THE EFFECTS OF SELECTED PERCEPTUAL-MOTOR EXPERIENCES ON BODY IMAGE BOUNDARY AND ACCELERATION OF CONSERVATION

by

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A THESIS

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THE EFFECTS OF SELECTED PERCEPTUAL-MOTOR EXPERIENCES ON BODY IMAGE BOUNDARY AND ACCELERATION OF CONSERVATION

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by

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ABSTRACT

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Purpose

The purpose of this investigation was to examine the effects of selected perceptual-motor experiences on body image boundary and on acceleration of conservation. The study was undertaken to explore whether or not conservation could be accelerated and body image boundaries could be changed. The investigation was designed to be an extension and elaboration of a previous study. The difference in this study was an addition of another variable body image boundary and a longer training session.

It was theorized that certain perceptual-motor experiences plus the use of the words wide, narrow, long and short would significantly accelerate conservation. It was also indicated that perceptual-motor experiences might effect body image boundaries and that there might be a relationship between body image boundaries and conservation.

Methods

Subjects for the study were eighteen Sam Houston State Kindergarden children aged five who attended the perceptual laboratory two times a week for a twenty week period. The

subjects came from different socio-economic levels. The investigation used a pre-test design with the children randomly assigned into experimental and control groups. Measures used were: barrier and penetration score measurements of body image boundary and the concept assessment test as a measurement of the attainment of conservation. The tests were given prior to the perceptual laboratory experience and again after twenty weeks of the training session.

Findings

The results showed that the body image boundary scores were not significantly changed, that the experimental group had an acceleration of conservation in the Two-Dimensional Space and the Discontinuous Quantity tasks as measured by the McNamar Test of Change. The experimental group had a significant total gain in the conservation assessment test when the Mann-Whitney Test was applied to the data. There was no significant relationship between body image boundary and acceleration of conservation as indicated by the Spearman Rank Correlations.

The results suggested the following conclusions: the use of the terms, wide, narrow, long and short with certain movement tasks in a perceptual-motor laboratory can significantly accelerate conservation.

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Supervising Professor

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This writer wishes to express her heartfelt thanks to Dr. Wilhelmina McFee, for without her patience, guidance, interest and friendship, this research would never have been completed. She will always have my respect and gratitude. I feel a better person from knowing her and having her help me realize the highest of expectations. I would like to extend a word of thanks to Dr. Coralie Emmons, a member of my committee and also a friend. She gave freely of her time and also allowed me to use the children in her perceptual laboratory. I know this took extra time and was an inconvenience. I would also like to thank Dr. Joel Bass, a member of my committee, and a consultant on Piaget, for his comments and criticisms regarding the writing of this thesis. The writer feels especially indebted to Dr. Seymour Fisher who took time out of his very busy schedule to score the Holtzman Inkblot Responses.

I would like to pay special tribute to Dr. Jack Staggs, Chairman of the Education Department, because without his approval for using the Sam Houston State Laboratory school children, this research would never have been possible. It is exciting to know that someone in education is looking for better ways to help children learn.

The writer also wishes to express her gratitude and extend her friendship to all those students from Sam Houston State University who helped to teach the children in the training sessions and also helped to administer the necessary tests. Also a special thanks to Elizabeth Schnabl for her help with the statistics involved in this study.

DEDICATION

This research is dedicated to you. To you who have spent your life helping children to learn, and to become. This research is the long way of finding out why children fall off tricycles. Thank you Mom for your guidance and love. I think you're great!

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CHAPTER I

INTRODUCTION

Gross motor activity is a very basic element in the child. He learns and develops from it. The child finds his environment much easier to understand if he can control his body movements. While the child does not appear to be as dependent on bodily coordination as he grows older, Piaget "implies that the individual's built up sensorimotor schemata may feasibly relate to total self integration." (1, p. 25)

A closer examination of perceptual-motor experiences reveals that human movement performances are more than reversals of direction, changes of position and non-locomotor movement. Bodily movements are a person perceiving and relating to his physical environment. As such movement is an integrated part of the self. Movement then can become involved in certain aspects of concept formation, namely conservation.

Interest in this study was stimulated by research on Piaget's developmental theories and experiments that explored the acceleration of conservation. Physical educators have for some time intuitively believed in the interrelationship of movement experiences and certain types of cognitive development. At the present time, claims that movement experiences contribute to an individual's cognitive ability

have not been validated. The researcher also has included in the study the effect of perceptual experiences on the development of body image boundaries. Much research has been completed regarding body image development using perceptual-motor programs but very little in the specific aspect of body image boundary development, one of the factors of body image.

In this study the writer examined the body image boundary concept. In the Holtzman Inkblot technique, Fisher and Cleveland used the inkblots to determine unconscious aspects of personality. This type of test depends on construct validity as there is no empirical way of assessing man's unconscious behavior. In the inkblot test the assumption was made that the child responded to the inkblot in the context in which he perceived himself. For example, when the subject sees an object that has certain boundary qualities - he sees himself as having body boundaries.

According to studies by McFee, "the relation of body image boundary and movement performance have suggested a reciprocity function between body image boundary and movement performance. These studies have implied the importance of early movement experiences that stress body awareness in space and experiences that permit the individual to explore both the range and limitations of his body framework." (2, p. 18)

Piaget's work indicates that conceptual development is

portioned into four stages: the sensorimotor stage, the preoperational stage, the concrete operational stage, and the formal operational stage. This study was primarily concerned with the preoperational phase of development. This phase takes place from ages four to approximately age seven. The children used in the experiment were approximately five years old and in the preoperational phase of development. Piaget believes that certain types of characteristics occur at certain ages. One of these characteristics is the development of conservation. It is believed that this characteristic is developed by approximately the age of seven, prior to the concrete operational stage. However, conservation formation has not been accelerated by the use of pure language concepts. Previous research has shown a relationship of verbalization with certain types of concept formation. It has been shown that none of the following conditions caused acquisition of conservation.

1. observation of empirical conservation
2. practice of adding and subtracting material
3. taking the pretest and posttest (3, pp. 71-84)

"Piaget and his co-workers assert that logical structure is not originally present in the child's thinking, but that it develops as a function of an internal process, equilibration which is heavily dependent on activity and experience." (4, p. 13) Piaget has cited situations where a child can conserve at simple and intermediate stages, but when the change

of objects is extreme the children claim different amounts and often rely on their perception. (5) Some children during the preoperational stage can conserve with simple tasks but when faced with more complex ideas are confused.

The relationship between body image boundary and conservation stems from the idea that development of body image involves the development of a concept about one's own body. It is speculated by the researcher that development of body image boundary and conservation are related areas and can be developed by a similar means, in this case experiences with perceptual-motor learning.

It was the contention of this writer that the child may be helped to reorganize simultaneously through movement experiences and verbal instruction. Thus the child is doing with his body and thinking with his mind at the same time.

The writer sees this study as an attempt to justify inclusion of perceptual-motor experiences in the early childhood and pre-school period. The author also sees this study as a means of interpreting the value of perceptual-motor experiences.

Statement of the Problem

The purpose of this study is to examine the effects of selected perceptual-motor experiences on body image boundary and on the acceleration of conservation. The study was undertaken to explore whether or not conservation could be

accelerated and body image boundaries could be affected.

Hypothesis

The study attempted to test the following hypotheses:

1. The use of the words: wide, narrow, long, and short with certain movement tasks in a perceptual-motor laboratory will significantly accelerate conservation as measured by the Conservation Assessment Kit.

2. Perceptual-motor experiences will affect body image boundaries significantly.

3. There will be a significant relationship between body image boundaries and understanding of conservation.

Limitations of the Study

1. The smallness of the sample size and the fact that the subjects were not necessarily typical of their age, limits the generalizations of any inferences of the results in terms of generalizations to the total population.
2. The physical facilities of the perceptual-motor laboratory necessitated having two children from the control group exposed to the experimental group. The facilities were set-up to hold a maximum of eight students and four teachers. Therefore, it was necessary for one of the teachers to have her experimental children in with the control group.

3. The two sexes were not equally represented and it is recognized that this may limit the significance of the results.
4. It was not possible to control for inter and intra reliability of examiners and or instructors.
5. There was no attempt to determine that acceleration of the development of conservation and or body image boundary is necessarily desirable. This study only attempted to examine the possibility.

This chapter has included an introduction, statement of the problem, hypotheses and limitations of the study. The next chapter will be a review of related literature.

CHAPTER II

RELATED LITERATURE

Chapter one examined the reasons for the study. This chapter will deal with literature relating to body image boundary development, the development of conservation behavior, and perceptual-motor learning as it relates to Piaget's concept of conservation.

Body Image Boundary Development

An Aspect of Body Imagery

Body image is viewed as a psychological variable which evolves gradually by way of the learning process. According to one author body image is defined as one's concept of his body as it appears to him in his mind. (6, p. 375) There are indications that an understanding of our body is necessary to such things as arithmetical reasoning, reading, accurate perceptions of other persons and all perceptions and cognitive activities of the human organism. (7) The investigator wishes to study one aspect of body image namely body image boundary development.

Fisher and Cleveland devised the construct of body image boundary when examination of inkblot responses consistantly indicated that subjects who were concerned about the surface

areas of the body typically gave inkblot responses that were "characterized by an emphasis upon the protective, containing, decorative, or covering functions". (8, p. 53) The following may be scored as barrier responses:

1. All references to clothing whether mentioned or separate articles whether described as worn by a person or whether indirectly referred to. Examples: dress, girdle and sweater.

2. All references to buildings and similar enclosing structures. Examples: arch, church, closet, cottage and hall.

3. All references to vehicles with some containing or holding qualities. Examples: airplane, boat, and ski lift.

4. All references to that which contains, covers or conceals. Examples: bag, bubble, cage, chair and nest.

5. All living things (except human) described as having special surface qualities (fuzzy, rough, hard, smooth, stripped, spotted, bristly, feathered, long haired). Does not include references to the surface being light or dark, or unusual skins. Examples: alligator, badger, fox and lion.

6. All creatures possessed of shells or similar protective structures. Examples: snail, lobster and shrimp.

7. All references to geographic or natural formation with delimiting or container-like qualities. Examples: abyss, harbor, canal and cave. (9, p. 882-885)

In each of these responses special attributes are assigned to the periphery. Each inkblot response that contains one or more barrier ideas is given one point, the total score is the final number of barrier responses. (10) According to Fisher and Cleveland, the higher the barrier

score the more the person will feel sensations on the outer areas of the body especially the skin and musculature instead of inner areas such as the stomach and the heart. (8, p. 57)

If the person experiences sensations in the interior regions of the body he is said to have a penetration score. Fisher and Cleveland felt that the penetration score "would tap an individual's concern with the weakness, lack of substance and penetrability of the boundaries of the body." (7, p. 6) Fisher and Cleveland described the lower barrier scored individuals as "possessing a flaccid orientation that devalues activity and physical assertiveness." (7, p. 8) Some criteria involved in obtaining penetration scores are as follows:

1. All references to the fact of disruption, penetration, damage or destruction of any object or living thing.
2. All references to body opening or acts involving body openings.
3. All references to perceptions which involve a perspective of bypassing or evading the usual boundaries of the body or other objects.
4. All references to the process of outering or leaving structures and also the means of doing so.
5. All references to natural contexts that involve intake or expulsion.
6. All images that are insubstantial or vague in their delimination. (9, pp. 886-888)

Fisher and Cleveland have collected considerable information on the correlates of the body image boundary

dimension of body image perception. This concept has its beginning in the notion that during development a child gradually learns to divide himself from his environment. The importance of body boundary definiteness is, Kubie states, that if a child is to be able to relate to others he must be able to define his own body boundaries. (6) Fisher and Cleveland have found in their studies "that the more definite an individual's boundaries, the more likely he is to behave autonomously, to manifest high achievement motivation, to be interested in task completion, to be interested in communicating with others and to serve an active integrative role in small group situations". (10)

The potential importance of the body image lies in the fact that such a process is highlighted by the fact that one of the simplest of perceptual parameters namely size has proven to have exciting possibilities as a means of measuring body image attitudes and body boundaries (8, p. 51) The experiences in the perceptual-motor laboratory are clearly related to changing the size and shape of the body by making their bodies larger or smaller, wider or narrower. This terminology directly relates also to cognitive growth.

According to Lubert, Werner and Wapner research indicates that the manner in which an individual perceives his body size may be dependent on his attitudes toward himself and his body. Additional studies show that perception of body size is associated with such variables as:

ability to make independent judgements, degree of disorganization, exposure to sensory isolation, and use of psychometric drugs. (3)

Studies by Woods, (11) McFee (2) and Davis (12) indicate that there is a relationship between development of body image boundary and movement tasks in normal children age 8-10-12 years, late adolescents and retarded children ages 5-20 years respectfully.

It is of interest to note how the degree to which the child separates body from the environment affects conservation. Studies have not been found that deal with body image boundary and the development of conservation in a perceptual-motor laboratory with four and five year old children.

Piaget: On Conservation

In recent years there has been a surge of interest in the developmental theories of Jean Piaget. The development of the child before school age has also generated special interest. People in many professions, including psychologists, mathematicians, teachers, and developmentalists, are beginning to realize that what children experience before their formal school years may have a large affect and relate to the child's ability to handle intellectual ideas and to his cognitive development. (13)

Hunt refers to the idea that controlling the children's experiences in such a way that they are fun and enjoyable,

but matched to their abilities will help to develop their cognitive functions. (14) Touching, lifting, arranging, and sorting all help the child to become aware of differences and simularities among objects that he handles and sees in his environment. (13) Children seem to gain an expanded feeling that objects have many dimensions and properties as they manipulate and play with them. This type of object manipulation also takes place in a perceptual-motor laboratory situation. For example, bean bag throwing and ball handling activities. Eventually the child can order objects as to size, form, color and weight. He can arrange them accordingly from smallest to largest, darkest to lightest, softest to hardest and so on. According to Flavell, in these relationships Piaget sees the origins of conceptual thinking. (15, p. 48)

Piaget's conceptual development is divided into four stages, the sensorimotor stage, the pre-operational stage, the concrete operational stage and the formal operational stage. This study is primarily concerned with the pre-operational phase of development. Piaget feels that certain types of characteristics occur at certain ages. One of these is the development of conservation.

Conservation is defined by Flavell "as the cognition that certain properties (quantity, number, length, et cetera) remain invariant (are conserved) in the face of certain transformations (displacing objects or object parts in space),

sectioning an object into pieces,(changing shapes, et cetera). This process is considered by Piaget as a necessary condition to all rational behavior." (5, p. 245)

It has been observed during the program, that the pre-school child tends to rely on his perception and is easily taken in by the appearance of things. For example, he will think that if corn is poured from a large glass into two or more smaller glasses there is more in the two smaller glasses. An older child isn't fooled by this type of experiment. He has achieved conservation.

According to Carlson, Piaget describes the child as learning to conserve in terms of four steps that include centering and decentering. In other words, each step forms an equilibrium state. The first step involves the child dealing with A or B; that is height or width. The second step involves centering on the opposite dimension. The third step acts as a midway point between conservation and non-conservation, as the child can center on both height and width dimensions at the same time. This behavior is, however, inconsistant and the child is a part-time conserver. The fourth and last stage takes place when the child can focus on the transformation of A to B. He is not perceptually deceived, he is a conserver. (16, pp. 16-20)

An important component of conservation according to the interpretation of Piaget by, Mussen, Kagan and Conger, is development of operations and "coordination of operations".

An operation has two important characteristics: first, that it is internalized and second, that it is reversible. (17, p. 447) An example is addition and subtraction. Two balls can be added to two balls or they can be subtracted. Addition and subtraction are reversible.

According to research conducted by Smedslund, situations that permit simple response learning are detrimental to occurrence of more profound cognitive reorganization. (18, p. 18) This seems to reinforce Smedslund's feeling that conflict is necessary in the child to make him reorganize his cognitive activities.

Attempts to accelerate conservation behavior in children have had only limited success. Bruner contends that "acquisition of conservation is related to linguistic experiences" (19), and Sigel, Roeper and Hooper feel that encouragement to verbalize plus the necessary task may combine to provide significant experiences to acquire conservation. (20, p. 302) Studies have also shown that practice of addition and subtraction and taking the pretest and posttest have not caused acquisition of conservation. The researcher did not locate studies in which conservation had been accelerated by pure language concepts.

Some research has been done on sex differences but at the present time the evidence is not conclusive. According to Hooper, research has revealed notably different male and female patterns. While male and female primary mental

abilities were not significantly different for any age-grade level, male subjects were consistantly superior for all tasks, conditions and age levels. (21, p. 246) Hooper also states that at all levels and conditions 64.8% of the males as opposed to 37% of the females were conservers. Research by Fogelman indicated that the degree to which the student was allowed to actively handle and manipulate objects made a difference. Fogelman found that girls got better scores when they watched while boys scores were better when they could handle the objects themselves. He further stated that younger subjects were more successful with female testers while older children were more successful with male experimenters. (22)

It was reported by Lovell, that Piaget has not accounted in several instances for complexity of experience and maturation. Lovell cites a study done by himself and Ogilvie and also another study done by Hyde that would indicate that under certain conditions the conservation of continuous and discontinuous quantity may precede the conservation of substance. He also believes that the child may have had experiences involving such things as water, sand and clay which might influence his acquisition of conservation in certain situations. (23)

The children in the laboratory have had an experience with water although this was not controlled for in the training sessions. The swimming was not manipulative in

nature.

One study by Schnabl was found that dealt with acceleration of conservation through movement tasks in a perceptual-motor laboratory. Schnabl found a significant relationship between the experiences in the perceptual-motor laboratory and certain movement tasks with the acceleration of conservation. (24)

Summary

Having checked the research available and found that there appears to be none that directly relates to the effects of movement tasks on acceleration of conservation, parts of the following summary may only be considered speculative.

For many years physical educators have felt that perceptual-motor experiences contribute in some way to the development of cognition. (25, 26) Frostig has also related perceptual-motor laboratories to the development of body image. (25)

One can readily see the relationship between perceptual-motor experiences and the development of body image. Perceptual-motor programs include a station that deals exclusively with body image development. It helps to define body boundaries with such activities as identification of body parts, making the body different shapes and general exploration of the body. Manipulation of the body, experiences with the body parts would appear therefore to contribute to the development of an aspect of body image,

namely, body boundary.

One can also hypothesize that there is a connection between movement tasks and the acceleration of conservation. Piaget relies on object manipulation and experience in the development of conservation. In the laboratory the children experience many ways of using the body as both subject and object. They also experience their bodies in relationship to other children in the environment and other objects. Objects are seen in different ways, shapes and sizes.

The relationship between boundary development and conservation is not clear. However, both Kubie and Witkin feel that if boundary development is not clear and definite cognition will be affected and perhaps be retarded. This may intimate that conservation would take place at a later time and that body image boundary development was necessary for conservation at the proper time. It also could be speculated that development of boundaries at an earlier age may accelerate or affect conservation.

Zaner (27) has done some research on the mind-body problem, but it is a speculative attempt at aligning the views of Piaget and Merleau-Ponty. Research is not available that relates the three areas, body image boundary, conservation and perceptual-motor experiences. It would appear logical however that some relationship exists. It was of interest to study whether or not there were relationships.

CHAPTER III

PROCEDURES

This study has attempted to deal with the development of body image boundary and the acceleration of conservation. The first chapter showed the justification for the study and the second chapter examined the current related literature. The present chapter includes the procedures utilized in the study.

Selection of Subjects and Design of the Study

The subjects for this study were nineteen, five year olds who were presently attending the perceptual-motor learning laboratory at Sam Houston State University in the Department of Health and Physical Education for Women. The children were from Sam Houston State University Kindergarden School and attended the perceptual-motor learning laboratory two forty-minutes periods per week. They all reside in the city of Huntsville, Texas. The students were from different socioeconomic backgrounds and included white, black and Mexican-Americans. The children were randomly assigned into an experimental and a control group with nine in each group. The control group and the experimental groups did the same movement tasks with the exception that the control group did

not experience movements that stress the terms wide, long, narrow, and short, whereas the experimental group involved these words in all of their movement tasks.

Measurements

The Holtzman Inkblot Test and Conservation Assessment Kit were selected because they most nearly typified areas the researcher was concerned with in this study. The Holtzman Inkblot Test was used because the first twenty-five items relate to body image boundary as demonstrated by Fisher and Cleveland. This test which determines the unconscious aspects of personality depends on construct validity. As of now there is no objective way of assessing man's unconscious behavior.* The Conservation Assessment Kit was given because it measures conservation or the acquisition of Two-Dimensional Space, Number, Substance, Discontinuous Quantity and Continuous Quantity which take place in the age group represented in the laboratory.

A pretest was given using both the Holtzman Inkblot Technique and the Concept Assessment Kit. The tests were given prior to the perceptual-motor learning laboratory experience.

The first week the Holtzman Inkblot Test was given to

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*This test may be obtained from the Psychological Corporation, New York 17, New York.

determine the subjects present body image boundary. The children were taken in groups of nine and were seated on the floor to take the test. The following instructions were issued:

> Boys and Girls today we are going to see some slides of inkblots. Some of them will be in black and white while others will be in color. Tell your instructor what you see first and have her circle the area on the paper where you see the object or thing. There are no wrong answers so make sure you tell your teacher everything. Remember there are no wrong answers.

Two trial slides were projected. After each slide the administrator described the kinds of responses that are often seen in the trial slides. The administrator reiterated that there were no right or wrong answers. The time for administration was two to five minutes per slide. The entire testing was divided into thirty minute periods plus one fifty minute period.

The second pretest was the Conservation Assessment Test. This test took three thirty minute periods to administer. The test was given to individual children in one of the perceptual-motor laboratory rooms such that each child rotated from station to station for each task. The test consisted of conservation tasks. The tasks included were: Two-Dimensional Space, Number, Substance, Continuous Quantity and Discontinuous Quantity. One item, the conservation of weight, was excluded as it related to a much later stage of development, the formal operational stage. Conservation of weight comes at approx-

mately ages 10-12. An explanation of this test is available in Appendix A. There were no modifications of instruction and the children did not manipulate the test materials.

The posttest was completed after twenty weeks of perceptual-motor laboratory experiences. During the post testing all of the previously described tests were repeated. The instructions given were the same. Inasmuch as possible the same testing conditions were used with the exception of seven different examiners. The reason for the different examiners was the change in student teachers which took place at the universities semester break. The investigator also found that the posttests took a slightly shorter time for the subjects.

Training Program

The movement tasks used for the experimental group were like those used by the control group with one exception. The experimental group used the words, wide, narrow, long and short. These terms or words the child sees in the absolute rather than the relative. For example, the child sees either black or white, he does not see a shade such as grey in between. In an interview situation Piaget has referred to research by Dr. H. Sinclair.

> "Dr. H. Sinclair has made some interesting experiments along this line. She had two groups of children; one group had conservation, the

> other group did not. She took the group of children that did not understand conservation and taught them the language used by the children who understood the concept. They learned to use "long" and "short" and "wide" and "narrow" in a consistent way. She wanted to see if the concepts would come once the language was learned. They did not. If a ball of clay was pulled into a sausage, the children could describe it as "long" and "thin." But they did not understand that the clay was longer but thinner than the ball and therefore the same quantity." (28, p. 31)

The words were introduced one at a time to the experimental group as it was felt that giving them all at the same time would confuse the child. The term wide was introduced first, this was followed by narrow the opposite of wide. The term long was introduced next and was followed by its opposite, short. As each new word was used it was combined with those already used. An example of this procedure would be: "Jump as wide as you can, then jump as narrow as you can."

As the words became familiar to the children the tasks became more complicated. The subjects were asked, for example, to make the top of their body - wide - and the lower part of their body narrow or to be short on the top and wide on the bottom. If they did not understand, their instructor's were told to have the children repeat the instructions and the teachers, put the body part or parts in position.

The author has listed in Appendix B all of the movement tasks used by the perceptual-motor learning laboratory

teachers. Each teacher was instructed to use only those things discussed by the writer and the other teachers.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

Chapter three described the procedures which included the measurements used and the movement tasks used in the training program. Chapter four will interpret the data obtained.

The study dealt with two aspects, changes in body image boundary and acceleration of Piaget's concept of conservation. Examination of these two aspects was within a framework of perceptual-motor experiences.

Parts of the data were recorded on sheets furnished by the Sam Houston State University computer laboratory. Most of the treatment of the data was by non-parametric statistics as it did not appear reasonable to assume either a normal distribution or a homogeneity of variance.* Table I presents a summary of the change in conservation tasks for the control group using the McNamar non-parametric statistic. Change was measured on a success or failure basis. A response was considered successful and counted as change when a subject had a correct answer on the post test or on both the pre and

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*The writer wishes to acknowledge the help of Dr. Andrew A. Dewees, biological statistician at Sam Houston State University, for his help on the statistics of this study.

post tests. A response was judged as failure when a subject had an incorrect answer on the post test or on both the pre and post tests.

It can be seen from Table I that the only significant change for the control group was on the explanation of Task D, Continuous Quantity. This change was a net failure and represents a significant loss in conservation on the task of continuous quantity. In examination of the raw data it was found that a considerable loss on this task was due to one subject. Perhaps this subject for some unexplainable reason reacted negatively to the test examiner of this task, or in some way the examiner may have confused the child. It may have been a spurious result, since conservation concepts are thought to be stable once learned.

Table II indicates the McNamar tests of change for the experimental group on the conservation assessment tasks. Change was evaluated for the experimental group in the same manner as for the control group. The asterisks indicate a .05 level of significance. In Task A, Two-Dimensional Space, there is significant change in both explanation and total scores. The success in Task A, Two-Dimensional Space, perhaps may be explained by the fact that the motor tasks in the experimental group dealt extensively with Two-Dimensional activities. Task B, Number, has some change but not at the significant level. Task C, Substance, is notable only in that it showed the least amount of change. This was a result which

TABLE I

McNAMAR TESTS OF CHANGE ON CONSERVATION TASKS FOR CONTROL GROUP

Source of Variation	d.f.	for Two-Tailed Test	
Net Success or Failure			
Task A (Two-Dimensional Space)			
Behavior:	1	0.333	
Explanation:	1	3.0	
Total:	1	2.25	
Net Success or Failure			
Task B (Number)			
Behavior:	1	0.0	
Explanation:	1	0.0	
Total:	1	0.0	
Net Success or Failure			
Task C (Substance)			
Behavior:	1	0.0	
Explanation:	1	0.0	
Total:	1	0.0	
Net Success or Failure			
Task D (Continuous Quantity)			
Behavior:	1	0.25	
Explanation:	1	4.0	*
Total:	1	0.25	
Net Success or Failure			
Task F (Discontinuous Quantity)			
Behavior:	1	0.0	
Explanation	1	0.0	
Total:	1	0.0	

* = .05 level of significance (χ^2 of 3.84)

TABLE II

McNAMAR TEST OF CHANGE ON CONSERVATION TASKS FOR EXPERIMENTAL GROUP

Source of Variation	d.f.	for Two-Tailed Test
Net Success or Failure		
Task A (Two-Dimensional Space)		
Behavior:	1	3.0
Explanation:	1	5.0 *
Total:	1	5.0 *
Net Success or Failure		
Task B (Number)		
Behavior:	1	0.333
Explanation:	1	3.0
Total:	1	1.0
Net Success or Failure		
Task C (Substance)		
Behavior:	1	3.0
Explanation	1	0.2
Total:	1	0.2
Net Success or Failure		
Task D (Continuous Quantity)		
Behavior:	1	4.0 *
Explanation:	1	6.0 **
Total:	1	7.0 ***
Net Success or Failure		
Task F (Discontinuous Quantity)		
Behavior:	1	3.0
Explanation:	1	3.0
Total:	1	3.0

* = .05 level of significance (χ^2 of 3.84)
** = .02 level of significance (χ^2 of 5.41)
*** = .01 level of significance (χ^2 of 6.64)

was not anticipated in that a previous study had found a significant difference for the same experimental conditions. Perhaps again this could have something to do with the examiners. It can be noted at this time that the examiner used in this task was a male and as reviewed in Chapter two research indicates that young children relate better to female examiners. Task D, Continuous Quantity, shows the most significant change. Behavior showed a significance at the .05 level while explanation shows a significance of change at the .02 level. The total change was significant at the .01 level of significance. There is no apparent reasonable explanation for this result except the use of the particular words in conjunction with the movement tasks has in some way contributed to the understanding of this conservation task in those children who succeeded. Task F, Discontinuous Quantity, showed some gain but not at the significance level. All tasks with the exception of Task C, Substance, reveal some gain. Looking at all tasks the experimental group had a net gain significant at the .025 and the .05 level.

It appears that the movement tasks stressing the use of the words wide, narrow, long and short have in some way contributed to the acceleration of conservation in the experimental group.

Table III shows the total pre and post scores, the difference and the ranks of differences for both the control and experimental groups. Improvement in test scores appeared

TABLE III

PRE AND POST TOTAL SCORES, DIFFERENCES, AND RANKS OF DIFFERENCES OF CONSERVATION TASKS FOR CONTROL AND EXPERIMENTAL GROUP

Groups	Total Pre	Post	Difference	Ranks of Differences
Control				
01	2	4	2	11
02	3	6	3	14
03	15	16	1	8
04	15	14	-1	-3.5
05	8	7	-1	-3.5
06	13	14	1	8
07	6	6	0	5.5
08	6	6	0	5.5
09	13	8	-5	-1
			Total	60.0 R_1
				$N_1 = 9$
Experimental				
10	14	12	-2	-2
11	12	14	2	11
12	13	16	3	14
13	3	6	3	14
14	10	12	2	11
15	7	14	7	18
16	10	14	4	16.5
17	2	6	4	16.5
18	6	7	1	8
			Total	111.0 R_2
				$N_2 = 9$

for eight out of nine experimental subjects as compared to four of the control group. Only one subject in the experimental group went down in total scores whereas in the control group three subjects went down and two stayed the same.

Table IV indicates a summary of the Mann-Whitney test of differences between obtained and expected sum of ranks for net changes on the concept assessment test as found for the experimental and control groups. Table IV indicates that the experimental and control groups were significantly different at greater than the .05 but less than the .025 level of confidence. The control group had more low ranks and the experimental group had more high ranks. It is clear that the total performance of the experimental group was superior to the performance of the control group on the Conservation Concept Test.

TABLE IV

SUMMARY OF MANN-WHITNEY U TEST OF DIFFERENCES BETWEEN OBTAINED AND EXPECTED SUM OF RANKS FOR NET CHANGES ON THE CONSERVATION TEST OBTAINED FROM EXPERIMENTAL AND CONTROL GROUPS

Source of Variation	Critical Value of U for Two-Tailed Test
Net Change of Experimental and Control Groups on Conservation Test	15 *

*Significant at $> .05$ but $< .025$ level

Table V presents the Spearman Rank Method Correlations of all variables for all subjects.

TABLE V

SPEARMAN RANK METHOD CORRELATIONS OF ALL VARIABLES FOR ALL SUBJECTS PRETEST WITH PRETEST AND POSTTEST WITH POSTTEST AND PRE POST ON SAME VARIABLE

Piaget Pre-Test	Piaget Post	Barrier Pre-Test	Barrier Post-Test	Penetration Pre-Test	Penetration Post-Test
Piaget (Pre)	.841**	.008		.023	
Piaget (Post)			.031		.246
Barrier (Pre)			.520*	.092	
Barrier (Post)					.041
Penetration (Pre)					.391
Penetration (Post)					

** Significant at > .001
* Significant at > .02 level

Only the pre-post relations on the same variable and the pre to pre or post to post test inter variable relations were studied. For example, it did not appear logical that relations between a pre test barrier score and a post-test Piaget post score would be meaningful, so these kinds of potential correlations are omitted from Table V.

As can be seen by the above table there is significant relationship between the conservation pre and post tests at greater than .001 level. Also, there is a significant correlation between the pre and post barrier scores at greater than the .02 level of confidence. While, in general, subjects' changed in both the conservation and barrier scores, it would appear that the rank order of the subjects was fairly consistant. In other words, in these two tests, those subjects who ranked high or low on the pre tests also ranked high or low respectively on the post tests. The fact that subjects maintained a fairly consistant rank order may be in some way due to the fact that all subjects were experiencing a similar perceptual-motor training program. This is highly speculative and further research would be needed to gain insight on the idea.

Table VI examines the Means and Standard Deviations for the control group.

TABLE VI

MEANS AND STANDARD DEVIATIONS FOR CONTROL GROUP

	Barrier Pre	Barrier Post	Pene-tration Pre	Pene-tration Post	Piaget 1	Piaget 2
Mean	5.333	4.556	4.000	3.444	9.000	9.000
Standard Deviation	2.062	2.963	4.472	4.246	5.099	4.416

It can be seen from the table that the means of the post test are somewhat lower than the pre tests for both barrier and penetration scores. The standard deviation raised in the barrier scores indicating a larger distribution between scores at the time of the post barrier test. The penetration standard deviation dropped some, indicating that there would appear to be a somewhat smaller variability between the scores. The mean stayed the same in the total scores of the conservation test. The standard deviation went down indicating less individual variation.

Table VII examines the experimental group for means and standard deviations.

TABLE VII

MEANS AND STANDARD DEVIATION OF ALL VARIABLES FOR EXPERIMENTAL GROUP

	Barrier Pre-Test	Barrier Post-Test	Penetration Pre-Test	Penetration Post-Test	Piaget Pre-Test	Piaget Post-Test
Mean	6.222	5.667	4.000	2.556	8.556	11.222
Standard Deviation	2.819	2.121	3.202	2.744	4.304	3.866

Table VII showed that the mean barrier and penetration scores were lower at the time of the post test. It shows also that the mean was raised for the post test on conservation. The standard deviation also went down for both the barrier post test and the penetration post test.

Apparently at the end of the study experimental subjects tended to be more homogeneous in body image boundary aspects, but body boundary concepts were less definite and less penetrable. Perhaps this is simply an indication of different individual development patterns of each child and yields no special meaning for the study. However, since the control group also had a loss in body image boundary aspects,

there may be something inherent in the nature of perceptual-motor learning or in the total educational program of the children that affected the childrens' concept of their bodies. A further possibility is that at this age the child has not developed a stable body image boundary concept. Further research is needed to clarify the meaning of these results.

While there was no change in the conservation test mean scores of the control group, there is a distinct rise on the post test scores of the experimental group. The decrease in standard deviation indicates a decrease in the variability on the post test for both groups.

CHAPTER V

SUMMARY AND CONCLUSIONS

Chapter one reviewed the reasons for interest in this study and examined the need for the study. Perceptual experiences were shown to be a part of every individual's life. Chapter one also intimated that movement was a part of every young childs' experience and that it was vital to his growth and development. It was established that movement experiences are reciprocally related to the development of an individual's body image boundaries and may be found to be associated in some way with their cognitive functions.

Chapter two indicated that literature was not available directly relating body image boundaries to perceptual-motor learning. It was found however, that studies relating selected gross motor tasks and development of body boundaries were correlated. It was of interest to explore the relationship between the individual's concept of his body image boundary and the development of conservation. Chapter two elaborated on the importance of movement and experience in Piaget's theory. This importance led to the study of the effect of certain guided perceptual movement experiences on cognitive functioning.

Chapter three reported that the kindergarten subjects

were from different socio-economic brackets and arranged randomly into experimental and control groups. The design of the study required a pre-test followed by a training period of twenty weeks and ending with a post-test. The pre and post tests used the Holtzman Inkblot Technique and the Conservation Assessment Kit. The movement tasks were designed to be essentially similar for both control and experimental groups with the exception that the experimental group was presented the movement tasks in ways that asked them to move wide, narrow, long and short. Appendix C includes examples of the tasks used by the experimental group.

Chapter four indicated the results and interpretations of the data. The study examined three hypotheses. The hypotheses and conclusions follow.

1. The words wide, narrow, long and short with certain movement tasks in a perceptual laboratory will significantly accelerate conservation conceptual development.

It may be concluded that the use of the words: wide, narrow, long and short with certain perceptual-motor tasks in a perceptual-motor laboratory can significantly accelerate conservation; as measured by the Conservation Assessment Kit. This hypothesis is supported by the McNamar Test of Change for those tasks which indicated a .05 level of confidence or better on two tasks. Task A, Two-Dimensional Space, showed a .05 level of significance on explanation and total

score. Task D, Discontinuous Quantity, had a significance in behavior, explanation and total score. The total score was significant at the .01 level of confidence. These statistics are supported and confirmed by the Mann-Whitney

Test of net gains which indicates a significance between the .05 and the .025 level.

2. Perceptual experiences will affect body image boundary significantly.

Hypothesis two was not accepted. There was no significant change in either the penetration or barrier scores for either the control or experimental group. There was however a significant correlation at the .02 level. When examining the barrier pre and post means it can be observed that the mean went down on the barrier scores.

3. There will be a relationship between body image boundary and understanding of conservation.

There was no significant relationship between body image boundary aspects and understanding of conservation as shown by the Spearman Rank Method. Thus hypothesis three was not accepted.

It may be concluded that the use of the words: wide, narrow, long and short with certain movement tasks in a perceptual-motor laboratory can significantly accelerate conservation conceptual development. Thus hypothesis number one is accepted.

Suggestions for future study are as follows:

1. Control both number and sex of the testers.
2. Examine and test the children in the middle of the training period.
3. Give a retention test within six months after the training period.
4. A replication of this study is needed to substantiate the results.
5. The terms wide, long, narrow and short should be expanded to include bigger and smaller and other types of relational terms.
6. There should be more concern by future teachers with moving body parts to help them understand the terms wide, narrow, long and short.
7. It is also indicated that this type of situation should be exposed to different races and socio-economic groups.

APPENDIX A

EXPLANATION OF THE CONCEPT ASSESSMENT KIT-CONSERVATION

There are six items on this test, Two-Dimensional Space, Number, Substance, Continuous Quantity, Weight and Discontinuous Quantity. The conservation of Weight was not examined by the tester.

The first item, Task A, Two-Dimensional Space, consists of four parts. In the first area the child must recognize that there are two equal lines of sugar cubes. When he recognizes this he continues with the second part, two unequal lines. He must decide if these two lines are the same or if one has more. The test contains specific verbal cues for the tester to use. The third part has two equal squares of sugar cubes which the child must recognize as being the same. He cannot continue until he sees them as being the same. The last part of the first item is a square and a pyramid. He must again answer if they are the same or if one has more and why it does have more or less or is equal.

Task B, Number, consists of two areas. In the first area there are two equal lines of six poker chips. He must establish that they are the same or equal in number then he continues to the second part. In this part the top line of chips is drawn together. He is then asked if they are the same or if one has more or less, and why.

Task C, Substance, has two parts in it. In the first part the subject is presented with two equal balls of clay.

He is asked if they are both the same. When he agrees they are, one of the balls is rolled into a hot dog shape. He is asked then if the two shapes are the same or if one is more or less, and why.

In Task D, Continuous Quantity, there are five areas. They include identification of two glasses of equal quantities water and two glasses of unequal quantities water, quantities present in a large glass versus a quantities present in pie pan, and again two equal glasses of water and the pie plate and glass. In each case the child is asked if they are equal and why.

Task E, Weight, was not used.

Task F, Discontinuous Quantity, consisted of two items. They were first to identify two equal glasses of corn. Then one of the glasses was divided into five small but equal size glasses. The child was asked if they, meaning the large glass and the five smaller glasses, were equal or if one contained more or less.

Each scorable item was worth one point for behavior and one point for explanation. The total number of points possible was 16 for all tasks used in this study.

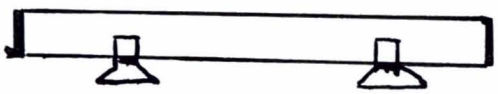
APPENDIX B

MOVEMENT TASKS

A. Walking Board

1. Walk wide
2. Walk narrow
3. Vary use of wide and narrow with legs
4. Slide sideways as wide and as narrow as possible
5. Make top part of the body wide and bottom narrow
6. Hop as wide, narrow, long and short as possible
7. Lay on back and stomach as long, short, wide and narrow as possible
8. Jump as wide, narrow, long and short as possible
9. Move on knees as wide, narrow, long and short as possible
10. Walk backwards, wide, narrow, long and short

Illustration of Walking Board



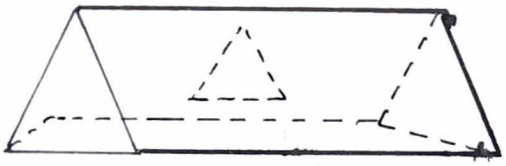
B. Tunnels

1. Go through tunnel and make yourself as wide as possible through the circle, square, triangle and diamond
2. Go through the tunnel walking, crawling or on your tummy making yourself as narrow as you can
3. Go through the tunnels on your back making yourself as long and narrow as you can
4. Go through the tunnels and make yourself as short and wide as you can

5. Crab walk through the tunnel as wide, narrow, long and short as you can. Combine more than one relational term

6. Roll through tunnels as wide, narrow, long and short as you can. Combine terms

Illustration of Tunnels



C. Tuber

1. Jump as narrow as you can

2. Jump as wide as you can

3. Jump wide on the outside of the tuber and narrow into the inside of the tuber

4. Jump as narrow as you can all the way around the tuber

5. Straddle the tuber as wide and narrow as you can

6. Lay as wide as you can on the tuber

7. Be as short as you can while jumping on the tuber

8. Be as long as you can while jumping on the tuber

9. Sit and bounce on the tuber as short and as long as you can

10. Combine wide, narrow, long and short in any way possible

Illustration of Tuber

D. Tires

1. Jump as narrow as you can in the tires

2. Jump as narrow as you can on the outside of the tires

3. Be narrow on one tire and wide on the next tire

4. Jump as short as you can on all the tires

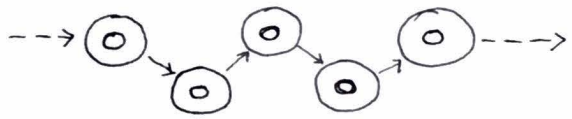
5. Jump as long as you can on all the tires

6. Jump short on the first tire and long on the next tire

7. Jump wide on the first tire, long on the next tire, wide on the next one and then narrow

8. Can you put your feet and arms in opposite relational terms?

Illustration of Tires



E. Spring Aling

1. Can you jump narrow?

2. Can you jump wide?

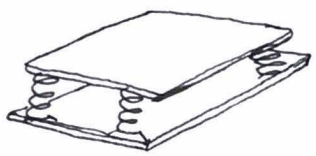
3. Can you combine jumping wide and narrow?

4. Jump narrow, arms wide

5. Jump long, with arms long too

6. Make your feet narrow in the air and wide on the spring aling

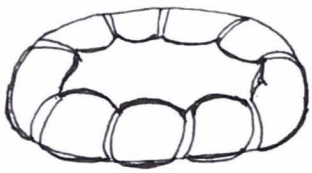
Illustration - Spring Aling - Side View



F. Trampolet

1. Jump as wide as you can seven times
2. Jump as narrow as you can
3. Jump both wide and narrow
4. Jump both long and short
5. Combine all terms in anyway possible
6. Turn around in the air being as narrow as you can
7. Turn around on the trampolet being as wide as you can on the bottom and as long as you can on the top
8. Reverse the above

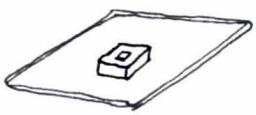
Illustration of Trampolet



G. Balance Boards

1. Balance as narrow as you can
2. Balance as wide as you can
3. Balance as long as you can on one foot
4. Balance as short as you can on two feet and make your arms as long as you can
5. Balance as long as you can - make your body and arms wide
6. Twist and balance, long, short, wide and narrow
7. Jump from one board to another as wide as you can

Illustration of Balance Boards



H. Stunts

1. Be a crab, bear, seal, dog as wide, narrow, long and short as you can
2. Forward roll as wide and narrow as you can
3. Push-up as wide, narrow, long and short as you can
4. Stand on your head with your legs as narrow, wide, long and short as you can
5. Log roll as narrow, wide, short and long as you can

I. Body Image

1. All locomotor movements, walking, running, skipping, hopping, jumping, galloping as wide, narrow, long, and short as you can
2. Combinations with different parts of the body
3. Variations of locomotor movements using all the terms
4. Angels-in-snow - all various body parts, wide, narrow, long and short on the floor
5. Crawl wide, long, narrow and short. Combine terms

J. Jump Rope

1. Jump as short as you can
2. Jump as long as you can
3. Jump as narrow as you can
4. Jump both long and narrow
5. Jump wide and short
6. Jump wide then jump long
7. Jump long and wide

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