CONCEPT UNDERSTANDING AND MOVEMENT EXPRESSION OF THE ELEMENTS OF SPACE IN CHILDREN

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The present study investigated children's acquisition of the movement concepts of Space such as the elements of Direction, Level and Pathway and the movement expression of these concepts. The primary goal was to discover whether concept acquisition and movement expression develop together or independent of each other.

Three tests were developed to measure two aspects of interest to the study: concept and movement. 264 schoolchildren were grouped according to three age levels and gender.

A 3x2x3x2 Analysis of Variance showed that concept acquisition and movement expression develop at different rates depending on the movement concept and the age level of the children. The results also showed that there are no differences between boys and girls in their performance on the three concepts tests and the two aspects. However, age differences were present among the three age groups. A movement hierarchy also seems to exist with the acquisition of Pathway concepts predominating over Level and Direction concepts.

Introduction

When I started handling Baby Ballet classes (ages 3–5 years old), I saw things I had only read and heard about pre-school children. It was impossible to expect them to execute ballet steps that older children of six or seven could do in rough form. Although the gap may only be between six months to one year between two children, the differences in abilities cannot be overlooked. The difference between pre-school and older children seems to be the knowledge of concepts necessary for movement. Younger ones could not maintain their formations, could not locomote following prescribed pathways and did not know their directions. Neither could they follow instructions since they did not seem to understand the commands. However, they could imitate so we all survived.

So instead of the initial need for a sound movement program for pre-school children, it became more important to know how movement concepts and skills developed in young children:

Can it be assumed that a child understands a movement concept if he can imitate a movement task?

Can a child show his understanding of the movement concept by expressing it in movement?

Does the acquisition of a movement concept come before its expression in movement? Or can a movement be executed without the concept having been previously acquired?

Since the field of movement studies and theory can be overwhelming in scope, the selection of literature emphasized certain points. First, the focus was on movement processes (forms) and not on movement products (performance, e.g. motor skills). These studies describe the qualitative aspects of movement, see movement in the context it occurred, and consider the content of movement. Second, the focus on movement was from a developmental perspective. These studies considered the readiness level of children when engaging in movement tasks, describing movement as a developing process.

Review of Literature

It has been assumed that children will automatically develop their movement abilities as a result of maturation. Arnold Gesell, the chief proponent of this maturational view, concluded

that early development was almost entirely due to maturation. He made motion pictures of infants' behavior as they responded to standard conditions. Frame-by-frame analyses of sequences of behavior in infants showed that these seemed to be amazingly uniform in all children. Gesell was convinced that development and growth processes occur independently of experience (Biehler, c1981).

However, many have come to recognize the significance of the seemingly random motions a child makes. The gradual build-up of movement which a baby begins to acquire and which continues throughout life can be encouraged, engaged upon and sensitized through the practice of the art of movement (North, 1972).

Erikson believes that the foundation for a sense of trust in the world, in self and in others is rooted in the early physical interchange between the newborn infant and its primary caretaker. He suggests that pre-school age children will first develop autonomy and later acquire a sense of initiative if they are given opportunities to try out skills and to engage in independent activities (Biehler, c1981).

Cognitive information is also gained through physical experience in the earliest stages. For Piaget, concepts are formed through the processes of assimilation and accommodation which begin at birth. He suggested that the most crucial period for sensorimotor activity to facilitate perceptual development starts at birth and continues until about the seventh year (1952). During the first two years of life, the amount of stimulation a child receives is more important than the type of stimulation. However, the qualitative aspects of stimulation become essential by about age four. At this age and later, stimulation is most beneficial if it is directly related to the desired behavior. Piaget is convinced that intellectual development develops out of motor activity, not simply passive observation. Learning generally has its setting in a world of movement. The wider the range of activity, the more diversified will be the intellectual operations of the developing child (Barrow, 1983).

Kephart's program for slow learners (1960) is based upon the premise that cognitive development depends upon the orderly development of motor patterns. He contends that concept formation depends upon the manipulation of perceptual data. There is a close association between perceptualization and proper conceptualization. This perceptualization is aided by movement activities that help the child organize his near and distant space. A child with an inadequate space world cannot adequately organize percepts for the development of concepts and higher orders of thought. Since the most direct clue to space is movement, his program is based on a theory of perceptual training through movement (Cratty, 1970).

At present, there are a wealth of theories and speculations from developmental psychology with enlightening possibilities for those committed to movement education. Some theorists believe that physical experience forms the foundation for understanding the world and that early sensory-motor processes provide the groundwork for later abstract thinking. Movement can thus be harnessed so that man can function more effectively as movement seems to underlie our total development as human beings. This does not mean that movement forms the basis for all cognitive functioning or social functioning, for that matter. But it implies that an expansion of a child's movement skills repertoire can provide opportunities to explore and learn about his environment, and that structured movement experiences improve perceptual abilities and perhaps facilitate development.

Movement Education

Movement Education is characterized by a union of three equally important components: a thematic organization of content based on the work of Rudolph Laban; an instructional methodology that provides a range of decision-making for both teacher and learner; and a teaching

philosophy that is humanistic in focus, espousing creativity, self-concept enhancement and an individualized process-oriented view of skill progression (Haslam, 1988).

Laban outlined the basic motion factors of Space (Where we go), Weight and Flow (How we go) and Time (How long we go). In Movement Education, the children should be able to think, feel, do and observe movement in order to be able to use it.

There is also a lot of emphasis on creativity and problem solving. This is compatible with theories on learning (Cratty, c1970), the concept of meeting children's needs and allowing them to work at their own rate and level of ability. There is total involvement of children in their learning experience and a deemphasis of highly competitive situations. The children learn that their solutions to problems need not be the same as others. They also learn that their efforts are accepted because no external evaluation takes place. The process is of learning through an experimental, exploratory and creative process. Movement classes provide opportunities for the mastery of movement and the ability to think and carry out creative ideas. It is a recognition of the fact that when children discover, are guided to discover or to find things out for themselves, they will remember and retain these more easily (Briggs, 1974).

Recently, with the development of movement education, movement concepts and skills as proposed by Laban have been incorporated in other classification systems of movement (Table 1). An example of one such classification system is that of Kirchner (c1985) (see Table 2). It shows the integration of traditional programs for physical activities and present movement approaches.

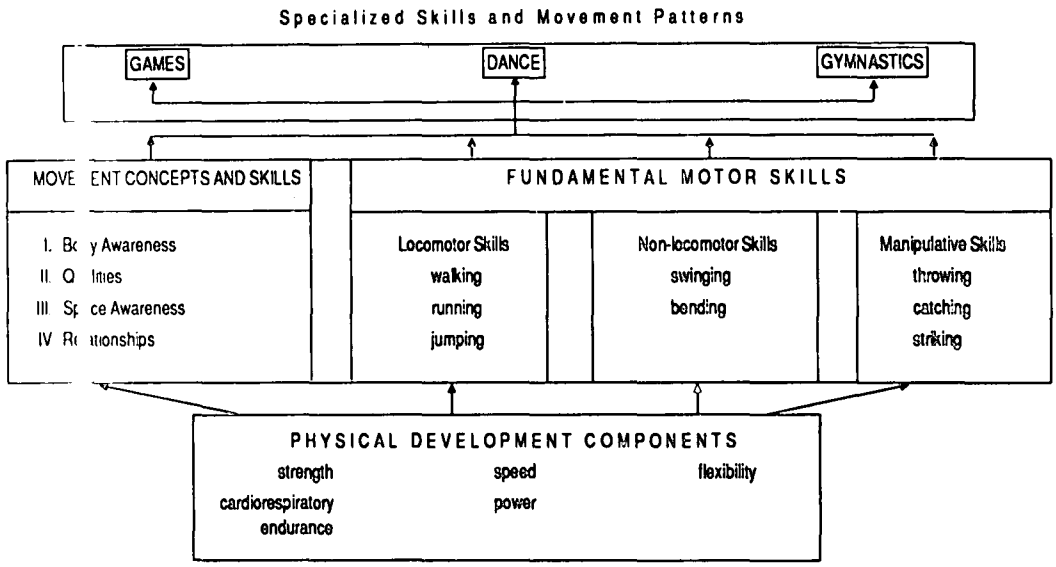
Movement Education in Physical Education

Before Movement Education was introduced into the physical education program, movement concepts and skills were usually classified as locomotor and non-locomotor skills or as basic sport, dance and gymnastic skills. Table 2 shows the Development of Movement Concepts and Skills, incorporating different classification systems found in the literature (Simpson, 1966 in Harrow, 1973; Harrow, 1973; Gallahue, 1982; Kirchner, c1985). The physical development components provide the foundation for all movement. No movement takes place nor develops without these components. Two basic classifica-

Table 1. Classifications of Movement

Simpson's Taxonomy for Psychomotor Domain (1966) (in Harrow, 1973)	Harrow Taxonomy for Psychomotor Domain (1973)	Gallahue's Motor Development Phases (1972)	Kirchner's Stages of Motor Development (c1975)
Perception	Reflex Movements	Reflexive Phase	Rudimentary Skills
Set – Mental Physical Emotional	Basic Fundamental Movements	Rudimentary Phase	Fundamental Movement Skills – Movement Concepts and Skills
Guided Response	Perceptual Abilities	Fundamental Phase – Initial – Elementary – Mature	– Basic Locomotor Skills – Combined Locomotor Skills
Mechanism	Physical Abilities	Sport-Related Phase – General – Specific – Specialized	– Basic Non-locomotor Skills
Complex Overt Responses	Skilled Movements		Basic Manipulation Skills
Adaptation	Non-discursive Communication		
Origination			Refined Movement Skills Specilaized Skills

Table 2. Development of Movement Concepts and Skills



tions of movement are included in the chart. Movement Concepts and Skills describe the what, how, where and with whom a movement takes place. The second type includes the Fundamental Motor Skills classified in the literature as locomotor, non-locomotor, and manipulative skills. Both types are necessary for all specialized skills of dance, games, gymnastics and athletics.

The classification systems cited present a means for teachers and researchers to assess movement per se. However, it is more important to assess movement in context.

Children do not move in a void. They are constantly interacting within an environment that requires them to use space effectively and to move in relationship with other people and objects. As they interact with a changing environment, they process more and more complex information. In order to describe movements within the context of an environment, Morris and Stiehl (1985) presented a movement-analysis framework to help explain what it was they were observing. Figure 1 below shows the four movement components of the framework.

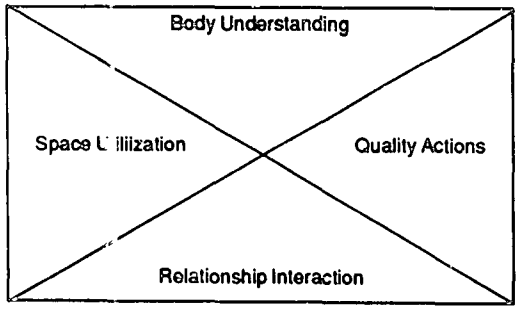


Figure 1. Movement Analysis Framework (Morris & Stiehl, 1985)

Each movement component is composed of elements that describe the component in a complete manner. Table 3 below shows the elements of Space utilization simplified from the framework of Morris and Stiehl used in this study.

Table 3. Elements of Space Utilization

Personal				General		
Levels	*Directions*	*Pathways*	*Planes*	*Levels*	*Directions*	*Pathways*
High	Forward	Straight	Vertical	High	Forward	Straight
Medium	Backward	Curved	Frontal	Medium	Sideward	Curved
Low	Sideward	Zigzag	Horizontal	Low	Backward	Zigzag

The present study investigated the development of the movement elements of Directions, Levels and Pathways in pre-school children. Instruments were developed to test the children's acquisition of the movement concepts under Space component (concept aspect) and their movement expression of these concepts (movement aspect).

Purpose of the Study

Constant physical movement has always been a characteristic of children so much so that we often take it for granted. Very few realize that a child's seemingly random motions are essential to his acquiring and interpreting information. A child at play or work is continually discovering and exploring his physical and social environment. Movement then is a significant medium for the development of a child.

As a dance teacher, it has become clear to me that the major concern in the primary years of the child should be with movement for movement's sake rather than the purely technical side (e.g. dance skills). This initial approach of movement training achieves the bodily control a child needs for more formal dance lessons as well as other forms of physical activity.

Recently, there have been attempts to identify the core content found in all movement. North (1972) refers to this core content as basic movement. When well-developed, basic movement will enable a child to efficiently manage his or her own body in a variety of movement situations. Any inquiry therefore about physical activity would do well to start with basic movement.

This approach to the study of the proper development of movement can be facilitated if we have a knowledge of what basic movement concepts children have or are capable of possessing at their age levels. Then it would be possible to present movement tasks that children can do at a certain age. It was the aim of the present study to contribute to this effort by working on one of the components of basic movement.

Basic movement includes the following components:

1. SPACE – pertains to where the body can go or move;
2. TIME – refers to the discovery, awareness and use of quick (sudden) or slow (sustained) movements performed by the whole body or any part of the body;
3. WEIGHT – refers to the discovery, awareness and use of strong and light movements performed by the whole or any part of the body;
4. FLOW – refers to the discovery, awareness and use of the flow (free flow, bound, arrested) of movement (Briggs, 1974).

These components differ in terms across authors. The present study is limited to the investigation of the basic movement elements of SPACE. These movement elements are Directions, Levels, Pathways. Directions include the movement concepts of forward, backward and sideward. Levels include the concepts of high, medium and low, while Pathways include the concepts of straight, curved and zigzag lines.

There were a few questions the study was interested in:

Does a movement hierarchy exist in the acquisition of the movement elements of SPACE?

Does the capacity for conceptual understanding of movement concepts exist independently of the capacity for movement expression of these concepts?

Are there any age and sex differences in acquiring the movement concepts as well as the capacity to express it in movement?

Significance of the Study of Movement In Space

The child's introduction to and early relationship with the world are wholly sensory (Bauer, in Yamamoto, c1979). His knowledge is bounded by what he sees, smells and touches. Perception rules his domain.

As his life unfolds, a stable image of space seems to be structured out of the constant input of momentary sensory experiences. Piaget (1956) points out how the later abstraction of space develops from the perception of space. Children make sense out of their perception of space by using symbolic representations to organize a life-space out of the boundless sense impressions of their experience. Their knowledge

exists as an extension of themselves in space. Instead of a separation, a joining of the self with the world takes place in the act of conceptualization.

Kephart (c1971) also emphasized the importance of space in conceptualization. The child who has difficulty with space is likely to have similar difficulties in thinking. Similarities and differences between objects are observed by locating them firmly in space and then observing these characteristics. Concepts, categorization and grouping involve dealing with similarities and differences. To make comparisons, we need a stable and sufficiently extensive space world so that objects for comparison can be held in mind and observed while relationships between them remain stable. If the child has not developed an adequate space world, he will have difficulty grouping phenomena since groups can only exist in space. It is therefore through space and spatial relationships that the child observes the relationship between objects in his environment.

In general, a close association exists between physical mobility (touching, manipulating, locomoting) and a child's construction of a more abstract view of space. This underscores the significance of the child's movements in the construction of his reality.

This emphasis on the importance of space in conceptualization underlies the need for studies on space and spatial relationships. If space can aid in concept formation, then an investigation of spatial concepts and their development in children, especially in pre-school years, is needed. In order to develop a program for movement applicable to education, health and other aspects of human development, we should start from the most basic "content" of movement—one of which is space.

Methodology

Subjects

A total Of 327 Nursery, Kindergarten and Grade One students participated in the study. There were a total of 168 males and 159 females with their ages ranging from 4.0 years to 9.07 years. They were students of a private Catholic school in Davao City and belonged to middle-upper income families in the Filipino-Chinese community.

Procedure

The teachers introduced the researcher to the classes involved before testing begun. The children were tested one at a time in sessions lasting 10–20 minutes. Present in these sessions were the child, the researcher (who administered the tests) and two "scorers" who positioned themselves where they could see and hear but not distract the child. Interaction between the scorers and the children was not encouraged. The children were free to use either English, Filipino or Cebuano as the language for testing.

The Instruments

There were three spatial concepts tested in this study.

1. Directions – involving the forward, backward and sideward elements,
2. Levels – dealing with high, medium, low,
3. Pathways – measuring straight, curved and zigzag lines.

These spatial concepts corresponded to the three tests developed for the study.

Each test consisted of two aspects. The concept aspect tested whether the child knew the spatial concepts measured at a cognitive level. The child could respond by giving the terms for the spatial concepts or by moving or manipulating a toy figure.

The movement aspect tested whether the child could perform the spatial concepts measured. The child was required to respond by executing

the movement tasks asked for. There were 12 items for the concept aspect and 12 items for the movement aspect for a total of 24 items for each test. The random order of presenting the 72 items for the 3 tests was predetermined. For 121 children, the items for the movement aspect were administered first. In some cases, the predetermined random order of presenting the movement aspect of the Directions and Pathways Test was not followed but the number of items remained the same.

For the concept aspect, a toy figure (Bioman for males and Barbie for females) was placed in the center of a circle of eight different toy objects located at 45 degree intervals and 19 inches away from the toy figure.

Bioman and Barbie were chosen because of their popularity with children. Eight toy objects were chosen by the child from a selection of familiar toys. Each child was made to identify the eight toys selected to ensure that all toys used were familiar. The circle of toys was then placed on an illustration board on a table.

There were two tasks for the concept aspect. First, the child was asked to identify which object the central toy figure would touch if it were to move in forward, backward or sideward directions. In response, the child named the toy or pointed to it. The child scored one point for correctly identifying the toy. For the second task, the child was asked to move the toy figure in any one of the designated directions. Both tasks were performed twice for each of the three directions for a total of twelve items.

For the movement aspect, the eight toys were placed on pillows arranged in a circle on the floor. The pillows were six feet from the center. Instead of the central toy figure, the child now stood in the center. He/she was asked to walk towards one of the eight toys. A point was given to the child if he/she was able to move in the right direction. This task was done four times for each direction for a total of twelve.

Levels Test

There were four subtests for the concept aspect of the levels test.

In the first subtest, the child was shown that the arms of the toy figure (Bioman for males and Barbie for females) could be moved. The child was then asked to place the arms of the toy at different levels (once for each level).

The second subtest required the child to identify the level the arms of three toy figures were in (once for each level). The levels were preset by the researcher before the session.

In the third subtest, the child identified what level three toy figures were in. One toy was held up using an 8-inch stick (high); another was in a sitting position (medium) while the third was lying down (low).

In subtest four, the child identified levels as shown by sketches of three children depicting the three levels. One child was on tip-toe (high); another was squatting halfway (medium) while the third one was lying down (low).

In the movement aspect, the child was asked to demonstrate the different levels using his arms (two times for each level) and his body (two times for each level).

Here, the child jumped up, stood on the chair, went on tip-toe (High); moved to a half-squat position (Medium) and either sat on the floor or went to a full-squat position (Low).

To check whether the children were physically unable to perform the movement task, the child was asked to imitate the researcher going to a half-squat position.

Pathways Test

There were four subtests designed to test the elements of straight, curved, and zigzag pathways.

The first subtest utilized cut-out patterns of the pathways which were one foot long and one inch wide. The child had to identify the patterns as they were presented one at a time. Sometimes a child gave another term for a pattern. A score was given for correctly naming the pattern or for

giving a term reasonable enough to represent the pattern. This allowed the researcher to use the children's terms for the pathways in the subsequent sub-tests.

In subtest two, the three patterns were shown in a drawing around a girl. The child was asked to point to the pathways one at a time.

For subtest three, the pathways drawn in broken lines were shown connecting an animal to an object. The child scored by correctly naming the pathway.

Subtest four required the child to move a toy car to a toy house using the three pathways.

In the movement aspect, the child was again placed in the center of the same eight toy objects that had been used in the directions tests. He was asked to walk to the toys using the three pathways. The three pathways were asked four times each for a total of twelve.

Method of Analysis Scoring

Three persons who were briefed on the point system and scoring criteria by the researcher helped in keeping the children's scores. Since there were 72 items for the three tests combined, a child could get as high as 72 points and as low as 0.

Study Design

The Split-Plot Factorial Design was used for the Analysis of Variance. There were four factors of interest to the study. The two between-subjects factors were Age (A) and Sex (C) while the two within-subjects factors were Test (B) and Aspect (D).

Factor A had three age levels: 4.0–4.11 years old; 5.0–6.11 years old; 7.0–9.7 years old.

Factor B consisted of the three tests: Directions, Levels and Pathways.

Factor C referred to the female and male groups.

Factor D stood for the concept aspect and movement aspect of each test.

Analysis was done using CRISP (Crunch Interactive Statistical Package).

Results

Inter-Scorer Reliability

Inter-scorer reliability between scorer 1 and 2 and scorer 1 and 3 was obtained using the phi coefficient. The highest computed phi was 1.0 while the lowest phi was .3877.

A phi of .80 served as the cut-off co-efficient for data to be used for the ANOVA. 264 (80%) out of 327 children obtained a phi greater than or equal to .80. The score sheets for each of these children were then averaged to obtain an average score per item for all the 72 items. Scores were summed for the concept and movement aspect of the three tests. Total scores for each test and a grand total score for the three tests combined were also obtained. These sums were entered into the 3x2x3x2 ANOVA cells.

Analysis of Variance

The Analysis of Variance is summarized in Table 4. Results indicate that Age (A), Type of Test (B), and Aspect of Test (D) are significant while Sex (C) is not ($p<.05$). There is a significant interaction between Age and Type of Test ($p<.05$) and between all treatment combinations that include factors A, B and D ($p<.05$). On the other hand, treatment combinations that include the factor Sex do not show any significant interaction.

At this point, we can come up with some answers to the problems mentioned at the beginning of the study. First, there is an absence of sex differences among the children in their performance on the three tests. Second, the three age groups performed differently from each other on both the movement and concept aspects of the three tests. In comparing data between the three tests, it seems that a movement hierarchy exists in the acquisition of the elements of Direction, Level and Pathway. Since Factor D (aspect of test) is significant, we can say that the capacity for concept understanding of movement exists independently of the capacity for its expression.

Table 4

Analysis of Variance (N = 264)

Source	*df*	*SS (UM)*	*MSS*	*F*	*P*
BetweenSubjects	262	5541.4199			
A (Age)	2	2908.1650	1454.0825	143.003	0.0000
S (Sex)	1	0.5627	0.5627	0.055	0.8142
AS	2	19.4875	9.7438	0.958	0.3894
Subj w groups	257	2613.2246	10.1682		
Within Subjects	1315	7085.1504			
B (Type of Test)	2	1315.9646	657.9823	121.082	0.0000
AB	4	114.5480	28.6370	5.270	0.0004
SB	2	8.0286	4.0143	0.739	0.4820
ASB	4	35.5205	8.8801	1.634	0.1631
B x SwGps	514	2793.1758	5.4342		
D (Aspect of Test)	1	135.0997	135.0997	40.202	0.0000
AD	2	60.1978	30.0989	8.957	0.0002
SD	1	1.4694	1.4694	0.437	0.5091
ASD	2	5.4947	2.7473	0.818	0.4467
D x SwGps	257	863.6546	3.3605		
BD	2	102.2442	51.1221	17.095	0.0000
ABD	4	125.2987	31.3247	10.475	0.0000
SBD	2	9.4021	4.7011	1.572	0.2111
ASBD	4	14.7639	3.6910	1.234	0.2932
BD x SwGps	514	1537.1079	2.9905		

Discussion of Results

The discussion of the results focuses on the possible internal unobserved processes that might be involved in the performance of movement tasks.

Modern theories of motor behavior treat the organism as an information processing system and speculate that internal mechanisms are involved in the execution of skilled movements. One of these is attention. It is claimed that attention is necessary during the learning phase and becomes less so after the skill has been well practiced. Fitts and Posner (1967) proposed that in the early stage of skill learning, a person simply learns what the task demands and what components are involved. In the intermediate or associative phase, the individual begins to strengthen stimulus-response associations. He now learns to produce the correct response to a given situation. In the final or autonomous stage, the task becomes less demanding of one's attentional resources. Many of the component activities of the skill have become "automatic" and can be performed "without thinking about them" (Mazur, c1986).

The child's first information about the coordinates of space comes from the kinaesthetic awareness of differences in his own body. The child tries out all the muscular responses his body is capable of to find out what his body and its parts can do. Much of the early movements he engages in involve activity of the total organism. The specific movements of isolated parts develop from the more generalized pattern of total movement.

In much the same way, spatial relationships and directions develop first in relation to the child himself. Only later are objective relations developed between objects. He learns to make a sensory impression of how sensory data about things is obtained and how to vary the data when he is in certain positions relative to things. This is called "egocentric localization" or the development of subjective space (Piaget, 1956). Later, the child is able to conceive of objects to the right of another without the intervening step of locating each object in relation to himself.

We can say that the primary directions of space and the coordinates of space are developed first within the organism and later on projected outward into objective space. Orientation in space and the observation of relationships between objects in space becomes difficult if not impossible unless these coordinates are first established within the body itself.

The above-mentioned explanations serve as bases for the following more specific discussion of the factors investigated in the study.

Sex Differences

No significant sex differences were found between the three age groups for performance on the concept and movement aspects of the three tests. Thus, there were no differences between male and female children in their acquisition and understanding of the movement concepts and in expressing these concepts in movement. This

implies that a common movement program can be participated in by both boys and girls. Of course, there is the possibility that gender differences might begin to manifest beyond the ages covered by the present study. This would be an interesting point to look into in future studies.

Age Differences

Age was found to be a significant factor affecting performance on the three tests. Means for total scores on the three tests for each age group show that performance significantly increased with age (see Table 5). Older children (7.0–9.7 yrs. old) obtained the highest scores on all three tests, followed by the two younger groups. It can be expected that children would improve in their conceptual understanding of movement concepts as they get older. They would also be more capable of expressing movement concepts with increasing age.

Table 5. Mean Scores on the Three Tests

Age	*Directions*		*Levels*		*Pathways*
A1 (N=73)	12.568	<	15.299	<	17.221
A2 (N=99)	14.600	<	17.178	<	20.624
A3 (N=92)	20.472	<	21.297	<	23.243

Comparison of means for the three groups using Scheffe's Test showed high significant differences between each of the three age groups.

Movement Concept Acquisition and Expression (FACTOR D)

The significance of Factor D shows that there is a difference between performance on the movement and concept aspects of the three tests. There were differences among the children in the acquisition of movement concepts and their capacity for the expression of these concepts. This difference is present in all three age groups but is not significant between boys and girls. Table 6 gives the group means for the movement and concept aspects of the three tests. Generally, the acquisition of the movement concepts under study and the capacity to express these in movement improves with age.

Table 6. Group Means on Type of Test and Aspect of Test

Age	*Concept Aspect*			*Movement Aspect*		
	Direction	Level	Pathways	Direction	Level	Pathways
A1	6.123	7.293	9.691	6.368	7.319	7.926
A2	7.281	9.104	10.845	7.319	8.160	9.779
A3	10.423	10.372	11.793	9.974	10.925	11.573

For the three age groups, means on the concept aspect for Pathways Tests are significantly higher than the means on the movement aspect. Thus, acquiring the concept seems to develop ahead of its expression in movement. This is especially true for the younger children who acquire the movement concepts of high, medium and low before they are able to express it in movement.

There is the possibility that for younger children, moving the arms and body to different levels requires differentiation (at a cognitive level) of body parts in relation to external boundaries. It is easier to identify the levels where the body is or where one's limbs are if these are seen from a perspective away from oneself. This perspective becomes well-developed as the child gets older. More attention may also be required of the younger child in the differentiation of body parts so that the influence of concept acquisition would tend to manifest itself more than movement expression at an earlier age.

Movement expression will predominate if body differentiation and concept formation are already developed. This is so that movement expression of the concept becomes automatic and does not require too much thinking. The child need not consider the physical components inherent in the task. Thus, an improvement in both concept formation and motor development work together to enable one to express movement concepts better. This accounts for the increasing mean performance on the movement aspect across age groups.

Piaget found that younger children tend to judge size more accurately insofar as their space is not yet fully structured. As conceptual space becomes progressively more organized, size estimation becomes more difficult and accuracy is

regained only when this structure is fully developed. Only after the age of ten or eleven is accuracy restored (Piaget and Inhelder, 1956). Assuming that discriminating levels involved processes similar to that of size estimation, this can partly explain the reversal of predominance from concept understanding to movement expression in the older age group.

The results of the Directions Test were opposite to that of the Levels Test. The younger age groups obtained higher mean scores on the movement aspect while the older group had higher mean scores on the concept aspect. According to Piaget and Inhelder (1959), the child arrives at a "space structure" through a process of development. First, he locates objects singly with reference to himself and only later develops a system of coordinates in space where he can locate numerous objects by means of fixed directions. The child may be able to say how many steps it would take him to walk over to object A and how many steps to go over to object B. But he may have no idea how many steps to walk from A to B when he himself is located at a point removed from the two objects. He has to put himself in the position of walking over to one of the objects in order to get an idea of estimation.

If we follow this line of thinking, younger children will find the tasks for the concept aspect of the Directions Test more difficult than the movement tasks. In the concept aspect, the child had to position himself away from the doll and the objects thus making it more difficult for the younger child who has not fully developed his space structure. In the movement aspect, the child positioned himself in the center where it was easier for him to locate objects with reference to himself.

Development of a Movement Hierarchy in Acquiring Directions, Levels and Pathways Concepts (Factor B)

In comparing means between the three levels of Factor B (Type of Test), Scheffe's Test showed significant differences between the Directions, Levels, and Pathways Tests. The development of a Movement hierarchy would seem to start with the acquisition of Pathways concepts, then the Levels concepts and lastly, the Directions concepts.

I had expected that children would first acquire the concepts of Directions followed by Levels and Pathways concepts. However, the results show that development seems to be the other way around. A check on the data was done to see what specific directions the children found most difficult. Going forward was easiest followed by going backward and sideward. It is suggested that younger children find it more difficult to build a space structure behind them (Piaget and Inhelder, 1956). When a toddler sits on a stool, he is not sure there is anything behind him until he has located it with his hands. Space behind him does not yet exist. When he turns around, the objects and situations he previously faced cease to exist for him. The space structure exists only directly in front of him. Space far out to the sides or behind is not present. This probably explains the appearance of Directions in the lowest level of the hierarchy. Reflecting back on my experience in dance teaching, younger children's lessons are actually limited to the forward direction.

Summary and Conclusions

The results indicated that concept understanding and motor expression do not develop in parallel. This depended upon the particular movement concept and age level. The children seem to acquire the concepts for Pathway first before they are able to express them in movement.

In contrast to this consistent predominance of concept understanding over movement expression in the Pathway Test, the Direction and Levels Tests showed reversals in predominance with increasing age. For Levels, younger children seemed to show concept understanding of the movement before they could express it. With increasing age however, movement expression

predominated over concept understanding. For Directions, movement expression predominated over concept understanding with the younger children. But with increasing age, concept understanding began to predominate.

Recommendations

It is suggested that another level of older children should be included in further studies on this problem. Studies on an older age group could provide data to explain more fully the reversals in results with increasing age.

The tests can also be improved by providing different movement tasks that measure a specific concept as to avoid repetitiveness in one task. The children might also be more challenged in responding to the items. In the judgment of the researcher, the children's responses are quite definite such that a task need not be repeated more than once.

In general, we can say that some movement concepts, like the Pathways concepts, are already understood by the child at an early age. If these basic concepts have been identified to be present during early childhood, children may start receiving proper movement instruction on these concepts at an early age rather than wait until the elementary years, as is usually the case. The teacher can utilize his knowledge of the children's understanding of concepts to plan practical and creative movement experiences. He can further enhance movement expression by providing opportunities for children to understand and explore their own movement capabilities. This implies the need for appropriate movement activities with clearer objectives in the primary school.

Teachers usually think that free play provides enough movement experiences for the child. Teachers need to do more than provide opportunities for free play. Syllabus or curriculum planning involves determining what children can do or are capable of doing at their age levels. Even if basic movement is said to be exploratory and experimental, it is important that children progress from the simplest to the more difficult movement activities in a logical manner. This means that children necessarily understand the concept involved in movement. We can say "push" to a child but unless he understands what "push" is and what makes "push," he cannot do it.

Even in more complicated combinations of movement skills, we sometimes assume that these develop through maturation. If simple skills, like a jump in ballet, are broken down into more basic skills and good teaching techniques are applied, we might be more successful at teaching these skills.

These points correspond to Bruner's discussion of the role of structure in learning and the role of readiness for learning, which have important implications for movement education (Russell, 1975). Effective learning occurs when emphasis is given to the learning of fundamental ideas which are then used as the bases upon which different aspects of the ideas are developed. Learning experiences should lead children to understand movement as well as to experience it. It is not only necessary that children learn the fundamentals early but also that the learning process be aided by exploration and discovery.

In considering readiness for learning, Bruner (Russell, 1975) maintains that the foundations of any subject can be taught to anyone at any age in some "intellectually honest form" and that basic ideas are "as simple as they are powerful." The acquisition of basic ideas and their effective use requires a continuing understanding that is developed out of learning to use them in progressively more complex forms.

These considerations stress the need for materials that are the optimal stimuli for learning. The sense of discovery should be aroused and maintained in children. Finally, teaching increases children's awareness of their body capacities and their mastery of movement. This is the central notion of Movement Education— an awareness and sound understanding of child growth and development so that children de-

velop their own ideas both for their own and their teacher's sense of satisfaction and achievement.

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