptual-motor schemata extensive enough for the achievement of normal movement and behavior patterns.

As the child grows into the pre-school or early childhood phase of development behavior becomes more

diversified with an increased development of the verbal and more complex cognitive process, but the perceptual-motor responses are still dominant. Mental and physical activities are still closely related and motor activity plays a major role in the intellectual development. Out of this early motor learning higher and more complex forms of behavior develop (14). Until the age of eight or nine the child's body forms his basic frame of reference (4).

During this period perceptual-motor skills become more dependent on environmental experiences than on neuromotor characteristics. The imitation, play, and simple games of the young child develop an increasingly skilled use of sense organs and the motor systems. It is most desirable if the functions of the muscle groups are developed for purposeful over-all usefulness so that they contribute to the general behavior adjustment and not to specific skills. Coordinated motor activity is required for the ability to learn advanced skills. The child must construct an awareness of body image which includes size, shape, laterality and directionality (14). He must learn, through movement and observation of movement, the relationship of the moving part to the rest of the body, as well as to external objects. Only through body image or kinesthetic perception does movement become spacially structured. Along with the perceptual abilities that develop in connection with large muscle action and the

posturing mechanism, sensory-perceptual abilities are developing in smaller, more manipulative aspects as well. Eye movements, eye-hand coordination and dexterity are also of prime importance during this period of development. These are also being developed through the interaction of the child's movement in relation to his environment.

Extensive studies with retarded and slow-learning children seem to indicate that the pre-school period of perceptual-motor development is a critical point in the development of intelligence and the ability to learn (22).

In conclusion, when considering motor development of the human, one must start even before the infant is born, for movement begins shortly after life itself begins. Some studies have detected movement as early as the eighth week of fetal life (24). Motor growth is not a random sort of growth, but unfolds in an orderly sequence. The trend is from the more generalized movements of total bodily adjustment to the mastery of locomotion, and then on to finer, more manipulative movements. The development of movement patterns follows the law of developmental direction as the growth wave begins at the head and travels toward the feet, (cephalo-caudal) or moves from the mid-point to the extremities (promimo-distal) (15). Control of the larger muscles of the trunk and upper body precedes the voluntary control of the smaller muscles and the movements of the lower body. By the age of five or six the

child may have experienced all of the basic movement patterns that he will possess, although they may be rudimentary and awkward.

III. PERCEPTUAL-MOTOR DEVELOPMENT AND THE PHYSICAL EDUCATION PROGRAM

The literature at this time relating perceptual-motor development with the physical education program is limited. Most of the interest in perceptual-motor development has been concerned with children who have been referred to clinics as having perceptual problems, or who are described as non-achievers. Research with normal children has been concerned with the results of perceptual-motor training programs as they relate to reading readiness, or other phases of school achievement (6,14,29,32). Relatively little information is available at this time concerning what types of perceptual-motor training programs seem to be most effective.

Hope Smith (31) expressed the importance of physical educators becoming aware of the relationship that exists between perceptual-motor development and the physical education program. She feels it is imperative that physical educators become acquainted with the perceptual training programs and the recent trends in research in this area. She states that the physical education teacher is probably the best qualified person in the school to supervise these activities, and that most perceptual-motor training

activities can be included in the physical education program.

A great contribution to the literature concerning the psychological and sociological aspects of perceptual-motor patterns has been made by Cratty (3,5,27,8). He indicates that perceptual-motor skills of early infancy seem dependent upon inherent neuromotor characteristics, while in later childhood it is more dependent upon learning and implies that activities which encourage this development should be included in physical education programs. He also notes the importance of exploration and problem solving on the part of the child involved in the motor learning process.

While this study was in process Cratty's book Perceptual-Motor Efficiency in Children (4) was published. This book written in conjunction with Sister Margaret Mary Martin contains a comprehensive review of the recent literature concerning movement and perception, the movement attributes of children, and the principles of perceptual-motor education. A large section of the book is devoted to activities in several areas that are conducive to improvement of perceptual-motor abilities, and testing devices by which to measure perceptual-motor development. Although he expresses no specific methods to be used, he repeatedly refers to instructional theories such as those of Muska Mosston which encourage child centered activities and problem solving learning, while de-emphasizing traditional exercise programs.

In a recent publication, Godfrey and Kephart (10) have collaborated their works on the principles of movement, developmental motor patterns, and perceptual-motor functioning to express the basic fundamentals of movement as related to movement education. They provide examples of how to build physical education programs incorporating many aspects of motor development, as well as the inclusion of perceptual-motor training activities, in a variety of teaching techniques as a part of the total physical education program. They include a small section devoted entirely to activities directly pertaining to special perceptual-motor development. They suggest having the children move about blindfolded or jump from heights to develop spatial relationships. Laterality and balance may be developed on the trampoline, or the walking board. Crossing the mid-line may be encouraged through throwing or passing games. Their ideas are expressed in generalization rather than specific activities and many of them are ideas expressed by Kephart in his other works.

Two valuable sources of information were unpublished master's theses investigating the effects of various programs on the perceptual-motor development of young children. Genevieve Painter (33) found that a carefully designed program of sensory-motor experiences brought about a significant gain in the areas of body image and perceptual-motor integrative skills of kindergarten children as

assessed by the Goodengough Draw-A-May, the Beery-Bujtenica Developmental Form Sequence and a sensory-motor-spatial performance test. Eileen Warrell (34) investigated the effect of three programs: (1) a movement education program, (2) a traditional or games oriented program, and (3) a program involving the children in art, singing and speaking upon the perceptual-motor and motor performance of first grade children. Her findings indicated no significant difference between the three groups after an eight week program, although small gain scores for the two physical education groups were noted. She recommended that further studies be made, investigating the effectiveness of various programs involving larger numbers of children and administered over a longer period of time.

The evidence connecting perceptual-motor development with the primary physical education programs seems to be more generalized than specific. All of the literature agrees that the development of these special perceptual-motor skills can be learned responses, and justifies the inclusion of them in some phase of the young child's education. Physical educators are beginning to see the relationship that does exist between the physical education program and the perceptual-motor training programs, and the areas to be investigated now seem to be the ways in which the perceptual-motor training can be most effective, and the most efficient ways of including it in the primary curriculum.

CHAPTER III

EXPERIMENTAL PROCEDURES

I. POPULATION AND THE SAMPLE

The children used in this study attended Kittitas Elementary School, Kittitas, Washington. They were all in regular kindergarten or grade one classrooms. None of the children had been identified as slow learners or special students. The socio-economic backgrounds of the children were similar as the community is largely rural. Farmers, semi-skilled and skilled laborers made up the majority of the occupations engaged in by the parents, with a few belonging to the professional and semi-professional groups. The kindergarten children were mostly age five, with some just turned six. The first grade children were six and seven. There were no selection procedures to determine which classroom the child would be in and each group was heterogeneous as far as sex and ability.

The afternoon kindergarten made up the experimental group K_E, and the morning kindergarten class made up the control group K_C. Both kindergarten classes had the same classroom teacher. One first grade made up the experimental group 1_E, and the remaining first grade class the control group 1_C. Each first grade group had a different classroom teacher. The afternoon kindergarten was chosen as the

experimental group because the physical education specialist was available only in the afternoon. The grade one experimental group was determined by a draw of teachers' names.

II. TESTING PROCEDURES

The Purdue Perceptual-Motor Survey (21) was designed as an instrument which would assess qualitatively the perceptual-motor abilities of children in the early grades. It will detect errors in perceptual-motor development, and allows the examiner to observe a series of perceptual-motor behaviors and isolate and designate areas for remediation. The survey items are specifically designed to be easy to administer, representative of behavior familiar to all children, regardless of socio-economic status, or sex, and is not overstructured so that it elicits a specific learned response. Each item measures one or more aspects of perceptual-motor learning. Kephart and Roach have obtained significant results on intercorrelations to indicate the feasibility of using individual scores for each test item, or using a total score for the survey. Both the mean scores and standard deviation were available for grades one through four.

Since this study concerned only gross motor activities rather than manipulative skills or ocular development, only the test items measuring balance, posture, body image and differentiation were used to assess the basic

perceptual-motor skills of the children. Seven subtests were used which contain a total of nine scorable tasks. All items were scored on a scale of one to four. See Appendix A for more detailed description of test items.

1. Walking board. The child was scored on three walking board tasks: (1) walking forward, (2) walking backward and (3) walking sidewise. A rating was given individually on each of the three tasks.

2. Jumping. The child was asked to perform eight hopping and jumping tasks. Each task was evaluated individually as adequate or inadequate, then a rating was assigned, based on the number of tasks adequately performed.

3. Identification of body parts. The child was instructed to touch his shoulders, hips, head, ankles, ears, feet, eyes, elbows and mouth. A rating was assigned based on the ability of the child to locate, and then touch the body parts with either one or both hands.

4. Imitation of movements. The child stood facing the examiner and imitated seventeen different arm positions. The rating was given on the basis of whether the child could follow the examiner and with what accuracy the movements were made.

5. Obstacle course. The child was asked to perform three simple tasks; (1) stepping over a broom handle held level with his knees. (2) going under the broom handle held about two inches below his shoulders, and (3) going

between a wall and the stick as the broom handle was held away from the wall just far enough so the child could get between the end of it and the wall. The child's performance was evaluated on the basis of his over-all ease or difficulty of performing all three tasks.

6. Kraus-Weber. The child performed two of the original tasks included in the Kraus-Weber test for physical fitness. (1) The child is to lie face down on a mat, with his hands on the back of his neck; he is asked to raise his head, shoulders, and chest off the floor for a count of ten. (2) He is then asked to rest his head on his hands and lift his legs about ten inches off the floor without bending his knees for a count of ten. The tasks are rated either pass or fail and a numerical rating is given according to whether he passes both tests, or fails either or both.

7. Angels-in-the-snow. The child lies on his back with his arms at his side and his feet together. From this position he was asked to perform ten different tasks involving adduction and abduction of the arms and legs. The child's performance receives a rating based on his over-all performance on the ten tasks.

All of the children were tested with the Purdue Perceptual-Motor Survey prior to the study. Physical education majors specializing in elementary physical education at Central Washington State College were used as testers. The children were post-tested at the end of the three month period of the study by the same group of testers.

III. THE PROGRAM

The experimental group program. The movement education program in which the two experimental groups took part was designed to offer the children movement experiences through which a basic background of movement patterns could be developed. The learning experiences were structured to include exploration, imitation and problem solving methods. The program involved the children in activities that would develop basic locomotor skills, balance, laterality, directionality and body image. A movement education program differs from the traditional games oriented physical education program in that the focus is on teaching the children basic movement concepts through physical activity, rather than teaching physical skills to the children so they can be used in various game situations. The movement education program included dance, gymnastic activities, and simple games as well as movement exploration of the fundamental locomotor and non-locomotor movements.

The kindergarten children (K_E) met with the physical education specialist for a period of thirty minutes for two days a week during the three month period of the study. The kindergarten program concentrated on the development of basic locomotor patterns and the awareness of the child's own body. Such concepts as over and under, around, in front, and behind were explored in a number of different movement

situations. The children were introduced to the basic principles of rhythm through creative dance activities. Through movement exploration they were encouraged to find out what their bodies could do, and were guided into discovering the basic concepts involved in balancing, stopping and starting, and the qualities of movement. The problem solving approach allowed the children to move and explore within their own individual physical capacities. The basic locomotor patterns were developed through simple games, many of them made up by the children themselves (see Appendix B for more detailed lesson plans.)

The first grade children (l_E) were involved in the movement education program for a period of thirty minutes, three times a week, for the three month period. They encountered the fundamentals of movement through movement exploration, simple games, gymnastic activities and creative dance. Locomotor and non-locomotor patterns were developed. The children were introduced to the basic principles of balance, center of gravity and force. They worked on coordination activities and explored such movement parameters as flexion and extension, contraction and relaxation, and movement qualities. The children worked with the elements of movement in concrete game situations as well as in more abstract creative activities. A progression from simple to more complex movement patterns was developed as the material presented continually demanded

more complicated movement responses. Throughout the program the children were allowed to work within their individual skill levels. (See Appendix C for more detailed lesson plans.)

The control group program. The control groups K_C and 1_C continued with the regular course of study as established by the classroom teacher. All activities that would have been offered the children had there not been a study were carried out in the usual manner. No attempt was made to influence their curriculum, by either adding or omitting any classroom or outside activities. There were no special perceptual-motor training programs in existence at the time of the study. The physical education program was the responsibility of the classroom teachers as the school district has no physical education specialist for the elementary school.

IV. STATISTICAL PROCEDURES

The following statistical procedures were used:

1. Mean scores and standard deviations were figured for each scorable test item for all groups on both pre-and post-test scores to determine the significance of difference between the experimental and the control groups both prior to and subsequent to the movement education program.

2. Change scores were obtained by finding the

difference between initial and final mean scores on each test item. The t test was administered to the change scores to determine the significance of the difference of the change between the experimental and the control groups.

3. Gain scores were obtained by finding the number of children making a gain (+), making no change (0), and showing a loss (-) on each test item for each group. Z values were obtained by the sign test. (Formulas used and additional statistical information are found in Appendix D.)

The significance of the difference between the control and experimental groups was determined at both the .05 and the .01 level. Conclusions were drawn from a careful analysis of the data collected.

CHAPTER IV

ANALYSIS OF THE DATA

The design of the study involved subjecting two experimental groups of children to a movement education program, taught by a physical education specialist, for a period of three months. Two control groups of children were deprived of the program in order to assess the effectiveness of the movement program upon the perceptual-motor development of the experimental group. One experimental group (K_E) and one control group (K_C), were kindergarten children, and one experimental group (1_E) and one control group (1_C) were first grade children at Kittitas Elementary School, Kittitas, Washington.

The children were given a pre- and post-test containing the first seven items of the Purdue Perceptual-Motor Survey. The Survey was used to indicate the perceptual-motor development of the children.

In order to test the null hypothesis regarding the difference between the experimental and the control groups on the test items selected to indicate perceptual-motor development, the following statistical procedures were employed:

1. The student t test was utilized to test the significance of difference between mean scores for each of

the nine scorable items for both experimental and control groups on the pre- and post-test.

2. Change scores were obtained by finding the difference between initial and final mean scores on each test item. The t test was administered to the change scores to determine the significance of the difference of the change between the experimental and the control groups.

3. A summary of gain scores was made; pre- and post-test scores were analyzed. The number of children making a gain (+), those remaining unchanged (0), and those showing a loss (-) were identified for each group on each test item. The Z values were obtained by the sign test (Appendix D).

I. INTERPRETATION OF PRE-TEST AND POST-TEST t RATIOS

The student t test was administered to both pre- and post-test mean scores. The mean scores for the experimental group were compared to the mean scores of the control group for both kindergarten and grade one. Tables containing the mean score, standard deviation and t ratios for each group on both pre- and post-test are included in Appendix D.

Pre-test. An analysis of t ratios for the kindergarten pre-test indicated that there was no significant difference on any of the nine test items between the experimental and the control group at the beginning of the program. (Table I).

The pre-test scores for grade one showed a significant difference between experimental and control group on only one test item. The two groups can be considered not significantly different on all but the item indicating strength (Table II).

Post-test. The post-test *t* ratios for the kindergarten group of children revealed a significant difference on four test items at the .01 level of significance, and one test item at the .05 level of significance. The kindergarten control and experimental groups are considered to be significantly different in five areas after the movement education program (Table I).

The grade one post-test *t* ratio shows a significant difference on three test items at the .01 level of significance and one at the .05 level. The test item indicating strength (Kraus-Weber test) which was significant at the beginning of the program was no longer significantly different. There were more areas showing a significant difference at the end of the program than at the beginning, so the groups may be considered to be more different on post-test scores than on pre-test scores (Table II).

II. INTERPRETATION OF CHANGE SCORES

The change scores were obtained by calculating the difference between the initial and the final mean scores. A positive value implied a gain since the final mean score

TABLE I

A COMPARISON OF PRE AND POST-TEST MEAN SCORES AND *t* RATIOS FOR KINDERGARTEN

Test Items	Pre-test			Post-test		
	Mean Scores		*t* Ratio	Mean Scores		*t* Ratio
	K_C	K_E		K_C	K_E	
1. Walking Board Forward	2.35	2.33	0.093	2.42	2.66	1.15
Backward	1.57	1.55	0.075	1.42	1.61	0.87
Sidewise	1.85	1.55	1.91	1.71	1.77	0.40
2. Jumping	2.42	2.50	0.236	2.57	3.33	2.95**
3. Identification of Body Parts	2.14	2.33	0.841	2.42	3.72	7.05**
4. Imitation of Movement	2.92	2.72	1.59	2.92	3.00	1.00
5. Obstacle Course	2.71	2.50	0.833	2.78	3.77	4.67**
6. Kraus-Weber	2.35	2.33	0.052	3.07	3.88	2.58*
7. Angels-in-the-snow	2.28	2.33	0.229	2.42	3.05	4.23**

(n_c=14) (n_e=18) (df=30)

*indicates significant difference where 0.05 level=2.021

**indicates significant difference where 0.01 level=2.704

(supporting data in Appendix D)

TABLE II

A COMPARISON OF PRE AND POST-TEST MEAN SCORES AND *t* RATIOS FOR GRADE ONE

Test Items	Pre-test			Post-test		
	Mean Scores		*t* Ratio	Mean Scores		*t* Ratio
	l_C	l_E		l_C	l_E	
1. Walking Board Forward	2.77	2.73	0.225	2.72	2.78	0.353
Backward	2.16	1.82	1.640	2.16	2.04	0.663
Sidewise	1.94	2.04	0.683	1.94	2.08	1.060
2. Jumping	2.66	2.52	0.810	2.88	3.56	5.200**
3. Identification of Body Parts	3.16	2.78	1.920	3.27	3.87	3.890**
4. Imitation of Movement	2.88	2.78	0.898	2.88	3.00	1.440
5. Obstacle Course	2.83	3.26	1.740	3.16	3.78	2.240*
6. Kraus-Weber	3.27	2.69	2.580*	3.50	3.65	0.621
7. Angels-in-the snow	2.50	2.56	0.404	2.61	3.65	6.710**

(n_C=18) (n_e=23) (df=39)

*indicates significant difference where 0.05 level=2.021

**indicates significant difference where 0.01 level=2.704

numerically exceeded the initial mean score. A negative score occurred where the initial mean score exceeded the final mean score. The zero value indicated identical mean scores on the initial and the final tests. The student t test was administered to the change scores to indicate the significance of the difference between control group change and experimental group change.

Kindergarten. There was a positive change score on all nine of the test items for the kindergarten experimental group (K_E). There was a negative change on the walking board backward and sidewise for the kindergarten control group, and no change on the imitation of movement test item (K_C). The (1) jumping, (2) identification of body parts, and (3) obstacle course t ratio were also significant at the .01 level and the t test showed the change to be significant at the .05 level on one of the test items (Table III).

Grade one. There was a positive change score on all nine of the test items for the grade one experimental group (1_E). The control grade one (1_C) had no change on three items: (1) walking board backward and (2) sidewise and (3) imitation of body movement. There was a negative change on the walking board forward. The t ratio for the jumping item, and the angels-in-the-snow item were significant at the .01 level. The t test showed the change to be significant at the .05 level on one additional test item, the Kraus-Weber.

TABLE III

A COMPARISON OF PRE AND POST-TEST MEAN, CHANGE SCORES AND CHANGE *t*

FOR KINDERGARTEN

Test Item	Mean Scores K_C Pre	K_C Post	K_E Pre	K_E Post	Change K_C	Change K_E	Change *t*
1. Walking Board Forward	2.35	2.42	2.33	2.66	.07	.33	1.301
Backward	1.57	1.42	1.55	1.61	- .15	+ .06	1.051
Sidewise	1.85	1.71	1.55	1.77	- .14	+ .22	1.902
2. Jumping	2.42	2.57	2.50	3.33	.15	.83	3.269**
3. Identification of body parts	2.14	2.42	2.33	3.72	.28	1.39	4.444**
4. Imitation of Movements	2.92	2.92	2.72	3.00	.00	.28	1.401
5. Obstacle course	2.71	2.78	2.50	3.77	.07	1.27	4.804**
6. Kraus-Weber	2.35	3.07	2.33	3.88	.72	1.55	2.077*
7. Angels-in-the-snow	2.28	2.42	2.33	3.05	.14	.72	1.935
	(n_c=14)		(n_e=18)				(df=30)

*indicates significant difference where .05 level=2.021
**indicates significant difference where 0.01 level=2.704

TABLE IV

A COMPARISON OF PRE AND POST-TEST MEAN, CHANGE SCORES AND CHANGE *t*

FOR GRADE ONE

Test Item	Mean Scores $^{1}_{C}$ Pre	Post	$^{1}_{E}$ Pre	Post	Change $^{1}_{C}$	$^{1}_{E}$	Change *t*
1. Walking Board Forward	2.77	2.72	2.73	2.78	- .05	.05	.392
Backward	2.16	2.16	1.82	2.04	.00	.22	1.036
Sidewise	1.94	1.94	2.04	2.08	.00	.04	.235
2. Jumping	2.66	2.88	2.52	3.56	.22	1.04	3.219**
3. Identification of body parts	3.16	3.27	2.78	3.87	.71	1.09	1.785
4. Imitation of Movement	2.88	2.88	2.78	3.00	.00	.22	1.729
5. Obstacle course	2.83	3.16	3.26	3.78	.33	.52	.890
6. Kraus-Weber	3.27	3.50	2.69	3.65	.23	.96	2.146*
7. Angels-in-the-snow	2.50	2.61	2.56	2.65	.11	1.09	4.615**
	(n_c=18)		(n_e=23)				(df=39)

*indicates significant difference where .05 level=2.021
**indicates significant difference where 0.01 level=2.704

III. ANALYSIS OF GAIN SCORES

The test scores for each grade level were analyzed and the number of children making a gain, showing no gain, and showing a loss were determined for each test item. A positive value on change scores implied a gain (+), the zero value (0) indicated the mean scores on the initial and final test scores were identical, a negative (-) score indicated the number of children scoring higher on the initial test than on the final test. Z values for the gain scores were determined by the sign test to indicate test items where the gain is significant at the .01 level, and the .05 level. No values are given where the gain score proved to be zero or negative.

Kindergarten. The kindergarten experimental group (K_E) made more gain scores than did the kindergarten control group (K_C). The experimental group (K_E) showed no negative scores, while the control group (K_C) had some children with negative scores on five test items. The gain for the experimental group (K_E) was significant at the .01 level on five of the test items: (1) jumping, (2) identification of body parts, (3) obstacle course, (4) Kraus-Weber, and (5) angels-in-the-snow. The kindergarten experimental group (K_E) can be considered to have made significantly better gains on the perceptual-motor survey, on over half of the test items as indicated by significant differences at the

.01 level (Tables V & VI).

Grade one. More children in the grade one experimental (1_E) group made gains on all of the test items than did the children in the control group (1_C). Five of the areas were significant at the .01 level, (1) jumping, (2) identification of body parts, (3) obstacle course, (4) Kraus-Weber, and (5) angels-in-the-snow. The two groups may be considered dissimilar as there was a significant gain on the part of the experimental group (1_E) on more than half of the test items in the perceptual-motor survey (Tables V & VI).

TABLE V

SUMMARY OF GAIN SCORES

Item		Sign values according to group			
		K_C (n=14)	K_E (n=18)	l_C (n=18)	l_E (n=23)
1. Walking board Forward	+	1	6	2	3
	0	13	12	15	18
	-	0	0	1	2
Backward	+	1	1	1	5
	0	8	17	16	18
	-	5	0	1	0
Sidewise	+	0	3	0	3
	0	12	15	15	15
	-	2	0	0	2
2. Jumping	+	3	12	4	18
	0	10	6	14	3
	-	1	0	0	0
3. Identification of body parts	+	4	16	2	20
	0	10	2	14	3
	-	0	0	0	0
4. Imitation of movement	+	0	5	0	5
	0	14	13	18	18
	-	0	0	0	0
5. Obstacle course	+	1	15	6	11
	0	13	2	12	12
	-	0	0	0	0
6. Kraus-Weber	+	6	14	3	16
	0	7	4	14	7
	-	1	0	1	0
7. Angels-in-the-snow	+	3	11	2	20
	0	10	7	16	3
	-	1	0	0	0

TABLE VI

Z VALUES FOR GAIN SCORES ON THE SIGN TEST

Test Items	Groups			
	K_C	K_E	1_C	1_E
1. Balance board Forward	0.960	1.199	-	-
Backward	-	0.960	-	0.562
Sidewise	0.771	0.396	-	-
2. Jumping	1.921	5.215**	0.079	5.799**
3. Identification of body parts	0.079	8.161**	0.771	11.221**
4. Imitation of movement	-	0.612	-	0.612
5. Obstacle course	0.960	7.415**	1.199	4.499**
6. Kraus-Weber	0.181	6.679**	1.921	8.151**
7. Angels-in-the-snow	1.921	4.501**	0.771	11.221**
	(n_c=14)	(n_e=18)	(n_c=18)	(n_e=23)

No values are given where the gain scores proved to be zero or negative.

* Indicates significant difference where .05 level=2.09

** Indicates significant difference where .01 level=2.85

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY

The purpose of the study was to investigate the effectiveness of a movement education program on the development of perceptual-motor skills of young children. The intent of the study was to test the null hypothesis that a movement education program would have no significant effect on the perceptual-motor development of kindergarten and grade one students.

A movement education program was administered by a physical education specialist to one group each of kindergarten (K_E) and grade one (1_E) children for a period of three months. One group each of kindergarten (K_C) and grade one (1_C) children were deprived of the movement program, although all other school activities were the same for both groups of kindergarteners, and both groups of first graders. The perceptual-motor development was evaluated both prior to and subsequent to the movement program by the first seven items of the Purdue Perceptual-Motor Survey.

The following statistical procedures were employed to test the null hypothesis stated in chapter one: (1) The

t test was administered to the mean scores for each group, to determine the significance of difference between the experimental and the control groups on both pre- and post-tests. (2) Change scores were obtained and the *t* test was administered to determine the significance of the difference of change. (3) An analysis of gain scores was made, and the values were obtained by the sign test to determine the significance of the difference of numbers of children making a gain.

II. DISCUSSION

On close examination of the gain scores indicated in Table V, Chapter IV, it may be observed that there was a larger percentage of both kindergarten and grade one children in the experimental groups showing a gain on the jumping, identification of body parts, and angels-in-the-snow test items. It may be concluded that the movement education was especially beneficial in these areas. One of the basic goals of movement education is the structuring of opportunities that will enable a child to become aware of himself and what he can do. The jumping and angels-in-the-snow tests were designed to assess the areas of basic locomotor patterns, control and body image.

The improvement made by the grade one experimental group (1_E) on the angels-in-the-snow test items seems to be due to the elimination of all overflow into unused

limbs (see sample test booklet Appendix A). All but three of the children in the group made a gain on the test item and fifteen of the twenty three children in the group made a perfect score on the test item. The movement education program may have provided these children with the opportunity to develop a degree of control not associated with the normal growth and development of this age group.

Although there was no way to test attitude or other areas which the movement education program may have effected, the testers noticed that demonstrations were unnecessary for the children of the two experimental groups on the post-test. The children were able to follow the tester's verbal directions and carry out the task they were directed to do, while many of the children in the control groups, especially from the kindergarten group, needed demonstration of a test before they were able to perform.

An examination of the K_E post test scores (Table III, Chapter IV) reveals a higher mean score on all of the test items except the walking board tests, than the post-test mean scores for group 1_C (Table IV, Chapter IV). All of the 1_C pre-test mean scores were higher than K_E pre-test mean scores, revealing that the kindergarten experimental group of children made more improvement in perceptual-motor development during the period of the study than did the control grade one in a one year period of maturation. This may indicate that the kindergarten age level is a

critical period for the development of perceptual-motor skills. If further studies support this observation then perceptual-motor training should be made an integral part of the kindergarten curriculum.

III. CONCLUSIONS

Initial and final test scores. The *t* ratio for initial test scores indicated no significant difference between the two kindergarten classes. The final *t* ratio for kindergarten indicated a significant difference between groups on four items at the .01 level, and one additional item at the .05 level of significance. For grades one there was a significant difference on only one test item at the .05 level on the pre-test. The final *t* ratio for grade one indicated a significant difference between groups on three test items at the .01 level, and one additional item at the .05 level of significance.

Difference scores. The change *t* ratio indicated a significant difference between pre- and post-test scores for the kindergarten group on three test items at the .01 level of significance, and one additional test item at the .05 level of significance. The grade one change *t* ratio indicated a significant difference between pre- and post-test scores on two test items at the .01 level of significance, and one test item at the .05 level of significance.

Gain scores. The analysis of gain scores and the Z values revealed that more children in the two experimental groups made gains on all test items than did the children in the two control groups. For the kindergarten the number of children making a gain was significant on five test items, at the .01 level. The number of grade one children making a significant gain was indicated on five test items at the .01 level. Since the gains were significant on more than half of the test items both experimental groups were considered to have made significantly better gain scores on the Purdue Perceptual-Motor Survey than did the two control groups.

From the analysis of the above data it was concluded that the null hypothesis as stated in Chapter I may be rejected. At the end of the movement education program there was a significant difference between the two experimental and the two control groups on enough of the test items to consider them dissimilar.

The results of this study indicate a significant improvement in perceptual-motor skills among both kindergarten and grade one children who took part in a movement education program, making it possible to concur with the theories of Kephart (15) and Cratty (3) that perceptual-motor development is a result of learning rather than a matter of maturation.

If this sample is indicitive of the learning

patterns of young children then it can be stated that a movement education program using a problem solving method, and presented by a physical education specialist will give children the opportunity to develop basic perceptual-motor skills.

IV. RECOMMENDATIONS

A noticeable lack of gain, or in some cases even a loss on the walking board tasks, may indicate the need for some revisions of this test item. On the Kephart survey (21) there is no way to score the child that performs somewhere between stepping off the board more than once (forward), or twice (backward and sidewise), and the child who cannot perform the task. Many of the children seemed to have some degree of control on the walking board, but stepped off three or four times. There was a definite difference in the quality of their performance and the performance of children who demonstrated a definite lack of balance and control. An expanded scoring system which would enable greater differentiation between performances may be desirable. In addition to the walking board test items some measure of static balance should be added to the test (4).

This study was concerned with the effects of a movement education program on just the perceptual-motor development of the young child. To determine the effects of movement education of other aspects of the child's

development further studies must be conducted.

To determine whether the gain made by the kindergarten children had any lasting effect on their development, a follow up study of these children in the first grade may be desirable.

A comparison of the gains made in the area of perceptual-motor development by the children in the movement education program, with gains made by children taking part in other kinds of perceptual-motor training programs may be of value in determining the best ways in which to incorporate perceptual-motor training into the school curriculum.

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APPENDIX A

APPENDIX A

THE TEST ITEMS*

Walking Board. The walking board tests are designed to measure dynamic balance. The child is asked to walk a two-by-four board measuring eight to twelve feet long and placed on brackets. The child is directed to walk the board forward, then backward, and then sidewise. Three scores are given, one for each task. The child is not told how to walk the board, and the tasks are left as unstructured as possible, so the normal or customary behavior can be observed. If any amount of structuring is necessary to get the child to perform, it must be noted on the score sheet.

Scoring:

Forward

4. If the child walks easily and maintains dynamic body balance throughout.

3. If the child has occasional difficulty but is able to regain balance each time.

2. If the child steps off the board more than once, or if he pauses frequently and has difficulty regaining balance.

1. If the child cannot walk at least one-fourth of

* Test items taken from Purdue Perceptual-Motor Survey (20)

the board, or if he runs to avoid using balance.

Backward

4. If the child walks easily without looking behind.

3. If the child has occasional difficulty but is able to regain balance without stepping off.

2. If the child steps off the board more than twice, or if he pauses frequently and looks behind him.

1. If the child cannot walk at least half the board, or if he must continually feel with his toe.

Sidewise

4. If the child walks easily in either direction.

3. If the child has occasional difficulty but is able to regain balance each time.

2. If the child steps off the board more than two times, or if he has difficulty regaining balance.

1. If the child cannot perform, or if his performance is markedly better in one direction.

Jumping. The jumping subtest has been included to detect problems in laterality, body image, rhythm, or neuromuscular control. The child is asked to perform eight different hopping and jumping tasks. The first is designed to present a bilateral activity, the second and third, are unilateral tasks, the fourth, fifth, and sixth are alternating tasks in a regular pattern, and the seventh and eighth are irregular alternating patterns.

In task one the child is instructed to place both feet together and jump one step forward. Task two the child is to stand on his right foot with the left foot off the floor, then jump one step forward, for task three the child repeats task two on the other foot. Task four involves skipping and the child is asked to skip around the room. The last four tasks involve hopping, (5) first the child must hop once on the right foot and then once on the left, (6) then twice on the right and twice on the left, (7) next, the child must hop twice on the right and once on the left, finally (8), the child must hop twice on the left, and once on the right.

Scoring: Each task is evaluated as being adequate or inadequate, and the total rating is based on the number of tasks adequately performed.

4. If the child performs all tasks easily.

3. If the child can do tasks one through six adequately.

2. If the child can do tasks one through five adequately.

1. If the child can do fewer than five of the tasks adequately.

Identification of body parts. This test involves space localization, and body image. Bilateral relationships of paired parts is indicated by the response of the child, if both members of a paired body part are touched

simultaneously. A cross lateral response is required when the child is asked to touch his elbows.

The child is instructed to stand facing the examiner, and then he is asked to "touch your shoulders." Then in turn he must touch the hips, head, ankles, ears, feet, eyes, elbows, and mouth.

Scoring: A rating is assigned based on the child's overall performance.

4. If the child performs adequately throughout.

3. If he shows only slight hesitancy or confusion.

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

1. If the child is unable to identify more than one of the parts called for.

Imitation of movements. This is a modification of semaphore movements, and measures neuromuscular control and the translation of visual clues into motor responses. Three types of movements are required, (1) unilateral, (2) bilateral, and (3) contralateral. The child's response can be one of either parallel movement, or mirror image. A parallel movement is very seldom demonstrated by elementary children. The consistancy of the movement is of prime importance, the child that sometimes mirrors and sometimes parallels is apt to have some laterality difficulties. The examiner should observe the child's movements with

respect to their promptness, preciseness, and definiteness.

The child is instructed to stand facing the examiner, and then directed to "move your arms just like I do." The examiner then moves through each of the seventeen arm positions in order, waiting for the child's response to each position.

Scoring: Performance ratings are based on an overall performance.

4. If the child parallels the pattern and performs promptly, consistently and surely.

3. If the child mirrors the examiner, but performs promptly, consistently, and surely.

2. If the child shows hesitation or lack of certainty.

1. If the child makes more than one error, or if the movements are abortive.

Obstacle course. This test was designed to see how a child reacts spatially to objects in his environment. A broom handle or stick is used as an obstacle. The stick is first held about level with the child's knee, and the child is asked to step over it. It is then held shoulder height, and the child is asked to go under it. It is then held away from the wall just far enough so the child can get between the end of it and the wall and the child is asked to go between the wall and the stick without touching either.

Scoring: The child's performance is evaluated on the basis of his overall performance.

4. If his performance is adequate throughout.

3. If he makes only a slight error which he corrects easily.

2. If he is able to correct himself on one repetition.

1. If he over-estimates or under-estimates more than two inches or cannot correct himself.

Kraus-Weber. A high correlation between tasks 4 and 5 of the Kraus-Weber series and school achievement among elementary school children prompted the inclusion of these two items in this test. The first is the chest lift, and the second the leg lift. The child is instructed to lie face down on a mat, he is then directed to place his hands on the back of his neck, and raise his head, shoulders, and chest off the floor for the count of ten. He is then asked to rest his head on his hands and raise his legs about ten inches off the floor without bending his knees for the count of ten. The child either passes or fails each test.

Scoring:

4. Passes both tests

3. Fails test 5

2. Fails test 4

1. Fails both tests.

Angels-in-the-snow. This subtest is a modification of the game called "angels-in-the-snow" and thereby derives its name. The child lies down in the snow and moves his arms and legs to make a pattern. This test is useful in detecting problems in neuromuscular differentiation and specific problems with right-or left-sidedness. Both bilateral and cross lateral skills are involved in this test. The child must first identify the part to be moved, move the limb so identified, and prevent an overflow from this movement into other limbs.

Ten tasks are presented to the child. The child is asked to lie on the floor, and a short practice session may be permitted, where the child pretends to make "angels-in-the-snow." (1) The child is asked to move only the right arm out, then back in, (2) next the left arm, (3) then just the right leg, (4) and last just the left leg. (5) The child is then asked to move both arms out, and then back, (6) then both legs out and then back in. (7) The child is then directed to move the left limbs out and back, (8) and then the right. (9) The right arm and the left leg are to be moved out and then back in, (10) then the left arm and the right leg.

Scoring: The child's performance received a rating based on his overall performance.

4. If the child performs adequately throughout all the tasks.

3. If the child shows only slight hesitancy in

some of the patterns. If he shows restricted movement or overflow which can be corrected.

2. If the child shows marked hesitancy and if the movement is restricted and cannot be corrected.

1. If the child cannot perform one or more of the tasks, or if there is a great deal of overflow to limbs not required in the pattern (20).

	Score 4	3	2	1		
Walking Board: Forward					Balance and Posture	
Backward						
Sidewise						
Jumping						
Indentification of Body Parts					Body Image and Differentiation	
Imitation of Movement						
Obstacle Course						
Kraus-Weber						
Angels-in-the snow						

BALANCE AND POSTURAL FLEXIBILITY

1. Walking Board

Forward

Steps off board	____	Comments
Pauses frequently	____	
Uses one side of body more consistently than other	____	
Avoids Balance:		
Runs	____	
Long steps	____	
Feet crosswise of board	____	
Maintains inflexible posture	____	Score ☐

Backward

Steps off board	____	Comments
Pauses frequently	____	
Uses one side of body more consistently than other	____	
Avoids balance:		
Runs	____	
Long steps	____	
Feet crosswise of board	____	
Twists body to see where he is going	____	
Must look at feet	____	
Maintains inflexible posture	____	Score ☐

Sidewise

Unable to shift weight from one foot to the other	____	Comments
Confusing or hesitation in shifting weight	____	
Crosses one foot over the other	____	
Steps off board	____	
Performs more easily in one direction than the other:		
Right lead	____	
Left lead	____	Score ☐

2. Jumping

Both feet

Cannot keep both feet together	____	Comments
Uses one side of body only	____	
"Ties" one side of body to the other	____	

One foot

Postural shift not smooth	____	Comments
Cannot keep opposite foot off the floor	____	
Performance better on one foot than other:		
Right	____	
Left	____	

Skip

Movement not free	____	Comments
Hesitates after each step to determine which side to use	____	

Hop

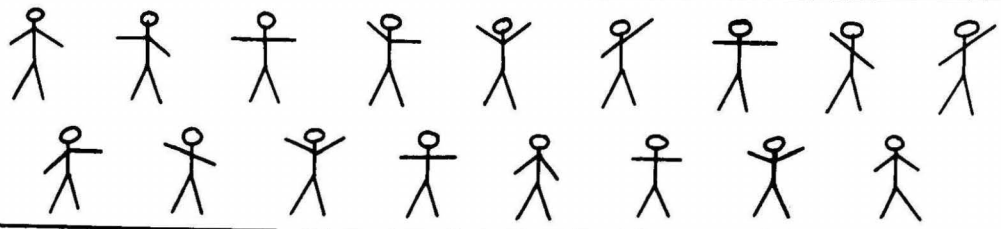
Cannot remain in one spot while performing	____	Comments
Cannot shift easily from side to side	____	
Movements jerky and lack rhythm:		
All patterns	____	
Asymetrical patterns only	____	

Score ☐

3. Identification Of Body Parts

Show hesitancy in one or more responses	____	Comments
Does not touch both members of paired parts	____	
Must "feel around" to find parts	____	
Makes more than one error in identification	____	Score ☐

4. Imitation Of Movement



Does not mirror the patterns	____	Comments
Not consistent (sometimes mirror sometimes parallel)	____	
Shows hesitation or lack of certainty	____	
Makes abortive movements	____	
Moves wrong limb	____	
Does not recognize errors spontaneously	____	
Recognizes errors after some delay	____	Score ☐

5. Obstacle Course

Going over

Overestimates (steps too high)	____	Comments
Catches foot on bar	____	
Cannot correct on one repetition	____	

Going under

Knocks bar off	____	Comments
Bends too low to clear bar	____	
Cannot correct on one repetition	____	

Going between

Does not turn body	____	Comments ☐

6. Kraus-Weber

Cannot raise chest and hold	____	Comments
Cannot raise legs and hold	____	☐

7. Angels-In-The-Snow

		Comments
Must look from one limb to the other to identify	____	
Cannot identify by visual data alone	____	
Requires tactual information to identify limbs	____	
Taps or moves limb on floor to identify	____	
Abortive movements to get started	____	
Hesitation at beginning of movement	____	
Movements are hesitant and jerky	____	
Overflow into other limbs than those called for	____	
Movements do not reach maximum extension	____	
Requests repetition of instructions	____	
Cannot correct response on one repetition	____	

Score ☐

APPENDIX B

APPENDIX B

UNIT OVERVIEW FOR KINDERGARTEN

January 5

Get to know children

Introduce Mr. Drum, stop, look and listen

Exploration of locomotor movements

Space - make yourself as small, large, bent, stretched as you can

Relaxation - find your own space on the floor and collapse

January 7

Body awareness - ankles, knees, feet

Locomotion walking-high, low, fast, slow etc. Galloping

Relaxation - lie on floor and find heart, feel the rhythm, clap the rhythm.

Wiggle worms

Exploration - how many ways to go up and down

January 12

Follow the leader

Stop and go

Collapse, and relax thinking of relaxing the feet

Balance - points (large parts) - patches (small parts)

January 14

Balance - different patches and points

Move on different patches and points

Red light - Green light

Make your body very still, very busy

Simon says

January 19

Obstacle course

Mother may I

Run, stop, start, change directions

Body awareness - lie down and find your heart feel it in other parts of your body

January 21

Running, galloping, alone and with partner

Moving on back-not going anyplace, but moving different parts of the body while on back

Simon says

Balance - walking on benches

January 26

Moving low, high, wide, skinny, up, down

Moving with feet going first, head, hands

Animal walks

Relaxation

Jumping off benches

January 28

Running, jumping, hopping

Rhythms - bunny hop

Red light - Green light

Relaxation - hibernating bears

Bear walk

February 2

Horses and ponies, walk, trot, gallop, run, jump, stop

Make bridges

Bend and stretch, contract and relax, flex and extend

Over and under tables

February 4

Simon says

Swinging and turning

Balance two feet low and high, one foot low and high

Relaxation

Acting out game (non verbal communication)

February 9

Follow the leader

Rhythms - marching

Animal walks

Jump and roll

Run, jump, fall and roll

February 11

Body awareness - back, elbows, shoulders

Locomotion, small and low, narrow and tall, wiggle worms

Going over, under and around benches

Relaxation

Follow the leader

February 16

Hopping, both feet, one foot, step and hop

Going over and under with partner

Rhythms - marching and bunny hop

February 18

Jumping ropes - exploration, in and out etc.

Frog in the puddle

(see detailed lesson plan)

February 25

Non-locomotor movements

Rhythms - Dusky Indians

Relaxation - sleeping indians

Creeping, sneeking, crawling

March 2

Bean bags

Throwing, catching

Balancing - in one place, moving

Over and under the bag

March 4

Obstacle course

Acting out game

Rhythms - improvisation to music

Relaxation with music

March 9

Acting out to music

Little bear story

Moving like the characters in the story

March 11

Wands - Exploration

Horses

Relaxation

March 16

Hopping and skipping

Follow the leader (over and under)

Relaxation

Rolling, (log, egg, forward)

March 18

Jumping rope (using the rope in many different ways)

Relaxation

Frog in the puddle

March 23

Jumping ropes and wands (using the rope and wands im many different ways)

March 25

Going over, under and around other children - with partners

Rhythms - Dusky Indians

Bridges and roads

March 30

Simon says

Obstacle course

Rhythms - instruments

April 1

Post-testing

SAMPLE LESSON PLAN

KINDERGARTEN

OBJECTIVES:

1. To develop a physical awareness of in and out.
2. To give the children an opportunity to develop skills using a rope.
3. To give the children the opportunity to use large locomotor patterns such as running, jumping and skipping.
4. To give the children the opportunity to take part in a game situation.

EQUIPMENT:

Ropes of various lengths.

TEACHING CUES:

As the children come into class they select a rope of their choice and choose an area on the floor. They are allowed to use the ropes in any way they wish for a few minutes.

Problem	Example responses
"How many ways can you find to move using your rope?"	Walk holding rope Run holding rope Skip using rope Jumping rope Swinging rope Twirling rope

(The teacher selects the responses which are desired, and points this out to the other students.)

"Tommy is using his rope to jump over, let's all try to jump like Tommy. Can you count the number of jumps you can make. See if you can jump on one leg. See if you can jump faster ..... now slower. Which way is the easiest?"

Problem	Example Responses
"Lay your ropes on the floor in a circle, and find as many different ways as you can to get in and out of your circle.	Walking, hopping, jumping, crawling, in and out of the circle.
Can you use both feet, one foot, one foot and one hand? Can you move in and out of your circle without using your feet.	
Can you move about the room fast without going into anyones circle. Can you move about the room staying inside your own circle."	

The students should now be given a time to rest. The children are directed to lie on the floor, and think of as many things as they can that are round and that you can get inside.

After a short rest period, the children are introduced to a new game.

FROG IN THE PUDDLE

"Today we have been using our ropes in many different ways, now we are going to use them in a new way. We are going to place our ropes in a circle on the floor. No rope may be touching another, there must be room to walk in between the ropes. (Children place ropes.) Your ropes are going to become mud puddles, and as we know children are not supposed to walk in puddles. All around the puddles are trees, the trees are in a deep forest. Can you close your eyes and see the trees. You are all walking through the forest. I am a witch and I can change children

into frogs, and frogs into children. When I say FROG IN THE PUDDLE, you must run to the closest puddle and jump into it. When I say CHILDREN IN THE WOODS, you may be children and run and jump and play in the woods."

After the game has been played for a few minutes the children may be asked to add any new rules that may make the game become more challenging. Some rules they may want to add are: Taking a puddle away so one child is left without a puddle. This child may become the fox, and try to catch the frogs before they can get into their puddles. The children may come up with many good ideas for new rules to the game.

The children are dismissed from class and each one is asked to take his rope and put it where it was when they came in.

APPENDIX C

APPENDIX C

UNIT OVERVIEW FOR GRADE ONE

January 5

Get to know children

Introduce Mr. Drum, stop, look and listen

Exploration of locomotor movement

Relaxation- find own space on the floor and collapse

Run and stop, skip and stop

Red light - Green light

January 7

Stretch, introduce flex and extend

Walking- different parts of the feet, high, low, different speeds

Exploration of movement using different parts of the body touching the floor

Locomotor movements to specific drum rhyhms

Relaxation

January 9

Movement explorations on mats, hanging rope, walking board and stairs

January 12

Follow the leader

Body awareness- ankles, knees, feet

Flex and extend

Balance - points and patches

Relaxation - as small and still as possible

Stop, go, right turn

January 14

Rhythms - moving to drum beat, sliding, hopping, falling

Introduction of skipping song

Relaxation - find heart beat

Put rhythm of heart beat in other parts of your body

January 16

Locomotion - move fast, stop and start, turn right

Back to back game

Relaxation

Skipping, slow, fast, change directions

January 19

Obstacle course

Slide and galloping

Rhythms, slide and skip to music (seven step)

Relaxation

Run to music

Flex and extend, contract

January 21

Marching

Running, galloping, alone and with partner, then to music

Relaxation

Move fast, change directions, first right, then left

January 23

Jumping ropes

Exploration

Rope jumping alone with one rope

Rope jumping with partner or group

January 26

Running, jumping, hopping, skipping

Rhythms - seven step, improvisation to music

Relaxation- to music

January 28

Balance - low, high, two points, one point, discuss principles of balance

Flex and extend, move with legs flexed, extended

Body awareness- contraction of muscles of leg, arm, back, stomach

Animal walks

January 30

Obstacle course

Back to back game

Run, stop, balance, change direction, right, then left

February 2

Horses and ponies- walk, trot, gallop, run, jump, turn, stop

Make bridges - alone, with partners

Make shapes - alone, with partners, in groups

Bend and stretch, contract and relax

February 4

Marching - follow the leader

Flex and extend - arms and upper body only

Move with feet going first, head, elbows

Hokie Pokie

February 6

Bean bags

Throwing and catching

Balancing - stationary - moving

Over and under game with bean bags

February 9

Animal walks

Glue game

Relaxation - find as many places where you can feel your heart beat

Exploration - getting feet higher than head - balancing moving

February 11

Move about in squares, forward backward, etc.

Acting out game, a trip to the sea shore

Snails, star fish

Relaxation - clams

February 13

Movement exploration on mats - rolling and balancing activities

Walking board - follow the leader on board and lines on the floor

February 16

Hopping - Bunny hop

Skipping with partners, skipping tag

Over and under with partner

Run, jump, fall and roll

February 18

Rhythms - moving and playing instruments - comparing sound and movement, matching movement to sound, and sound to movement

February 25

Non-locomotor movement - swing, shake, twist turn

Making movement sentences - alone, in groups

March 2

Bean bags - throwing and catching games - balancing using non-locomotor movements, and locomotor movements

March 4

Obstacle course

Acting out game

Rhythms - improvisation to music

Relaxation to music

March 6

Exploration on mats

Forward roll

Cartwheel

Balancing

March 9

Wands - Exploration - finding all the ways they could use the wands alone, with partner

March 11

Wands and jumping ropes, finding all the ways they could use the wands and ropes alone and with partner

March 13

Exploration on mats

Forward and back roll

Cartwheel

Balancing

March 16

Jumping ropes - free play with jumping ropes

March 18

Frog in the puddle

Running, jumping, dodging tag

March 23

Jumping ropes and wands - working with partners and small groups

March 25

Bridges and roads

Freeze tag

Jumping and hopping in different rhythmical patterns

Leaping high, wide

March 27

Animal walks

Animal walk races and relays

Balancing for a given count, moving, balancing

March 30

Back to back game

Mirroring with partner

Moving high, low, with partner

Moving to a given rhythm with a partner

April 1

Post-testing

SAMPLE LESSON PLAN GRADE ONE

Objective: Discovery of the forward roll

Equipment: Long mats, bean bags

Introductory activity:

Problem:	Anticipated Responses:
Find a way you can balance your bean bag on a part of your body.	Children may balance the bean bag on their heads, shoulders, hands, etc.
Can you keep your bean bag balanced and move, fast slow?	
Put bean bags next to wall	

Lesson Core:

Lie on the floor and make yourself as long as you can, how can you move?	Students will move in various ways - the response the teacher will build on is the log roll.
Make yourself as small as you can, now how can you move? (time is taken here to examine the response and talk about the efficiency of keeping like a "ball")	
Can you use your hands in some way to help you roll forward?	The teacher builds on the correct form for the forward roll
Can you get your bean bag and hold it somewhere so you can still roll but don't drop the bean bag?	Children will put the bean bags in various places such as under the arms, chin, knees, between the legs
Can you hold it under your chin, between your legs, any other place?	

APPENDIX D

STATISTICAL DATA

Treatment of data

Standard statistical procedures were used in evaluating the test scores. The mean, M, of test scores on an item was found from

$$M = \frac{\Sigma X}{N} ,$$

where N is the number of children in the group. The standard deviation, SD, was then determined from

$$SD = \sqrt{\frac{X^2}{N} - M^2} .$$

The standard error of the mean, $sigma_m$, was then found from

$$\sigma_m = \frac{SD}{\sqrt{N-1}} ,$$

and the t ratio from

$$t = \frac{Diff\,(M_1 - M_2)}{SEM_{diff}} ,$$

where $SEM_{diff} = \sqrt{\sigma^2_{M_1} + \sigma^2_{M_2}}$, and M_1 and M_2 refer to the means of the two groups, experimental and control.*

*As in texts in statistics, e.g. Garrett, Linquist, Edwards, etc.

The sign test was administered to the change scores to determine the significance of the number of children making gains in each group;

$$T_e = \frac{N(N+1)}{4},$$

where T_e represents the expected mean, and N is the total number of signed ranks. The standard deviation found from

$$\sigma_T = \sqrt{\frac{N(N+1)(2N+1)}{24}}$$

allowed the calculation of the z values from

$$z = \frac{T - T_e}{\sigma_T}.$$

The levels for significance of the z values were 2.85 at the .01 level and 2.09 at the .05 level. **

**Unpublished material furnished by R. B. Smawley, Central Washington State College

TABLE VII

PRE-TEST DATA FOR KINDERGARTEN

Item	Group K_C M_2	SD	Group K_E M_1	SD	diff $M_1 - M_2$	SE Mdiff	t ratio
1. Walking board Forward	2.35	.718	2.33	.667	.024	.257	.093
Backward	1.57	.623	1.55	.497	.016	.212	.075
Sidewise	1.85	.350	1.55	.497	.301	.158	1.91
2. Jumping	2.42	.821	2.50	.833	.072	.305	.236
3. Identification of body parts	2.14	.639	2.33	.577	.190	.226	.841
4. Imitation of movement	2.92	.258	2.72	.448	.207	.130	1.59
5. Obstacle course	2.71	.700	2.50	.687	.214	.257	.833
6. Kraus-Weber	2.35	1.29	2.33	1.247	.024	.458	.052
7. Angels-in-the-snow	2.28	.452	2.33	.667	.047	.205	.229
	(n_c=14)		(n_e=18)		df=30		

TABLE VIII

PRE-TEST DATA FOR GRADE ONE

Item	Group 1_C M_2	SD	Group 1_E M_1	SD	diff $M_1 - M_2$	SE Mdiff	$\underline{t}$ ratio
1. Walking board Forward	2.77	.533	2.73	.507	.039	.173	.225
Backward	2.16	.601	1.82	.550	.340	.207	1.64
Sidewise	1.95	.230	2.04	.624	.099	.145	.683
2. Jumping	2.67	.472	2.52	.651	.145	1.79	.810
3. Identification of body parts	3.16	.688	2.78	.507	.384	.200	1.92
4. Imitation of movement	2.88	.315	2.78	.413	.106	.118	.898
5. Obstacle course	2.83	.833	3.26	.674	.428	.249	1.74
6. Kraus-Weber	3.27	.869	2.69	1.04	.582	.230	2.58
7. Angels-in-the-snow	2.50	.500	2.56	.496	.065	.161	.404
	(n_c=18)		(n_e=23)		df=39		

TABLE IX

POST-TEST DATA FOR KINDERGARTEN

Item	Group 1_C M_2	SD	Group 1_E M_1	SD	diff $M_1 - M_2$	SE Mdiff	$\underline{t}$ ratio
1. Walking board Forward	2.42	.623	2.66	.471	.239	.207	1.15
Backward	1.42	.623	1.61	.487	.182	.210	.87
Sidewise	1.71	.452	1.77	.416	.064	.161	.40
2. Jumping	2.57	.729	3.33	.667	.762	.259	2.94
3. Identification of body parts	2.42	.495	3.72	.448	1.24	.176	7.05
4. Imitation of movement	2.92	.258	3.00	.000	.071	.071	1.00
5. Obstacle course	2.78	.674	3.77	.416	.991	.212	4.67
6. Kraus-Weber	3.07	1.10	3.88	.315	.818	.315	2.59
7. Angels-in-the-snow	2.42	.490	3.05	.230	.627	.148	4.23

(n_c=14) (n_e-18) df=30

TABLE X

POST-TEST DATA FOR GRADE ONE

Item	Group 1 M_2	SD	Group 1 M_1	SD	diff $M_1 - M_2$	SE Mdiff	$\underline{t}$ ratio
1. Walking board Forward	2.78	.549	2.72	.507	.061	.173	.35
Backward	2.167	.521	2.04	.550	.124	.187	.66
Sidewise	1.94	.230	2.08	.584	.143	.134	1.06
2. Jumping	2.88	.315	3.56	.496	.676	.130	5.20
3. Identification of body parts	3.27	.559	3.87	.337	.592	.152	3.89
4. Imitation of movement	2.88	.315	3.00	.000	.111	.077	1.44
5. Obstacle course	3.16	1.07	3.78	.413	.616	.274	2.24
6. Kraus-Weber	3.50	.764	3.65	.758	.152	.245	.62
7. Angels-in-the-snow	2.61	.488	3.65	.477	1.040	.155	6.71
	(n_c=18)		(n_e=23)		df=39		