AN ABSTRACT OF THE THESIS OF

JOAN S. SHAW (Name) for the degree of DOCTOR OF EDUCATION (Degree)

in EDUCATION (Major Department) presented on Sept. 23 1974 (Date)

TITLE: THE EFFECT OF A PERCEPTUAL-MOTOR PHYSICAL EDUCATION PROGRAM ON READING ACHIEVEMENT IN GRADE ONE

Abstract approved: Redacted for Privacy

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The Purposes of the Study

The purpose of this study was to investigate the relationship between perceptual-motor skills and reading achievement and to determine if a structured physical education program would develop perceptual-motor skills which would affect the ability of first graders to learn to read.

The Procedure

One hundred children, comprising the entire first grade population of one elementary school participated in a perceptual-motor physical education program based on the principles developed by Kephart and others. The first grade population of a similar elementary school served as a control group. Both groups were tested on perceptual-motor development and reading readiness at the beginning of the study and after six months were again assessed on perceptual-motor development and reading achievement. An analysis of covariance

was used on both the perceptual-motor tests and reading tests to equate the groups and determine if one group had progressed further than the other. Correlation coefficients were used to determine relationships between perceptual-motor skills and reading.

Summary of Findings

Comparison of the scores of the two groups on both pre-tests indicate there were no significant differences between the groups at the beginning of the study on either perceptual-motor development or reading readiness. After six months of perceptual-motor training through a structured physical education program, the experimental group showed significantly greater gain in reading achievement than the control group. However there was no significant difference in the perceptual-motor development of the two groups.

Correlation coefficients for both groups computed between perceptual-motor pre-test and reading readiness and between perceptual-motor post-test and reading achievement indicated significant positive correlations.

Summary of Conclusions

The difference in the reading achievement scores so significantly favors the experimental group it must be concluded there was some treatment effect.

It must be concluded that there is no evidence in this study to prove that a structured perceptual-motor physical education program will improve perceptual-motor skills more than the normal activities of a traditional first grade physical education curriculum.

There is a positive relationship between eye-hand coordination and reading.

THE EFFECT OF A PERCEPTUAL-MOTOR PHYSICAL EDUCATION PROGRAM ON READING ACHIEVEMENT IN GRADE ONE

by

Joan S. Shaw

A DISSERTATION

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

DOCTOR OF EDUCATION

June 1975

APPROVED:

Redacted for Privacy

Professor of Education
in charge of major

Redacted for Privacy

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Date thesis is presented September 23, 1974

Typed by Mary Syhlman for JOAN S. SHAW

ACKNOWLEDGEMENTS

Many caring people have given invaluable assistance in the completion of this study.

I wish to express my most sincere appreciation and gratitude to Dr. Frank Cross for his guidance and encouragement throughout this project.

Appreciation is also extended to Dr. Theodore Madden, Dr. Carvel Wood, Dr. Denis Baron and Dr. Kenneth Patterson for their advice and assistance as committee members.

Acknowledgement is made to Dr. Lyle D. Calvin and Mr. Shadman for their assistance with the statistical design and application.

Special thanks are due to all the first grade teachers and students who participated in the study. A particularly grateful acknowledgement goes to Doris Hall who initiated the perceptual-motor program in Junction City and served as a consultant throughout this project.

A final thank you is due my husband, Eldon, for his constant and loving support.

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CHAPTER I

INTRODUCTION

Primary teachers have long been concerned about children who do not seem to profit from learning experiences in school. Although a variety of new methods and approaches have emerged, a percentage of each group of primary grade children still fails to learn to read.

It is obvious that when some children come to school, they possess, in varying quantities, some quality which enables them to attack and be successful with school activities. Some children do not demonstrate a similar "readiness to learn". This concept of readiness has been little understood, and it has been generally held that time alone brings maturity. Little or no credit has been given the children themselves for having acquired the essential ingredients of maturity. The question of what happens within the child which has made him more mature and able to demonstrate readiness for classroom success has not been adequately explored.

An old concept in education held with separation of mind and body. It was conceded that good health was important to both mind and body. A healthy body was essential to a healthy mind - physical fitness was conducive to mental fitness. Classroom teachers have often observed that children who are more capable in all academic activities are usually more capable in all playground and physical

education programs. (Getman, 1968) There appeared to be a relationship between the physical and mental development of children, but the nature of the relationship remained a mystery.

There are a number of educators and psychologists, as well as physical education specialists, who have made a considerable effort to explore this relationship. One of the most notable of this group is Newell Kephart, who has studied in depth the effect of motor development upon learning. He has formulated the idea that an organism's input-output functions occur in a closed cycle in which perceptual and motor activities work together in one process.

> Perception supplies the information upon which behavior is based. Motor responses supply the movements which are the overt aspects of behavior. Unless these two functions can be related to each other, behavior has little or no relation to information. (Kephart, p. 19, 1971)

The child learns about the world by exploring it and manipulating it. Information is supplied by his senses but it is through movement that he learns to interpret perceptual patterns in terms of information which is meaningful to him and useful for more efficient behavior. Consistant and efficient motor patterns permit the child to benefit from exploring his environment and systematizing his relationship to it.

This motor hypothesis of perceptual development is consistent with Piaget's theory of cognitive development whereby operational thought bears the impress of its sensory-motor origins, saturated with sensory motor adherances. (Flavell, 1963)

Getman's theory for developing readiness is that it must happen within the child himself through his physiological development and the integration of movement and experience. The total child must interact in order to be ready to learn. "As the child integrates and interrelates this kind of visual performance with motor performances, new levels of readiness are achieved and new skills of cognition result." (Getman, p. 3, 1968)

The implication of these theorists is that cognitive abilities and skills which contribute to success in school are dependent on perceptual-motor integration and development and can be improved by motor skill training. Kephart and others have done considerable research in this area and there is increasing evidence that some kinds of motor skill training do increase a child's ability to deal with learning experiences.

Background of the Problem

A group of first grade teachers in a public elementary school became interested in developing a physical education program based on this perceptual-motor philosophy. After studying much material on perceptual-motor development and several specific projects designed on the developmental philosophy, these teachers began accumulating activities which seemed to fit the needs for developing specific skills. They formulated a program which included activities from all the areas recommended by Kephart relating to the motor bases for achievement.

Rather than identifying children who needed help and singling them out as different, the program was designed to involve all children in the six first grade classes of the school. All children participated in the activities and those who needed developmental skills had the opportunity to acquire them. During the two years this program had been in operation, the teachers had noted some very positive results in observable improvement in attitudes as well as physical abilities. They believed there could be other possible advantages which were not so readily apparent. However, teacher observations and feelings about the program were not adequate evaluations to determine if the program actually had accomplished (1) the developmental advancement of children which had been predicted or (2) if there was a transfer into other areas of achievement. Although the program had not been static and had continued to change with observed needs of children, it became apparent that a more objective evaluation was needed to assess the value of the program as it existed and to determine the direction for its future development.

One area of special concern was whether there was a relationship between physical and mental development and whether the training of one can have an effect on the other. It was the purpose of this study to evaluate this one perceptual-motor program with respect to any significant relationship between the motor development of first graders and their ability to read and whether the intensive movement training does increase reading achievement.

Statement of the Problem

The problem of this study was to determine if a relationship existed between perceptual-motor development and academic achievement and whether a structured physical education program of perceptual-motor training could have an effect on the reading achievement of first graders.

The first objective was to measure perceptual-motor development of first grade children at the beginning of the program, and again after six months of perceptual-motor training in a physical education program to determine if there had been a significantly different amount of growth than for a similar group which did not receive perceptual-motor training.

The second objective was to measure the reading achievement of the children involved in the study to determine if those who received the perceptual-motor training made a significantly different amount of growth than those who did not receive the perceptual-motor training.

The third objective was to determine if there was a relationship between perceptual-motor development and reading achievement by correlating scores from the drawing coordination test and reading tests.

Hypotheses

A physical education program structured for perceptual-motor development will affect reading achievement in grade one.

The development of motor skills affects perceptual skills which are related to academic achievement.

The development of perceptual-motor skills can be facilitated by a structured program of planned activities.

Greater perceptual-motor development will be reflected in improved academic performance.

Definition of Terms

The following definitions are included in order to standardize the terms used in the study. Other terms or phrases are considered to be self-explanatory.

1. Sensory experiences - Those experiences directly resulting from visual, auditory, or kinesthetic stimuli.
2. Perception - The comprehension of information received through the sensory experiences of the human body - visual, auditory, or kinesthetic.
3. Motor - Muscular responses.
4. Sensory-motor - Movement integrated with visual, auditory, or kinesthetic stimuli.
5. Perceptual-motor - The integrative process concerned with all sensory inputs operating in the organism and the translation of the perceptions of these inputs into appropriate movement. Each of these areas affect

the other and neither can successfully operate independently of the other.

6. Perceptual-motor training - A series of activities designed to develop movement patterns which lead to the understanding of the concepts of space and time through the medium of movement.
7. Reading readiness - The experience prerequisite for successful performance on academic or school activities. For this study it will be operationally defined as a score on the Lee Clark Reading Readiness Test.
8. Reading achievement - The level of skills aquisition for the ability to read. For this study it will be operationally defined as the total score on the California Achievement Test of Reading.
9. Perceptual-motor development - The level of eye-hand coordination as measured by the Slosson Drawing Coordination Test.

Assumptions

The following assumptions underlie this study:

1. Eye-hand coordination as measured by a drawing coordination test is an indication of perceptual-motor development. As the child receives impressions from the environment and from his own body, he is able to integrate and match the stimuli

so that perception and movement coincide. One measure of the degree of development of this matching of the perception and motor worlds of a child is his ability to coordinate eye and hand in a replication or drawing of a geometric figure.

2. Reading achievement is a measure of academic performance. If there is a causal relationship between perceptual-motor skills and academic performance, then a program to develop these perceptual-motor skills should result in higher scores on a reading achievement test.
3. The heterogeneous nature of the groups of both teachers and children include a wide range of differences. It is assumed that these differences are randomly distributed among both groups and will not significantly affect the results of this study.

Limitation of the Study

The purpose of this study was to attempt with scientific objectivity to determine if one particular structured program of movement and perception activities affected the reading achievement of first graders. These students were measured at the beginning of the academic year for reading readiness and perceptual-motor development. Six months later they were again assessed on reading achievement and perceptual-motor development. Their progress was compared with the progress of a control group which had not received a structured perceptual-motor training program.

A physical education program has many outcomes which are difficult to measure but which could be considered in the evaluation of such a program. Only minimum skill requirements are needed for perceptual-motor integration. (Kephart, 1971) But many children achieve a higher degree of skills in some areas which greatly enhance their enjoyment of free time activities. The development of satisfaction and confidence of self provides an aura of well-being which potentially carries over to greater success in other activities. The concept of healthier bodies being conducive to healthier minds and more productive performance cannot be discounted in measuring the success of a physical education program.

It is also very possible that given plenty of freedom to move in a completely unstructured setting, such as the playground during recess time, children can accomplish the same purposes as designed by the structured program. If this is true, then there should be no significant difference in the achievement of the groups.

The limits of this study, regardless of results, should not limit further research into these other areas before accepting or rejecting this perceptual-motor training program.

CHAPTER II

THE REVIEW OF RELATED LITERATURE

The Relationship Between Motor Responses and Mental Processes

For many years there was thought to be a connection between the physical and mental training of a child. Today there is more evidence that a good motor performance is essential for efficient use of the intellect and that sensory-motor activity provides the basic building blocks of the child's perceptual development. It is now believed by many that a child whose motor base has been incompletely or inefficiently established will likely have difficulties in verbal areas. Studies in child development have indicated the sequential development of the child as being a step-by-step process with motor development being the base of later higher order development processes. (Metteer, 1972)

Theoretical Background for Perceptual-Motor Relationship

Kephart explains the process of percetual-motor development as being based on the child's earliest motor experiences.

> The motor or muscular responses of the child, which are the earliest behavioral responses of the human organism, represent the beginnings of a long process of development and learning. Through these first motor explorations, the child begins to find out about himself and the world around him, and his motor experimentation and his motor learnings become the foundation upon which such knowledge is built. In early childhood, mental and physical activities are

> closely related, and motor learnings become the foundation upon which such knowledge is built ... So called higher forms of behavior develop out of and have their roots in motor learning. (Kephart, p. 79, 1971)

Mental activity or perception, according to Kephart's theory, results from an integration or matching of sensory information with motor experiences. Understanding in one area does not necessarily lead to related action unless there is a relationship between the two. "Perceptual data and motor data become related through the perceptual-motor match. Perceptual data is matched to motor information so that both come to have the same meaning." (Kephart, p. 20, 1971)

The development of eye-hand coordination progresses as the two work together, first one leading and then the other. They become matched so that one can be translated into the other. Such a matching is a very complex learning process. Many connections must be forged in the central nervous system, and the patterns of these connections are all important.

Kephart believes that initially the body of motor information provides the basis for the match. Perception is matched to the motor, not the reverse. It is important that the match be made in the proper direction. (Kephart, 1971)

Piaget's theory of cognitive development makes a similar assertion. He assumes a constant, ontogenetic sequence of stages described by a qualitative change in the intellectual structure of the individual, with each earlier stage integrated and incorporated into later

stages. Concrete operations must precede formal operations since the construction of the former is absolutely necessary to the activation of the latter. The child gradually changes from an organism whose most intelligent functions are sensory-motor, overt acts to one whose upper-limit cognitions are inner, symbolic manipulations of reality. (Flavell, 1963)

Getman expresses the view that movement is the basis for visual perception.

> I fully believe... that vision cannot develop its ultimate skill of performance without movement development, and vice versa. Moreover, these two systems are so inextricably interwoven that neither can operate effectively without the other. (Getman, p. 25, 1971)

Visual distortions are brought into correct meaning because of motor experiences. Distortions such as visual orientations, size and distance are understood because perceptual-motor match has developed from the motor base.

By first developing a consistent system of relationships perceived through movement, the child may begin to match his motor data with visual data. The child must know what "up", "down", "right", "left" feel like in order to perceive what they look like. The child who has not felt the difference between right and left can see no difference between "b" and "d". If he has not felt the difference between up and down he cannot distinguish the difference between "b" and "p". (O'Connor, 1968)

For children who have not yet completed the process of developing control systems to relate perceptual data to motor data, classroom presentations lack meaning because they exist in only one form, not in both. They fail to eventuate in changes in behavior because of the difficulty of the translations required. (Kephart, 1971)

> Consistant and efficient motor patterns permit the child to explore his environment and systematize his relationship to it. Perceptual data are similarly systematized by comparing them with his motor system. Through such perceptual-motor matching, the perceptual world of the child and his behavioral world come to coincide. It is with this organized system of perceptual input and behavioral output that the child attacks and manipulates symbolic and conceptual material in a viridical fashion. (Kephart, pp. 201-206, 1964)

The perceptual-motor match paves the way for perceptual control of motor responses. The structure being built up in the central nervous system provides for the collation of two or more separate patterns. Each pattern must be extensive enough to encompass all the required information. In addition it must be integrated so that each can influence the other promptly and accurately. Feedback establishes a correlation between the two bodies of information, permitting the relationship to work both ways. Perceptual data can be used to control motor response. Perceptual data generated or guided by motor activity takes on a continuity dictated by the motor activity. This continuity is preserved in the developing body of perceptual data. (Kephart, 1971)

When movement can be controlled, systematic exploration is possible.

> When the developing body of perceptual information begins to take on continuity, it can be manipulated within itself. Systematic exploration has revealed relationships among perceptual elements and these relationships have been structured into the body of information. Building upon these concretely learned relationships, other relationships can be derived by manipulating elements within the structure... When this new method of processing data has been achieved, the child becomes perceptual. (Kephart, p. 30, 1971)

Piaget, early in his career, formulated two assumptions which underlie his later work in cognitive development and which imply the relatedness of physical or motor development and cognition.

> (1) logical structures can be used to describe the organization of concrete, motor acts as well as that of symbolic, interiorized thought.
>
> (2) All thought is essentially interiorized action, and it therefore follows that the organization of overt action and of inner thinking can be characterized in the same general way. (Flavell, p. 2, 1963)

Research Relating Motor Development to Perception and Cognition

There are a number of studies which tend to support the concept that sensory and motor experiences are closely related. Edgar (1967) reported on animal studies done by Dr. Austin Riesen and Richard Held. Dr. Riesen found that apes, which had been reared in the dark, were not only unable to recognize such common objects as their nursing bottles, but they were actually retarded in their physical development. Held used kittens, reared without visual experience, to study the development of perception. Two kittens were placed in a carousel apparatus. One kitten propelled the carrier by walking on his own feet, while the second kitten stood motionless on a platform and was

pulled along. As the carrier revolved around the center post, both kittens were exposed to the same patterned visual experience. The walking kitten received sensory feedback from his own motor activity while receiving the visual experience. Only the kitten which walked on his own feet, while viewing the environment, had sufficient perceptual development to pass a simple visual test.

Ismail and Gruber (1967) report on studies of perceptual distortion, such as the initial experiment of Stratton, with reversing spectacles. These have indicated that such distortions are eliminated by the subject and the world appears right side up again - if he is allowed to investigate through motor response during the experiment. If such motor exploration is prevented, however, the perceptual distortion will remain.

From studies such as these, it is apparent that sensory-motor experiences do aid in the development of perception. The question, however, is not only what sensory-motor integration has to do with perception, but what it has to do with something which develops at the same time and which becomes much more complex, and that is cognition. Some researchers have sought the nature of the relationships involved. Using a group of mentally deficient subjects matched with a normal group, Sloan (1951) determined there is a relationship between motor proficiency and intelligence. Malpass' (1960) study also showed that motor proficiency is related to intelligence in retarded children. Yet, he has found no such relationship in his group of normal children. Bond and Tinker (1957) suggest

that a number of disabled readers show evidence of poor sensory-motor coordination and that furthermore, the sensory-motor problems often are due not to specific disabilities but rather to lack of sensory-motor training.

Another group of studies were designed to measure correlations between motor proficiency and reading achievement. Results are conflicting and indicate the problem is not simple but rather has many complexities.

Skubic and Anderson (1970) found a significant correlation between scores on a battery of perceptual-motor tests and the Stanford Achievement Test and the California Test of Mental Maturity for fourth grade boys and girls of normal intelligence. Keogh and Smith (1967), on a seven-year longitudinal study, found visuo-motor ability as measured by the Bender-Gestalt Test, was a surprisingly useful predictor of educational achievement in upper elementary school grades.

Trussell (1969), using a group of right handed, first and second grade children with no apparent cultural disadvantage, found no significant relationship between perceptual development, motor development and reading level.

Chang and Chang (1967) set out to obtain data on the relationship of reading achievement to visual motor development among superior visual-motor skills with those whose visual-motor development are average.

They hypothesized that correlations would be higher between visual-motor skills and reading skills in younger pupils. Their results proved this to be true. "This suggests that the maturation of visual-motor skills of superior pupils is accelerated and that the chronology of the relationship between visual-motor development and reading is therefore advanced." (Chang and Chang, pp. 51-53, 1967) They also suggested that older pupils may develop other techniques for reading development which compensate for average or low visual-motor skills.

Chissom's (1971) study considered first and third grade boys and supported Chang and Chang in the inference that age is a factor. A significant relationship was found between motor abilities and measures of academic aptitude and academic achievement for first grade boys, with no such significant relationships obtained for the group of third grade boys. Chissom's study introduced another variable. An analysis of factors indicated some real differences in the types of motor abilities that are indicative of achievement and aptitude for the two grade levels considered. Motor factors of balance and motor coordination correlated with the criteria of academic achievement and academic aptitude for boys in first-grade, but not for older boys. The motor factor of strength seems to increase in its relationship to the two academic criteria as age increases. But the relationship of motor coordination factor to the criteria had an inverse relationship to age. The balance factor displayed the same inverse relationship to criteria with increase

in age but was not as pronounced as with motor coordination. This seems to indicate that perceptual-motor theories are more applicable to boys at earlier ages and that there may be a difference in types of activities considered effective. (Chissom, 1971)

Studies to investigate the relationship between academic achievement and specific motor skills were conducted by Plack (1968) and Ismail and Gruber (1967). Plack discovered that the throw and catch test and zig-zag test produced highly significant coefficients of correlation when compared to reading achievement for selected children from grades one, three, and five. There was little or no consistent relationship between achievement in reading and the kicking test or the jump and reach test. Ismail and Gruber found significant correlations between coordination and balance items and I.Q. and Achievement scores. The relationship between intellectual performance and items measuring physical growth, strength, speed, and power are low or non-existant.

Specific Motor Patterns Related to Academic Achievement

In isolating specific areas of motor learning which are related to perceptual development, the findings of researchers that coordination and balance are relevant is consistant with Kephart's theory. He defines the motor bases of achievement as posture, laterality, directionality, body image, and the generalization of these concepts into balance, locomotion, contact, and receipt and propulsion.

Theoretical Constructs of Motor Development

The basic movement pattern out of which all other movement patterns must develop is that of posture. It is through posture that a constant orientation to the earth's surface and to the surrounding environment can be maintained. It is also necessary in order to move and respond quickly to any situation. Since posture forms the core of any behavioral activity it is desirable that the postural adjustments be flexible and operative over a range. If the posturing mechanism is stiff and inflexible, only a limited amount of elaboration can be accomplished without destroying the postural response. On the other hand, if posture is flexible, if it involves all muscle groups in a pattern, a certain range of movement is possible within which posture can be maintained. Flexibility permits more elaboration and manipulation which leads to an increased possibility of motor response and hence to an increased possibility of behavioral response. (Kephart, 1971)

Laterality and directionality both depend upon movement patterns and the learning of postural and movement adjustments.

> There are no objective directions in space. The directions which we attribute to space (right, left, up, down, before, behind) are attributed to external space on the basis of activities which take place within the organism. Spacial clues, visual or auditory, obtain their directionality through learning and through the projection onto external stimuli of internal experiences that result from the movement of the organism. (Kephart, p. 86, 1971)

Laterality, the concept of right and left, must be learned. By experimenting with the two sides of the body and their relationship to each other, one learns to distinguish between the two systems. The primary pattern from this differentiation is balance.

> When experimenting with the balancing problem, the child must learn right and left for he must learn how to innervate one side against the other, how to detect which side has to move and how it has to move, in order to execute the appropriate compensatory movements as his balance varies from one side to another. Out of these and similar activities he learns to differentiate the right from the left side. (Kephart, p. 86, 1971)

Laterality is the internal awareness of the two sides of the body and their difference. It is not naming right and left, or dominance of one over the other. Identifying the right or left hand is not a test of laterality since it may often be based on observation of specific characteristics of the external parts themselves.

> If there is no left and right inside the organism, there can be no projection of this left and right outside the organism, and consequently the directional characteristics of 'b' and 'd' disappear. (Kephart, p. 89, 1971)

The concept of laterality is developed within the organism. Directionality is the projection of these directional concepts into external space. One important factor in the development of directionality is control of the eyes. One must make a series of matches between the position of the eye and the position of the hand in contacting an object in space.

The concepts of up and down and other directional coordinates must become internalized through motor activity as with laterality before one's orientation in space is possible. This internal coordination comes as a result of learnings in balance and posture. (Kephart, 1971)

The body image becomes a point of origin for all spatial relationships among objects outside our body. If knowledge of the body is incomplete and faulty, all actions for which this particular knowledge is necessary will be faulty, too. Body image is necessary in order to start movements, especially when actions are directed toward the body. It also affects perceptions of outside objects and the relationship of body to objects in space and to the relative position of the body in space.

The most significant aspect of motor activity in the child lies in its implications for gathering information. (Kephart, 1971) Such information gathering is dependent upon interaction between the organism and the environment, not with the sense organs alone, but through movement. To explore and learn about his environment, the child must move about in his environment, and this movement must be for the purpose of contacting and interacting with the environment or parts of it. There are four basic movement generalizations which have particular significance to education: (1) balance and posture, (2) locomotion, (3) contact, and (4) receipt and propulsion.

Balance and maintenance of posture, with an understanding of the constant nature of gravity, and flexibility and freedom of move-

ment enables the child a secure foundation for exploration of his environment.

It is through locomotion that a child explores relationships between objects in space. Locomotion includes running, walking, skipping, jumping, rolling, etc.

Contact involves those movements related to the handling and manipulation of objects. Principally hand skills, it includes reach, grasp and release. The patterns of movement must be sufficiently skilled so that the attention can be given to exploration and not be diverted to the movement.

Receipt and propulsion provides data about objects in movement and one's body relationship to moving objects. The child learns to respond to movement toward him (catching, dodging, etc.) and movements away from himself (throwing, batting, pushing). (Kephart, 1971)

By relating objects to each other in space, the child begins to construct a world of space in which, eventually, everything in his environment will find its place in an orderly array which will encompass not only the concrete objects which he sees and touches but objects and spaces with which he can have no concrete experience as well. (Kephart, 1971)

As with concepts of the space dimension, the temporal dimension must also be generalized and systematized. Logical procedures may be difficult to organize without a temporal dimension along which to arrange them. Children may have difficulty with learning,

not with content, but because of inability to deal with the mechanics of the presentation. (Kephart, 1971)

There are three aspects of time important to education. First is synchrony. The child must appreciate simultaneity in time before he can appreciate serial events. Second is rhythm, which supplies the unit of extension of the temporal scale. Motor rhythm is the ability to perform a movement or series of movements with a consistent time pattern. It is necessary to have a stable, constant rhythm. The third aspect of time is sequence, the ordering of events in time. Sequence provides organization on the temporal dimension.

> The two great realities, space and time, are intricately interwoven in the child's environment. Some events are presented predominantly in one phase, some predominantly in the other. Seldom is an event limited to one phase. Even more, any manipulation of events always requires dealing with both phases simultaneously. When time is a true fourth dimension of space, the child can transform from space into time and back again with facility, since both phases are integrated in all his manipulations. (Kephart, p. 182, 1971)

As with space relationships, the temporal patterns must first be developed through motor activities.

Research on the Effect of Perceptual-Motor Training on Academic Achievement

> Authors such as Piaget, Hunt and Kephart, in the sensorimotor, experimental, and motor-perceptual theories do not see development as an automatic 'unfolding', but a process delayed or accelerated by the organism's experiences with his environment. (Tidgwell, pp. 229-235, 1967)

Under normal conditions, the child will usually have established a stable world, based on consistent perceptions, by age six. Some children, however, will be lacking the fundamental assumptions which underlie much of the material presented in school. The question at this point appears to be whether or not a training program based on the perceptual-motor development theory can contribute experiences to children which may accelerate his ability to deal with cognitive processes.

There is little agreement among researchers concerning the effectiveness of perceptual-motor training upon reading performance. There is a lack of consistency among studies in types of training exercises used as well as to the kinds of measuring instruments which are appropriate for either perceptual-motor development or academic achievement. Professionals differ in their orientation and frame of reference which undoubtedly influences the kinds of results they hope to obtain from training. The complexity of the reading task itself, which is a cognitive process, limits the generalizations to be drawn from a specific study. The transfer effect of these exercises to school achievement has been questioned. (Sullivan, 1972)

Kephart, in citing studies of motor skill training in relation to reading, indicated that most older studies found training had little effect upon intellectual competence. However, these studies, as reported by Kephart (Itard, 1932), (Seguin, 1907), and (Wellman, 1931), were concerned primarily with motor skills. More recent

studies have been more concerned with flexibility of motor activities, motor control, and the ability to perform a motor task without previous experience or the high development of skill. (Kephart, 1971) Some recent studies have indicated some success with the kind of training programs which pertain to Kephart's theory of movement generalization and perceptual-motor development.

By far the greater number of studies supporting the Kephart theory have been conducted with children who were deficient in some manner, either mentally retarded or at least considered potential reading problems. One study, however, done by Edward Lipton (1970) with ninety-two normal children from four regular first grade classrooms found significant support for a perceptual-motor training program. All four classes had regular class work, but two of them received a perceptual-motor program which emphasized directionality of movement and spatial relation of objects which surround the children. The control group, which consisted of the other two classrooms, had a traditional physical education program of rhythms, relays, stunts, self-testing activities and games of low organization. The instruments used for measurement in the pre- and post-tests were the Purdue Perceptual-Motor Survey, the Developmental Test of Visual Perception and Metropolitan Readiness Test. F ratios for three variables were all significant beyond the .01 level in support of the experimental program.

Gould (1964) and Rice (1962) found significantly greater gains in reading readiness and reading achievement among kindergarten and

first grade pupils following Kephart's perceptual motor training program.

Bender (1949) and Fabian (1945) view the development of reading ability as dependent upon some factors which result in perceptual-motor maturity. Silver (1952) considered specifically difficulty in constructing angles and difficulty in figure background perception. Fabian and Silver found that retarded readers show inferior "gestalt test" performance compared with normal readers. These results seem to confirm the hypothesis that reading disability is characterized by perceptual-motor immaturity and hence a developmental lag. Lachman (1960) supported this hypothesis though he felt development is not the only cause for distortions in performance on perceptual-motor tests.

Kephart (1953) studied twenty-six over-achieving and twenty-six under-achieving seventh grade boys. After three months of visual-motor and orthoptic training there was a significant difference in reading performance favoring the group who received the training.

McCormick, et al (1968) used forty-two under-achieving children from grade one in a short seven-week training program. The children were divided into three groups. Group one received perceptual-motor training which consisted of crawling to walking; balancing and jump rope; proprioceptive cues (blindfolded) and visual control; directionality; and increase in attention span. Group two served as control for the effects of extra activity and attention received by the experimental group. They received the standard physical education

training from the same specialist who taught the experimental group. Group three received no extra training, activity or attention. The measure of academic achievement was the Lee-Clark Reading Test, form A prior to program and form B at the end. Results showed there was significantly more gain by the experimental group. The authors concluded, "Perceptual-motor training could be a useful adjunct to the regular physical education curriculum, contributing by increasing the child's capacity for academic achievement." (McCormick, et. al., pp. 627-633, 1968)

Haring and Stables (1966) used mentally retarded children from age seven to fifteen for their study. They were divided into two groups with the control receiving no special training. The experimental group received special training in gross coordination and visual perception. Activities were chosen to fit the group and individuals as determined by Perceptual Survey Rating Scale. The program was adjusted and changed as needed and consisted of thirty minutes of training each day for seven months. Both groups were tested on Eye-Hand Motor Coordination Test at the beginning and end of the program as well as four months later as a follow-up. Results showed differences for the experimental group were significant on both the post test and follow-up. It was concluded that gross motor training significantly affected the scores of the experimental group and the increases came during the time of training.

One hundred five first grade students who had been designated as potential reading problems were divided into three groups for a study by Halliwell (1972). Group one received supplementary perceptual training in addition to the regular reading program for forty-five minutes twice a week. Taught by specially trained persons, the program consisted of sensory processing, intersensory development, fine and gross motor development, and concepts of directionality and laterality. Group two received traditional supplementary reading instruction in addition to regular reading program taught by the same special teachers, over the same time period and for the same length of time. Group three had no supplemental instruction. The results were presented in terms of both treatment and sex. Group one obtained the highest mean scores in each sex group and total, but only the group-one total and group-one boys scores were significant. This study raised a question about such a program being more effective with boys than girls.

Footlik (1970) described three studies conducted at the Reading Research Foundation in Chicago. The first was of three groups of first graders, matched for age, sex and I.Q. scores. One group received perceptual-motor training, one group received exercises from a standard physical education curriculum while the third group served as control with no special training. The Lee Clark Reading Test was given as a pre-test and, after a seven week, forty-five minutes per day training period, a post-test. The group receiving perceptual-motor training showed significant gains over the other two groups.

The second study included sixty-four first graders who were tested on the Metropolitan Reading Test. The experimental group received perceptual-motor training two days a week for nine weeks. The differences in the scores of the two groups were not significant for the total groups, but when sub-groups of retarded readers were examined there was a significant difference in favor of the group who received the perceptual-motor training.

The third study was with underprivileged Caucasian and Negro children with an average age of 15 and average I.Q. score of 75. After three months of training, the experimental group made significant gains over the control group.

The symptoms specifically attacked in the training program of these studies were (1) hyperkinesis (hypokinesis), (2) impulsiveness, (3) distractibility, (4) auditory memory and discrimination, (5) visual memory and discrimination, (6) laterality, directionality and body image, and (7) motor coordination. These studies indicate this form of training is useful for the slow-learner. (Footlik, 1970)

Oliver (1958) found significant gains in both physical and mental tests for a group of educationally sub-normal boys over a matched group after a ten week course of systematic and progressive physical conditioning. This author attributed the gains to emotion. Some possible reasons for the academic improvement were: (1) the effect of achievement and success, (2) improved adjustment, (3) improved physical condition, or (4) the effect of feeling important. These are all factors which are difficult to discount in any study. However, where a third group was used to control for

these factors, receiving some physical training other than perceptual-motor, it has been found that purposeful perceptual-motor training was effective.

Some studies, however, have failed to find success for perceptual-motor programs and have raised a number of questions concerning their use. Two separate studies, from short summer remedial programs, failed to find significant differences in favor of groups of slow readers who received perceptual-motor training over control groups who received no training. Roach (1966) and Sullivan (1972) each provided a thirty minute daily program of activities based on Kephart's concepts. Roach concluded that perceptual-motor training is not effective in raising achievement levels in reading when training is given in small groups of six to eight children. He also suggested the age of his students may have been a factor since there is some positive research with younger children or in programs where the training was individualized.

Dietrick (1973) used a group of average readers in a six month training program to compare perceptual-motor training with individualized reading instruction. A control group received neither the perceptual-motor training nor the individualized reading instruction. The reading group achieved significantly higher in reading achievement than the other two groups. Dietrick concluded that many assumptions in current use of perceptual-motor training for reading and general educational development need careful examination.

Falik (1969), who concluded a perceptual-motor program at kindergarten level, found little or no predictable difference

between experimental and control groups in reading readiness and reading ability two years later.

Hedges and Hardin (1972) provided a group of first graders with exercises for the development of perception for children as specifically directed in the manual of the Physiology of Readiness by Getman and Kane (1964). They found that not only did the Physiology of Readiness exercises not result in significant mean gains in achievement, but, if anything, they had a slightly deleterious effect in most instances. The authors concluded it was a waste of time to employ the materials for all children.

> Here, once again, we see the folly of doing the same thing for all children in the same way at the same rate. It may very well be that there were specific children for whom the materials and exercises were beneficial. However, the individual variance of such cases, if any, was lost in the larger group variances. (Hedges and Hardin, pp. 249-253, 1972)

O'Connor (1968) investigated the effect of specific gross motor activities based on the theory and techniques of Kephart on gross motor abilities, development of perceptual abilities, and academic achievement. She found the program had an effect on some motor abilities but had no effect on others and none on development of perceptual abilities and academic achievement.

Some studies have had mixed results which have raised some interesting questions. Smith (1970) compared a perceptual-motor program in which verbal directions were combined with the activities, with a program having no verbal coordination. Results indicated that giving directions verbally with the exercise was more successful.

The author concluded, "It would appear that just doing the movements will not bridge all perceptual-motor learning gaps. It seems that there is greater understanding and transfer of learning if the direction of each movement is used to reinforce the movement." (Smith, pp. 43-44, 1970)

Fisher and Turner (1972) and Wingert (1969) had conflicting results in readiness programs for preschool children. Both used the Frostig Developmental Test of Visual Perception and the Metropolitan Readiness Test. Wingert, using children from an upper-middle class district, found the program contributed significant gains on the Frostig visual test but none on the Metropolitan Readiness Test. Fisher, using economically and culturally disadvantaged children, found the opposite. These children in the perceptual-motor training program showed significant gains on the Metropolitan Readiness Test but none on the visual and motor instruments. It is possible the backgrounds of the children influenced the opposing results.

Thomas and Chissom summarized from related literature.

> The relationship between perceptual-motor and reading or cognitive abilities was more predictive for the young child. This relationship appears to decrease as age increases because of specificity of the tasks involved in the two domains. Fine eye-motor coordination also has been identified as a predictor of reading ... (Thomas and Chissom, pp. 185-189, 1973)

It appears there are many variables affecting the results of perceptual-motor training programs and their effect on academic achievement.

Bryant Cratty (1969), a physical education specialist, has presented an evaluation of the perceptual-motor development theory which considers some of the peripheral factors which may be equally important. Cratty acknowledges that correlations can be found between certain measures of intellect and measures of motor ability. One of the more obvious ways in which intellect and movement capacities converge is in tasks involving the transcribing of thoughts to paper in the form of handwriting. Studies with retarded readers reveal deficiencies when given tasks involving interaction of movement with vision, including hand-eye, body-eye, or foot-eye coordination as well as body-perception. The educationally handicapped children exhibited motor competencies of well-functioning children from two to four years their juniors. However, it might be hypothesized that as these retarded meet frustration and failure when attempting to function motorically they withdraw from situations in which competencies are needed, and this withdrawal further lowers capacities. This produces a cycle of failure, perceived ineptitude, withdrawal from participation, lowering of capacity to perform, further failure, etc. (Cratty, 1969)

Then, perhaps, one primary way in which children are aided by a movement program is toward achievement of a feeling of identity and success. Failure to do this can result in a general rejection of self which is reflected in poor performance in the classroom.

Another value suggested by Cratty for a movement program is an aid for the hyperactive child. Movement tasks which require

performance over increasing periods of time develop a sustained concentration and interest which may carry over into classroom activities.

> We believe that perceptual-motor activities offer no magic solution to many of the profound problems of the retarded and otherwise neurologically impaired children. At the same time, if intelligently applied, these kinds of tasks can offer help in certain components of classroom learning in the formation of basic perceptions necessary to reading and writing, as well as in aiding the retarded child to think in a more organized fashion, in helping the hyperactive child to place himself under control, in helping the male child to express his maleness and the female to manifest her femininity, and in improving the general self-concept of all children. (Cratty, p. 83, 1969)

Cratty further cautions that though movements are important, they are not the key from which all mental, emotional, and social facets of personality must stem. There must be emphasis on all facets of the child. The problem is very complex and there are no simple answers. (Cratty, 1969)

CHAPTER III

PROCEDURES

The procedures for an evaluation of a perceptual-motor physical education program include selection of population, instruments of measurement for both perceptual-motor development and reading readiness and achievement, procedures for gathering data and statistical application.

POPULATION

It is the purpose of this study to evaluate the perceptual-motor physical education program at Laurel Elementary School in the Junction City School District with respect to any significant relationship between the motor development of first graders and their ability to read and whether the intensive movement training does increase reading achievement.

Since all first graders in Laurel Elementary School were involved in the program, it was necessary to find a group as similar as possible from a different school for a control group. The Fern Ridge School District seemed to fit the requirements.

Junction City is a small town whose schools serve a large rural area, stretching from the edge of metropolitan Eugene to the foothills of the Coast Range. Fern Ridge School District has a similar setting. The district actually draws from two smaller communities, but is adjacent to Eugene and stretches into the foothills of the Coast Range.

Census statistics show the two districts to be very similar in socio-economic consideration.

	Junction City Dist. #69	Fern Ridge Dist. #28J
Population	7,768	6,938
Number of families	2,142	1,811
Families with children under 18	53%	56%
Families headed by persons over 65	16%	14%
Average size family	2.78	3.22
Mean family income	$9,172	$8,535
Median family income	$8,188	$8,061
Primary income source		
from wages	87%	85%
social security	25%	21%
welfare	6%	6%
farm, self-employed	15%	7.4%
non-farm, self-employed	15%	9%
Employed residents who work in city of Eugene	35%	50%
Incomes below poverty level	10.5%	13%
Homes, owner occupied	59%	77%

(L-COG Census, 1972)

The largest occupational groups of both communities are craftsmen, transport and other operatives, and non-farm laborers. These are the occupations found normally in lumber, plywood and paper manufacturing, loggers and woodsmen, log truck drivers, fork-lift

operators and others associated with mills.

Junction City tends to have a slightly higher population of elderly and self-employed. Fern Ridge has a higher percentage of home-owners and commuters. Otherwise the size and economic status of the two school populations are very similar. The geographical settings and socio-economic background of the two communities appear to be nearly equated. The physical facilities of the schools are different.

Junction City has four main buildings but all of the children grades one through four are housed in one building, with the exception of one small four room country school. Grades five and six are in one building with the remaining two being junior high and high school. Therefore, Laurel Elementary School has the entire first grade population of Junction City except for one small class in the country. This one class was not involved in the perceptual-motor physical education program and so was not included in the study.

Laurel Elementary School has about one hundred first graders divided into six classes. Each class is self-contained with one teacher per class. The teachers work together very closely and plan as a team. The reading program is linguistically based with the Sullivan Programmed Reading Series as the adopted text. However, many materials are used to supplement this. The building reading specialist assists as a consultant.

Even though the teachers work closely together, they vary according to the individual teacher's philosophy in organization

and teaching methods. One class consists of only twelve children who were assessed at the beginning of the year as immature and not ready for academic instruction. It is considered a readiness room and provides a completely different type of program than the others. One class is extremely traditional while another is extremely open and lacking in formal discipline. The remaining classes range between these two extremes. Due to unusually small enrollment in the fall of 1973, all classes were exceptionally small, averaging about twenty students per class.

The Fern Ridge School District is very nearly the same size as Junction City but the elementary children are housed in four buildings, each containing grades one through six. One building is located in the country between Eugene and Veneta and has one rather large class of twenty-nine first graders. One building is located at Noti, which is in the Western part of the district in the Coast Range. It also contains one class of first graders, but it is somewhat smaller than the others, having only about twenty children. The remaining two elementary buildings are located in the towns of Veneta and Elmira, each containing two first grade classes. The two classes at the Elmira school were equally divided and of average size of about twenty-six children each.

A readiness room of about twelve students had been planned for the Veneta school. However, since first grade enrollment in the fall of 1973 was exceptionally high, some changes had to be made. In order to maintain the readiness room, one classroom was

extended into an innovative open-class situation of forty children with two teachers. It is important to note that of the other first grade classes of the district, one is extremely traditional while the remainder range between the two extremes. The children for the readiness room were selected from results of an extensive pre-school testing program and demonstrated definite learning problems or lack of readiness to learn. A very structured behavioral modification program and readiness activities were provided in this class.

Fern Ridge district has a reading coordinator who assists teachers and coordinates the reading program. There is no one kind of material used in all classrooms but the reading program is linguistic based, adapted to fit the needs of the students, and appears to be sound, traditional instruction. It seemed important to select a school with a good reading program so that any difference in achievement would not be attributed to this variable. Comparable reading achievement scores were not available from both groups, but a view of some reading scores from each district showed an overall similarity in reading achievement over the past three years.

Averages taken in May 1971 from the Gates Reading Tests in Fern Ridge, show elementary students at grade three scored at a grade level of 3.85. Junction City students in grade three the same year but tested in February on the Stanford Achievement Test, scored at 3.7. Other averages from the 1971 Gates scores at Fern Ridge were 2.25 for grade one, 3.0 for grade two, and 4.8 for grade four. These

averages indicate the reading level of Fern Ridge students is at or above the norms of the Gates Reading Test and give assurance of a sound reading program for the control group.

The two groups appear to be very similar in geographical and socio-economic background. Even though the physical facilities of the buildings differ, structure of classes is similar. The organizational aspects of all the classrooms range from very traditional to extremely open, with an equal balance of each in the two districts. In addition, there is a low enrollment readiness room in each district for children identified at the beginning of the year as immature and not ready for academic learning activities or with potential learning problems.

The reading programs in the two districts appear to be comparable and adequate with a reading specialist available for consultation in both cases. The teachers in both districts range from beginning, inexperienced to professionally mature, experienced. Since there was no way to control the selection of teachers within groups, it was assumed that they were all adequate first grade teachers and that the randomness of age and experience would balance in both groups so as not to be a significant factor in the study.

The class sizes were somewhat larger in the Fern Ridge district and the introduction of an innovative open program after the beginning of the study produced some concern. However, some research supported the fact these variables would have little or no effect on achievement. Kemp (1955), in a broad study of classroom

variables, concluded that two variables which have not emerged as important determinants of any kind of attainment are progressiveness and class size, with progressiveness being defined as open-class or activity oriented situations. Spitzer (1954) also concluded that class size is not a factor in achievement.

The last consideration in equating the groups was among the students themselves. The measurement instruments were to be administered to all first graders in both schools, with the exceptions that retentions and those not remaining in the same school for the entire year and those who do not receive the post-tests would be eliminated from the study. An analysis of covariance would then equate the beginning groups and show whether there had been more significant growth in one group than in the other.

A PERCEPTUAL-MOTOR PHYSICAL EDUCATION PROGRAM

The structured physical education program of the experimental group was based on the theoretical principles developed by Kephart. The format for this program was a series of eight stations functioning simultaneously during a daily twenty five minute period. Six teachers and two aides plus a number of parent volunteers were involved in directing activities at the eight stations. Each station had a series of activities with a specific purpose. All first graders participated at the same time, moving at a signal from a timer from one station to the next and revolving around the

gym to perform at all stations during each twenty five minute period. Each child was exposed to each activity for a short two and one half minute period each day, but never had the problem of tiring of any activity or being bored by the same thing. Activities at each station were changed often and repeated at a later time as a need was observed.

Station one had the horizontal ladder, ring, and bars. This apparatus provided for activities which develop arm and shoulder strength, flexibility, and body control. Activities progressed from the passive hang to the pullup and chin hold to the repeated pullup and chin hold. Body control is developed along with arm and shoulder strength as the two coordinate toward mastery of skills. Rings were used for a knees hang, skin the cat, and dismount. The skills developed in these activities also improve flexibility and body control.

Station two provided activities for the improvement of balance on the balance beam. Simply walking across the balance beam is not adequate training, since it is in the act of losing one's balance and being required to correct it that learning occurs. Therefore, a number of routines to be performed on the beam were gradually introduced and mastered. Some activities at this station were (1) face side, step right, slide left foot up to right and repeat, leading left; (2) walk forward, touch knee, right and left; (3) walk backwards across the beam; (4) dip forward and backward, left and right; and (5) put right foot against

left knee and hold, repeat with the other foot. Activities specifically for bilateral training are toe balance, step over the wand, combination walk and beanbag pickup, all performed on the balance beam. A foot-knee balance after a backward walk and ball bounce and catch while walking are examples of activities for cross lateral exercises.

Vigorous activities for endurance, body awareness and control were at station three. The goals for these activities were to develop flexibility and balance in all parts of the body and to handle the body in relation to space, other people and objects. The areas of the body to be developed were the feet and legs, trunk, and arm and shoulder girdle. Some activities to develop flexibility in the feet and legs were (1) from long sitting position, ankle bending and stretching and ankle circling, (2) jumping, making shapes in the air, and (3) picking up bean bags with toes.

Activities for trunk development included (1) curl up small and move, (2) make shapes and letters with the body, (3) peek at someone between one's own legs, and (4) put bean bag through legs, twist, turn and pick it up. Activities for arm and shoulder girdle included (1) walk and run on all fours (hands and feet) and (2) bunny hop, crab walk, or bear walk.

Hoops and wands were used at times to extend the awareness of the body in space in relation to objects and the ability to control specific body parts within these relationships. One activity was to crawl through a hoop or jump into the center of a

hoop held eight inches off the floor and crawl out under it.

Jump rope activities were found at station four. These activities progressed from the simple jump over a rope lying on the floor to the ability to "run in" and jump in rhythm, a rope being turned by two other students. The ability to do this requires balance, body control and awarenss, flexibility, and a well developed sense of timing. They worked with both short and long ropes providing individual activities as well as cooperative. Some of the activities included (1) jump on two feet, clapping while jumping, (2) hop along on one side of the length of the rope, (3) hop on alternating sides of the rope, (4) feet together, jump across rope on floor and clap, (5) run and leap over stationary rope, (6) run through long rope while it is turning, (7) run in and jump, and (8) jump with single short rope - on one foot or both feet. These activities afford a real sense of accomplishment which have carry-over to children's play periods as well as affecting the movement skills related to perceptual development.

The ball skills were handled at station five. Receipt and propulsion are basic movement patterns. Also involved in these skills are eye-tracking of objects in space, eye-hand coordination in receipt of the ball, timing, right and left concepts, and flexibility of movement. Activities began with simple movements while holding the ball and progressed to throwing, catching, and bouncing activities both alone, while moving or standing still,

and in cooperation with others. Bouncing and throwing activities were done with each hand separately as well as both hands together.

Station six provided rhythms and creative movement. The goal for these activities was to develop a consistant sense of rhythm and timing. Activities provided simultaneity of two movements made together or movement matched to auditory stimuli. They also provided pace and sequence, with the child moving in time to music or rhythm and changing both speed and pattern. Creative movements extended knowledge of body image and control while coordinating movement with sound.

Tumbling activities which further develop body control and image occurred at station seven. Many stunts required a child to reverse normal patterns of movement so that the overall movement takes place in unusual directions or positions. They require forward movement through space but with motor patterns which are different from those normally used in walking or running. Laterality and directionality are required to carry out the task and must be maintained while the usual postural and balance relationships are altered. Parts of the body assume different relative positions and different functions thus altering the customary body schema and strengthening for the child his own body image. These were such activities and included individual stunts such as duck walk, crab walk, inch worm, wicket walk and others. Children also lay on the floor for an airplane, curl ups and rocker. A tumbling progression on mats included the log roll, forward roll and stand to fall.

At station eight were activities for eye tracking and eye-hand coordination. These are the most closely related to formation of ocular control and perceputal development. A chalkboard was used to explore movement in horizontal and vertical lines, circles and other forms. Templates were used to draw forms with chalk and at times this drawing was coordinated with time by combining a rythmic count with the drawing movements. Children were then required to draw forms while keeping eyes trained on one point. A moving ball was used for eye-tracking. The child lay on the floor or stood with head stationary while following the movement of the ball with the eyes. Another activity required the child to reach out and touch a free swinging object as it moved in front of him. This required him to follow the moving target and respond in terms of the position of the target. It required timing and synthesis between the visual system and the motor system. Many preliminary tasks were presented in working up to being able to touch the moving ball, such as touching it while it was motionless and progressing from very small, slow movements to those which were more rapid and larger in scope.

The primary sources for these activities were:

Trimble, T., Handbook for Perceptual Development, Eugene Public Schools, 1971.

Getman, G. B., et. al., Developing Learning Readiness, New York, McGraw-Hill, 1962.

Seymour, Mary and Don Megale. A Guide for Planning the Program in Physical Education in the Elementary Schools, Oregon State University, 1969.

Implementing Motor and Perceptual Skills, Schools of Portland, Oregon, 1966-1968.

MEASUREMENT OF PERCEPTUAL-MOTOR DEVELOPMENT

One of the first problems in designing an evaluation procedure for a perceptual-motor program is the selection of instruments which are appropriate for measuring perceptual-motor development.

There are basically two kinds of tests developed for the purpose of measuring perceptual-motor development. One kind is primarily physical movement and skill. The Purdue Perceptual-Motor Survey developed by E. G. Roach and Newell C. Kephart was designed to identify those children lacking perceptual-motor abilities for acquiring academic success. It is basically a motor test consisting of a number of physical activities individually administered. This test has been used in numerous studies for perceptual-motor development. However, Fisher and Turner (1972) concluded it was not an appropriate measure for the perceptual-motor program they conducted since their children gained in achievement but not on the motor survey.

The second kind of test of perceptual-motor development is the drawing coordination test. As the child receives sensory impressions from the environment and from his own body he is able, to some degree, to integrate and match the stimuli so that perception and movement coincide. One measure of the degree of development of this matching of the perception and motor worlds of a

child is his ability to coordinate eye and hand in the replication or drawing of a geometric figure.

Perceptual-motor functioning may be operationally defined by performance on a drawing coordination test. Performance on a test of this nature involves visual perception, but also the expression of that perception, the result reflecting the quality of the perception plus the motor behavior and attempts as its control.

Getman says about this eye-hand coordination,

> The more we have learned about perception, the more we realize that most perceptual skills are an ultimate result of how well the human being visually steers and appraises his movements through space, and how well he tactually and visually explores the contents of space. (Getman, p. 26, 1971)

The Bender Gestalt Test is a non-verbal measurement of the gestalt functioning in the perceptual-motor sphere. It has been used in some studies of the relationship between perceptual-motor development and academic achievement. It has proved to be a relatively useful tool in predicting academic success. Smith and Keogh (1962) did considerable research with the Bender Gestalt Test, for which they developed a method for group administration. They found the group administration was as reliable as individual administration. Their study "demonstrated consistently significant statistical relationship between external reading criteria and performance on the Bender Gestalt regardless of administrative method." (Smith and Keogh, pp. 639-645, 1962)

The value of this study is to indicate that a drawing coordination test can be as reliable when administered to a group as to individuals.

One of the most highly recommended perceptual-motor tests is the Developmental Test of Visual-Motor Integration developed by Keith E. Beery and Norman A. Buktenica. This test was developed to detect problems in visual-motor discrimination. It consists of geometric forms arranged in order of increasing difficulty and can be administered either individually or in small groups.

The Perceptual Forms Test which has been used under the direction of Kephart at Winter Haven Foundation consists primarily of geometric forms to be reproduced and is considered an evaluation of visual-motor or hand-eye coordination.

The Slosson Drawing Coordination Test was designed to identify individuals with various forms of brain dysfunction or perceptual disorders where eye-hand coordination is involved. It can be administered on an individual or group basis and presents a crude developmental scale.

The similarity of these eye-hand coordination tests is remarkable, considering they were designed to measure completely different characteristics. The Bender Gestalt was designed for an intelligence scale, the Slosson to detect brain dysfunction and the others for reading problems related to visual discrimination. Accepting the assumption that eye-hand coordination as measured by a drawing coordination test is a measurement of perceptual motor

development, then one of the aforementioned tests would be acceptable for such a measurement.

A second assumption of perceptual-motor performance is that it is developmental. Therefore, an instrument should be selected which begins with very simple figures and progresses to the difficult in a proven progression. Both the Developmental Test of Visual-Motor Integration developed by Beery and Buktenica and the Slosson Drawing Coordination Test have been statistically documented as to developmental progression.

For a study which involves a large number of very young subjects, the method of administration must be considered. The instrument must be as reliable for a group as for an individual. It should be a very simple test to administer and take only a short time to complete. The Slosson Drawing Coordination Test fits these requirements. First graders should be able to complete it easily without feelings of frustration.

The Beery Developmental Test of Visual-Motor Integration appeared to be the best instrument for item development and scoring. However, its excessive cost and difficulty of administration made it impractical. The Slosson Drawing Coordination Test is very similar to the Beery Test in the items presented for replication. By adjusting the administration from its original objective to a simple developmental scale (do as many as you can), and scoring, not on percentages, but a simple raw score of correct items, a range of scores could be obtained which would discriminate levels

of competency. In short, the advantages of the Slosson Drawing Coordination Test were that the items were well documented as a developmental scale; they were presented in a way which made them very simple for first graders to respond to in classroom sized groups; and they could produce a range of scores which could be meaningfully interpreted as a developmental scale for eye-hand coordination.

Since the original purpose of the Slosson Drawing Coordination Test was to screen out and identify individuals with various forms of brain dysfunction, most of the norming data for validity is pointed toward this purpose. However, each item was validated separately in regard to age level norms. The items were then ranked in order of complexity, providing a crude development scale. The authors claim a reliability of .96, obtained from a test-retest for a group of 200 individuals aged 4 to 52 years. The range of scores averaged 3.3 accuracy points.

This author conducted a test-retest study of the Slosson Drawing Coordination Test with one first grade class to validate the reliability score claimed for the test. The test was administered two days apart with all conditions as nearly similar as possible. The correlation indicating reliability was .65. However, some problems of administration were discovered which affected this correlation and which, in turn, could be anticipated and guarded against in the actual use of the test.

Because of the purpose for which this test was to be used in this study, the method of administration and scoring was somewhat different than directed in the manual. The original directions designate that each child should complete exactly the number of figures of his years of chronological age. The scores are then transformed into accuracy percentages. For statistical comparison and developmental measurement purposes, it seemed more reasonable to use the number of correct drawings for a raw score with each child completing drawings to his ceiling of performance.

For the pre-test, all subjects were asked to complete at least seven items and as many more as they felt they wanted to do. For the post-test all students were asked to complete at least eight items but could do all of them. Each items was produced three times before going to the next. All items drawn were considered and scored plus or minus according to the detailed scoring rules found in the test manual. The total number of plus items constituted the raw score.

MEASUREMENT OF READING READINESS AND ACHIEVEMENT

The primary purpose of a reading readiness test in this study was to establish a base of comparison for the two groups in academic achievement. It was necessary to establish the similarity of the groups at the beginning of the study in order to evaluate any achievement. Statistical analysis used the pre-test scores to determine the effects of any differences in the groups at the

beginning on the final results of reading achievement.

The Lee-Clark Reading Readiness Test was selected for the readiness pre-test. This test produces four scores: letter symbols, concepts, word symbols, and total. The total score was the only one considered.

The manual reports split-half reliabilities ranging from .87 to .96. Predictive validities vary according to criterion but average in the 50's. This is not high, but when compared with other tests, this test does predict about as well. Its advantages are that it requires a short testing time and is easily and meaningfully administered and interpreted. It is one of the older and more respected readiness scales.

For the reading achievement post-test, the California Achievement Test of Reading, Level I Form A, 1970 edition was selected. This test yields three scores: vocabulary, comprehension and total. The total score was the one considered.

Coefficients of reliability of the reading test were determined by averaging intercorrelations of the different forms for a single grade range. This reliability coefficient was .92. The manual does not explain how validity was determined but claims it is very high. The test has been developed over a long period and has been tested and revised many times. It is a highly respected test and correlates well with the Lee-Clark Reading Readiness Test.

STUDY PROCEDURES

During the inservice days before school began in September of 1973, workshops were held with both groups of first grade teachers. Testing procedures were explained and schedules worked out so that the best testing times could be utilized. These were early morning times which would interfere least with other activities and would take advantage of the freshness and enthusiastic vigor of the students.

The purpose of the study was explained at this session and ground rules established for the control group in relation to the study. It was not the purpose of this experimentor to interfere with the regular program of perceptual training which is a part of any beginning reading program. The only thing asked of the control group was that they do not structure their physical education program with any series of activities designed to develop perceptual-motor skills. Some of these skills may be gained through normal activities and games children play. No normal activity was to be restricted. Games and free play were to be encouraged. The cooperation of these teachers in keeping their physical education program unstructured was critical to this study.

The experimental group would continue to conduct their structured physical education program throughout the year.

The Slosson Drawing Coordination Test and the Lee-Clark Reading Readiness Test were administered to all first graders in both groups during the month of September. There were administered in the child's own classroom by this writer with the assistance of the classroom teacher.

The Slosson Drawing Coordination Test required one twenty-minute session, while the two reading tests each required two thirty minute sessions. Therefore, each classroom was scheduled for three testing sessions for both the pre-test and post-test. No classroom had more than one test session on any given day. In order to test the groups in as nearly identical manner as possible, both in regard to time and methods, each test or part of a test was given to all groups before a second part was started. The Slosson Drawing Coordination Test was administered to all twelve classrooms before the readiness test was started. Then, all groups had the first session of the readiness test before the second part was started. The same procedure was followed in April with the Slosson Drawing Coordination Test and the California Achievement Test of Reading. This insured that time differentials were held equal among the groups so that no group would have an advantage of several weeks longer instructional time.

All tests were hand scored by the researcher. The scoring of the Slosson Drawing Coordination Test was according to specific criteria set down in the test manual. Since this scoring was very subjective the tests were scored in groups of at least three class-

room sets. Only one item at a time from all papers in the set were scored before consideration of a different item. In this way the scorer's mind was on the criteria for one item at a time. This method should contribute to objectivity and consistency. Impartial persons were asked to spot check the tests for inconsistencies.

The scoring of both reading tests was objective with no judgment decisions involved.

The subjects were identified with their scores by classroom and no subjects were considered in the study who did not have a complete set of scores from all instruments. Retentions were dropped.

STATISTICAL APPLICATION

The statistical analysis was of two kinds. The analysis of covariance was used on the reading readiness pre-test and the reading achievement post-test to equate the groups and determine if there was a significant difference in the amount of growth of the two groups. This same procedure was completed for the pre-test and post-test of the Slosson Drawing Coordination Test to determine if there was a significant difference in the perceptual-motor growth of the two groups.

Model: Analysis of covariance for a completely randomized design

$$Y_{ij} = \mu + T_i + \beta (X_{ij} - \overline{X}) + E_{ij}$$

If we conclude that $\beta = 0$ then the model is reduced to

$Y_{ij} = \mu + T_i + E_{ij}$ which is a completely randomized design model in analysis of variance. (Ostle, 1972)

To determine if there is a relationship between the scores on the perceptual-motor test and the reading scores, product-moment correlation coefficients were found for the perceptual-motor test scores and reading scores of the pre-test and the post-test for both groups.

CHAPTER IV

FINDINGS

The purpose of this study was to determine if a structured perceptual-motor physical education program would have any significant effect on reading achievement. The first grade population of the Junction City School District comprised the experimental group which was provided with twenty-five minutes per day of a perceptual-motor training program over a six month period. The first grade population of a similar school district comprised the control group which did not receive a structured physical education program.

The data consisted of a set of four scores for each subject in both groups. The first score was the number of plus items on the Slosson Drawing Coordination Test administered to all groups in September, 1973. These scores are identified as the perceptual-motor pre-test. The second score was the total raw score on the Lee Clark Reading Readiness Test. This test was administered immediately after completion of the Slosson Drawing Coordination Test and the set of scores made up the reading pre-test.

The remaining two scores of the four acquired for each subject made up the perceptual-motor post-test and the reading post-test. The perceptual-motor post-test consisted of the number of plus items on the Slosson Drawing Coordination Test administered in April, 1974. The reading post-test score was the total raw score from the California Achievement Test: Reading, Level I Form A, 1970 edition.

Questions To Be Asked of the Data

1. Are the readiness scores of the experimental group significantly different than the readiness scores of the control group?

2. Are the reading achievement scores of the experimental group significantly different from the reading achievement scores of the control group?

3. Is there a difference between the readiness-achievement difference scores for the two groups?

4. Is there a difference between the September to April increase on the Slosson Drawing Coordination Test for the two groups.

5. What is the relationship between perceptual-motor skills and reading readiness?

6. What is the relationship between perceptual-motor skills and reading achievement?

The sets of scores were identified in the following conceptualization in order to organize the data in regard to questions being asked.

	Pre-test Reading	Post-test Reading	Pre-test Slosson	Post-test Slosson
1. Experimental Group	$X_1(\mu_1)$	$X_2(\mu_2)$	$X_3(\mu_3)$	$X_4(\mu_4)$
2. Control Group	$X_5(\mu_5)$	$X_6(\mu_6)$	$X_7(\mu_7)$	$X_8(\mu_8)$

μ_i = Mean of random variable $X_i, i=1,\ldots,8$

Null Hypotheses

I. The observed difference between the reading readiness scores of the experimental group and the reading readiness scores of the control group is not significant.

Ho: $\mu_1 - \mu_5 = 0$

II. The observed difference between the reading achievement scores of the experimental group and the reading achievement scores of the control group is not significant.

Ho: $\mu_2 - \mu_6 = 0$

III. The difference scores for the reading readiness test and reading achievement test do not differ significantly between groups.

Ho: $(\mu_2 - \mu_1) - (\mu_6 - \mu_5) = 0$ which can be rewritten

Ho: $(\mu_2 - \mu_6) - (\mu_1 - \mu_5) = 0$

IV. The difference scores for the Slosson Drawing Coordination Test in September and April do not differ significantly between groups.

Ho: $(\mu_4 - \mu_3) - (\mu_8 - \mu_7) = 0$ which can be rewritten

Ho: $(\mu_4 - \mu_8) - (\mu_3 - \mu_7) = 0$

V. There is no relationship between perceptual-motor skills and reading readiness.

Ho: $r_{x_3x_1} = 0$ Ho: $r_{x_5x_7} = 0$

VI. There is no relationship between perceptual-motor skills and reading achievement.

Ho: $r_{x_4x_2} = 0$ Ho: $r_{x_8x_6} = 0$

Two types of statistical analysis were considered for the first four hypotheses. Since the reading data and perceptual-motor data were to be considered separately, the simple analysis of variance (ANOVA) or completely randomized design may be appropriate. However, if there is any effect from the pre-tests on the post-tests this design would not be appropriate.

Analysis of covariance is a statistical technique which combines the concepts of analysis of variance and regression to handle situations where all variables cannot be controlled. It is a procedure for testing the significance of differences among means, accounting for the influence of uncontrolled factors in the experiment. By using regression analysis procedures this technique adjusts for initial differences in the data. In this way sampling error is reduced and precision is increased. (Courtney, 1972) If it is found there is an effect from the pre-test to the post-test, then the analysis of covariance would be an appropriate treatment for the data.

Model: Analysis of covariance for a completely randomized design

$$Y_{ij} = \mu + T_i + \beta (X_{ij} - \overline{X}) + E_{ij}$$

Y_{ij} = A score on the post-test

μ = Mean of population

T = Treatment effect

β = Regression coefficient of y or x

X_{ij} = A score on the pre-test

E_{ij} = Error, assumed normally and independently distributed

If we conclude that $\beta = 0$ then the model is reduced to $Y_{ij} = \mu + T_i + E_{ij}$ which is a completely randomized design model in analysis of variance.

Results of Data Analysis

I-The observed difference between the reading readiness scores of the experimental group and the reading readiness scores of the control group is not significant.

$$Ho: \quad \mu_1 - \mu_5 = 0$$

If the test confirms Ho, we would conclude there is no real difference between the two groups.

$$F = \frac{T_{xx}/1}{E_{xx}/176} = \frac{176 \times 49.4}{7376.2} = 1.18 < F_{.95}(1,176) = 3.9$$

Therefore, we cannot reject Ho at the level of significance $\alpha = .05$. There is no significant difference between the reading readiness scores of the two groups. (See Table I)

II-The observed difference between the reading achievement scores of the experimental group and the reading achievement scores of the control group is not significant.

$$Ho: \quad \mu_2 - \mu_6 = 0$$

$$F = \frac{T_{yy}/1}{E_{yy}/176} = 6.43 > F_{.95}(1,176) = 3.9$$

Ho is not accepted. The test confirms that there is a significant difference between the post-test reading scores of the two groups. The experimental group scores are higher than the control group. (See Table I)

TABLE I

	N	Pre-test Mean	Post-test Mean	Post-test Adj. Mean
Experimental	77	54.44156	79.12987	80.02705
Control	101	55.50495	72.60396	71.91997

III-The difference scores for the reading readiness test and reading achievement test do not differ significantly between groups.

Ho: $(\mu_2 - \mu_1) - (\mu_6 - \mu_5) = 0$ which can be rewritten as

Ho: $(\mu_2 - \mu_6) - (\mu_1 - \mu_5) = 0$

Before testing this hypothesis it was necessary to determine the extent of effect of the pre-test reading readiness scores on the post-test reading achievement scores.

Model: Analysis of covariance for a completely randomized design

$$Y_{ij} = \mu + T_i + \beta(X_{ij} - \bar{X}) + E_{ij}$$

If we conclude that $\beta = 0$ then the model is reduced to

$Y_{ij} = \mu + T_i + E_{ij}$ which is a completely randomized design model in analysis of variance.

In order to determine if there was a pre-test effect, an F-value was determined for β.

Ho: $\beta = 0$

If the test confirms Ho' then the use of the analysis of variance (ANOVA) is appropriate. If the test does not confirm Ho' an analysis of covariance (ANACOVA) will be used. The F-value for testing Ho' is

$$F = \frac{E_{xy}^2/E_{xx}}{S_E} = 82.34 \text{ with } \begin{matrix} v_1 = 1 \\ v_2 = 175 \end{matrix} \text{ degrees of freedom,}$$

which is larger than $F_{.99}(1,175) = 6.8$.

The above test strongly suggests that the pre-test scores (reading) have considerable effect on the post-test scores. In order to detect the possible effect of the treatment, it is necessary to adjust the post-test scores on the pre-test scores. Therefore, an analysis of covariance is the appropriate technique for this analysis.

$$F = \frac{E_{xy}^2/E_{xx}}{S_E/(\sum_{i=1}^{t} n_i - t - 1)} = \frac{E_{xy}^2/E_{xx}}{S_E^2} = 14.402$$

E_{xy} = experimental sum of products for X and Y

E_{xx} = experimental error sum of squares for X

$S_E = E_{yy} - E_{xy} - E_{xy}^2/E_{xx}$ where E_{yy} is experimental error sum of squares for Y.

X = pre-test

Y = post-test

The F-value for testing Ho is 14.402 and this is larger than $F_{.99}(1,175) = 6.8$. Therefore Ho can be rejected at the level of

significance $\alpha = .01$. The analysis of covariance suggests that the difference between the reading post-test and pre-test for the experimental group is significantly different (larger) than the same value for the control group.

IV-The difference scores for the Slosson Drawing Coordination Test in September and April do not differ significantly between groups.

Ho: $(\mu_4 - \mu_3) - (\mu_8 - \mu_7) = 0$ which can be rewritten

Ho: $(\mu_4 - \mu_8) - (\mu_3 - \mu_7) = 0$

Using the same procedures as for the reading scores an F-value was found for β to determine if there was a pre-test effect.

Ho': $\beta = 0$

$$F = \frac{E_{xy}^2/E_{xx}}{S_E^2} = 85.3 > F_{.99}(1,175) = 6.8$$

It was determined an analysis of covariance was appropriate.

The F-value associated with Ho resulting from the analysis of covariance was $.473 < F_{.95}(1,175) = 3.9$. Therefore, Ho cannot be rejected at the level of significance $\alpha = .05$. The test suggests that the difference between the Slosson post-test and pre-test for the experimental group is not significantly different from that of the control group.

Ho: $\mu_3 - \mu_7 = 0$

$$F = \frac{T_{xx}/1}{E_{xx}/176} = .92 < F_{.95}(1,176) = 3.9$$ Do not reject hypothesis.

This test indicates that the difference between the experimental group and the control group on the Slosson Drawing Coordination pre-test in September is not significant.

Ho: $\mu_4 - \mu_8 = 0$

$$F = \frac{T_{yy}/1}{E_{yy}/176} \simeq .0 < 3.9$$ Do not reject hypothesis.

This test indicates that the difference between the experimental group and the control group on the Slosson Drawing Coordination post-test in April is not significant.

Analysis of Relationships

The second part of the statistical analysis consists of correlations. The questions to be considered are concerned with the relationship between perceptual-motor development and reading readiness and between perceptual-motor development and reading achievement.

In order to determine the relationship between perceptual-motor development and reading readiness, a product-moment correlation coefficient was computed for the scores on the Slosson Drawing Coordination pre-test administered in September and scores on the Lee Clark Reading Readiness pre-test for both the experimental group and the control group. To determine the relationship between perceptual-motor development and reading achievement, a product-moment correlation coefficient was computed for the scores

of the Slosson Drawing Coordination post-test administered in April and the scores on the reading achievement post-test for both the experimental group and the control group.

Although the correlation coefficients for the perceptual-motor development scores and the reading readiness and achievement scores appear slightly higher for the experimental group than for the control group, a t-test indicates there is no evidence there is any real difference between correlation coefficients of the groups. All correlation coefficients show relationships which are significant at the level of significance $\alpha = .01$.

$r_{x_3x_1} = .53$ Correlation for perceptual-motor pre-test and reading readiness pre-test for the experimental group.

$r_{x_5x_7} = .38$ Correlation for perceptual-motor pre-test and reading readiness pre-test for the control group.

$r_{x_4x_2} = .43$ Correlation for perceptual-motor post-test and reading achievement for the experimental group.

$r_{x_8x_6} = .27$ Correlation for perceptual-motor post-test and reading achievement for the control group.

Summary

Results from both the experimental group scores and control group scores indicate that there was no significant difference between the groups in either perceptual-motor development or reading readiness at the beginning of the study in September. Analysis of the data for the post-tests indicate that the experimental group gained significantly more in reading achievement than the control group. However, there was no difference between the groups in perceptual-motor development.

Correlation coefficients were all significant indicating there is some relationship between perceptual-motor development and reading readiness and achievement.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS

The Problem Restated

The purpose of this study was to investigate the relationship between perceptual-motor skills and reading achievement and to determine if a structured physical education program would develop perceptual-motor skills which would affect the ability of first graders to learn to read. The problem was to determine if training one group in perceptual-motor skills would improve the reading achievement of that group significantly more than the control group. Both groups were tested in perceptual-motor skill development and reading readiness at the beginning of the first grade. They were then tested on the same perceptual-motor skills and reading achievement at the end of the first grade and scores of these pre-tests and post-tests were compared for amount of growth in each area. Correlations were also considered between the perceptual-motor skills scores and reading scores to see if there were significant relationships.

Summary of Procedures

The entire first grade population of one elementary school, about one hundred students, received a physical education training program structured on the principles of perceptual-motor development advanced by Kephart and others. A similar elementary school first

grade which had no structured physical education program served as the control group. The size of the first grade population of the two schools was similar. The type of community, geographic location, and socio-economic status of the groups were similar. Similar reading programs and readiness philosophies were employed by both groups. The heterogeneous groupings of both students and teachers were assumed to be randomly assorted and not a factor affecting the study.

All subjects were administered the Slosson Drawing Coordination Test as a measure of perceptual-motor development pre-test at the beginning of the school year and post-test six months later. The Lee Clark Reading Readiness Test served as the pre-test for reading assessment and to help equate the groups at the beginning of the study. The California Achievement Test of Reading, Level I Form A, was used as post-test to assess academic achievement.

An analysis of covariance was used to equate the two groups and to show if there was more significant growth in one group than the other in both perceptual-motor development and reading. Product-moment correlations were used to determine the degree of relationship between the perceptual-motor scores and reading readiness and reading achievement scores.

Summary of Findings

Comparison of the scores of the two groups on both pre-tests indicate there were no significant differences between the groups at the beginning of the study on either perceptual-motor development or reading readiness. After six months of perceptual-motor training through a structured physical education program, the experimental group showed significantly greater gain in reading achievement than the control group. However, there was no significant difference in the perceptual-motor development of the two groups as measured by the Slosson Drawing Coordination Test.

Correlation coefficients for both groups computed between perceptual-motor pre-test and reading readiness and between perceptual-motor post-test and reading achievement indicated significant positive correlations.

Conclusions

One hypothesis of this study was that if there is a relationship between perceptual-motor development and reading achievement, the scores on both the drawing coordination test and the reading achievement test will reflect this relationship by being significantly higher for the experimental group than for the control group. The failure of the scores to reflect any significant difference between groups on the drawing coordination test indicates there is an error in the original assumption.

However, the reason for the error is in doubt. It is possible that the Slosson Drawing Coordination Test is not an adequate measure of perceptual-motor development. There appears to be many facets of this development, only one of which is eye-hand coordination. This test does not include balance, laterality and directionality, nor timing. It is possible there were changes in the development of the experimental group in these other areas which did not affect eye-hand coordination but which did, in fact, affect reading.

Since the difference in the reading achievement scores so significantly favors the experimental group, it must be concluded there is some treatment effect even though it is not clear in what manner it is manifested.

It must be concluded that there is no evidence in this study to prove that a structured perceptual-motor physical education program will improve perceptual-motor skills as measured by a drawing coordination test more than the normal activities of a traditional first grade physical education curriculum.

The highly significant nature of the correlation coefficients indicate there is truly a relationship between eye-hand coordination and reading. However, if eye-hand coordination, measured by a drawing test, is not an adequate measure of perceptual-motor development, then it is not possible to generalize that these correlations truly indicate a relationship between perceptual-motor development and reading achievement. They do support the notion

presented in a number of other studies, that a drawing coordination test for first graders is a reliable predictor of academic success.

Implications

The failure of the data to indicate any difference in the perceptual-motor development of the experimental group over the control group casts doubt upon any implications which might be drawn from the significant difference found in the reading achievement. However, due to the highly significant difference in reading scores, it cannot be said that the perceptual-motor program did not have an effect. The possibility that the drawing coordination test was not an adequate measure of perceptual-motor development must be considered.

The implications are that there is no evidence that a perceptual-motor physical education program affects reading achievement, but there is also no evidence that it does not.

Significant differences in reading achievement without the same differences in perceptual-motor development might also imply other effects which had not been controlled. Such factors mentioned by Oliver (1958) as the effect of achievement and success, improved adjustment, improved physical condition or the effect of feeling important (in short an improved self-concept from the successful achievement of physical skills) may carry over into academic work.

It is possible there were factors in the reading program itself or in reading instruction which were not evident nor could they be controlled in this study.

It is impossible to draw any statistical inferences from the correlations between perceptual-motor development and reading but it is interesting to note that the relationships appeared to be higher at both pre-test and post-test levels for the experimental group. Even though significance tests indicate the differences could well be attributed to chance and there is no evidence of real differences, it is possible that some unknown pre-treatment effect in the experimental group which was not evident in the particular instruments used to measure perceptual-motor development and reading readiness caused this group to be better prepared for academic tasks. There is no public kindergarten program in either district, but it is unknown the number in each group who have had private pre-school instruction.

Suggestions for Further Study

The number of questions raised by the findings in this study provides a wide area for future consideration.

The most crucial question raised concerns appropriate instruments for measuring perceptual-motor development. Researchers found difficulty with the Purdue Perceptual-Motor Survey (Fisher and Turner, 1972) which is primarily an individual physical test. The group drawing coordination test also appears to have limitations.

The development of a scale which measures all aspects of perceptual-motor development and is practical to use with a large number of small children appears to be necessary before meaningful relationships and developmental data can be determined.

Benefits other than influence on academic achievement which may be attributed to this physical education program need to be considered. Since this study was for the purpose of evaluating the physical education program, these other benefits should be considered before radical alteration or deletion of the program. Attitudinal studies of self-concept in relation to performance in physical activities and academic activities would be appropriate. The development of physical skills and their carry-over into play-time activities could be considered. The effect on the general health and well-being of the child is an important aspect. An integral part of this program was the independent movement of children from station-to-station. It would be well to determine if this type of program adds to the self-reliance and responsible actions of first graders.

Another apsect of perceptual-motor development has to do with the differences in the ages of the children receiving training. It may be possible that even younger children may benefit more from such a program. Types of activities which are included in the program also need further examination.

With improved testing instruments, a more controlled study of the effect of such a perceptual-motor physical education on reading

achievement would also make a significant contribution to the understanding of the physical and mental development of children and how they learn.

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APPENDICES

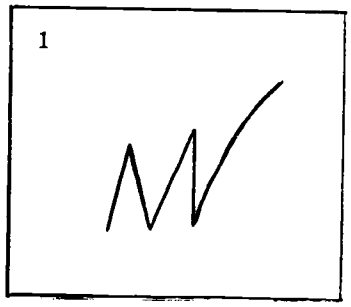
SLOSSON DRAWING COORDINATION TEST

Detailed Scoring Rules for each Figure

The following rules and examples are to be used in scoring the Slosson Drawing Coordination Test. In view of the fact that the drawings are all made "free hand" without use of eraser, ruler, or compass, the rules for scoring are necessarily lenient.

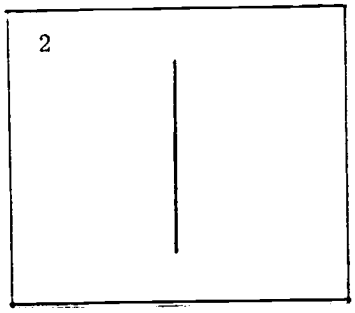
The drawings may be large or small in size and may extend outside the box area. Some children may hold the page on a slant so it is necessary to be liberal as far as positioning is concerned. It is impossible to give specific rules to cover all cases but the following directions should prove adequate to cover most scoring problems.

Item 1



Any kind of "scribble" or marking is scored plus. A blank space is scored minus.

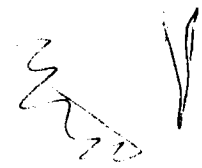
Item 2



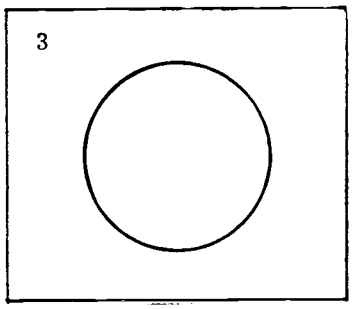
A vertical line must be more than a scribble. It should be a single line. It can be either vertical or diagonal. It can be curved or wavy.

Plus

Minus



Item 3

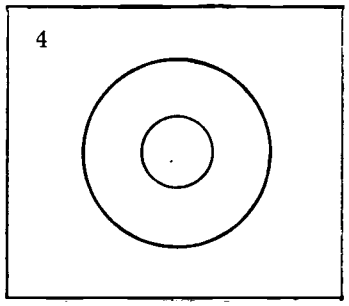


Any curved figure, circular or irregular oval, which is closed or nearly closed is scored plus. Lines which go "round and round" several times making a circular figure are scored plus.

Plus

Minus

Item 4

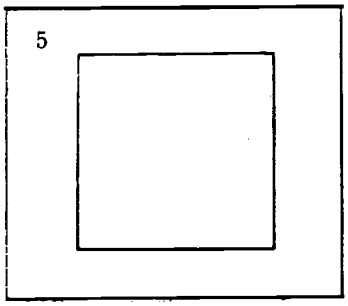


The two circles, one inside the other, must not touch. The two circles must be closed. They may be irregular ovals. They do not have to be spaced perfectly. One may be very large and the other very small. The smaller circle must be more than a dot.

Plus

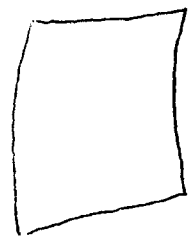
Minus

Item 5

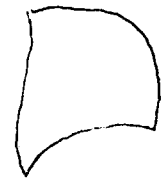


All angles must be well formed. They must not be rounded or peculiar in any way. The sides may be slightly curved. The figure can be rectangular or lop-sided but must have four definite sides and four definite angles.

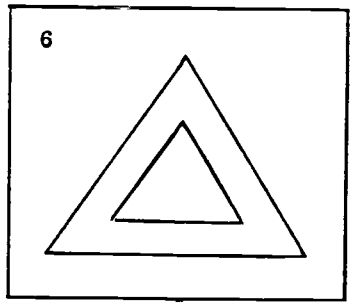
Plus



Minus



Item 6

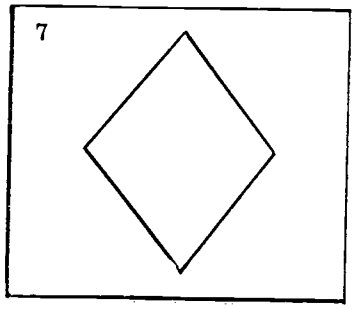


The two triangles must not touch. All angles must be well formed, not rounded or peculiar in any way. The sides may be slightly curved. The triangles may be lopsided and do not have to be spaced perfectly.

Plus

Minus

Item 7

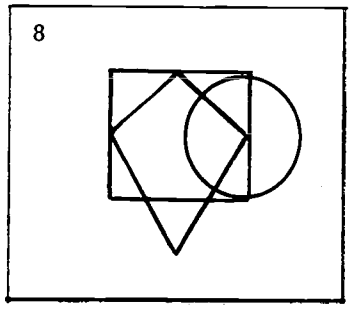


All angles of diamond must be well formed, not rounded or peculiar in any way. The sides may be slightly curved. The figure may be lopsided and the opposite angles do not have to be directly across from each other. A kite shaped figure is scored plus. Beginning with this figure there should be no abnormal degree of tremor.

Plus

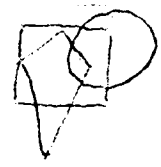
Minus

Item 8



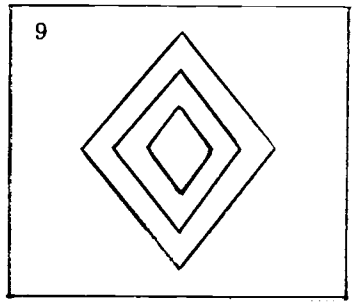
Circle must be well formed. Square and kite must meet requirements of Figures 5 and 7, respectively. With the kite, two of the upper three angles must touch or nearly touch the sides of the square. The lower angle must protrude the lower side of the square. Circle, any size must overlap both square and kite and must protrude right side of square.

Plus



Minus

Item 9



Diamonds, three and only three, one inside the other, must not touch. Each diamond must meet requirements of Figure 7. They do not have to be perfectly spaced, one inside the other

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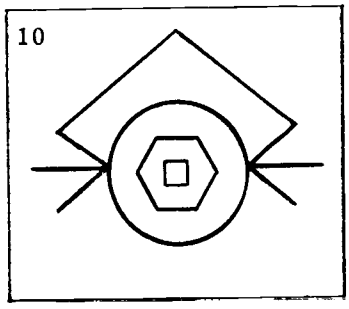
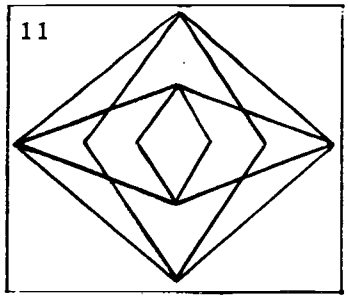
Item 10



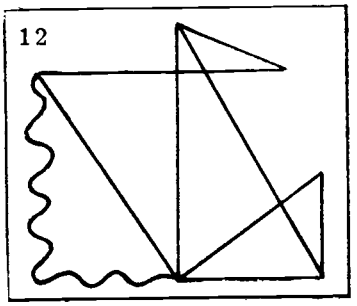
Small, well-formed square must be inside but not touching six sided hexagon, which in turn must be inside but not touching circle. Square must meet requirements of Figure 5. Circle must be well formed but may be oval in shape. Hexagon may be lopsided but must contain six definite lines and may be slightly curved. These three figures do not have to be perfectly spaced. "Whiskers" must come together at a common point and may be above or below midline at side of circle. Sides of crown at top must not touch circle. The crown may be lopsided.

Item 11



Each of the diamond figures must meet the requirements of Figure 7. All connections must come together at common points. The smallest diamond must not touch the other inside vertical diamond. The diamonds do not have to be spaced perfectly one inside the other and the lines may be curved. All lines must come together at common points.

Item 12



The scallops, exact number does not matter, should not be jagged or "saw toothed" and must show two dimensions, vertical and horizontal. The "mast" or perpendicular line, must be nearly vertical, not slanting. The horizontal bottom line must be nearly parallel with the top line. The "flag" at top must be made up of two triangles. All lines must be nicely connected at proper points.

(Slosson, pp. 5-10, 1971) A number of examples of both plus and minus items are provided in the manual in addition to ones shown here.

Examples from Student's Performance in this Study

The following are examples taken from tests of students in the study from both the experimental and control groups on the pre-test and post-test. Due to leniency of scoring the first three items, no minus scores were recorded for any student. Therefore, examples begin with item four.

	Pre-test Score	Post-test Score
Experimental Group		
Student 1		
Average Male	16	21
Student 2		
Low Female	11	17
Control Group		
Student 1		
Low Male	13	17
Student 2		
Low Female	13	19

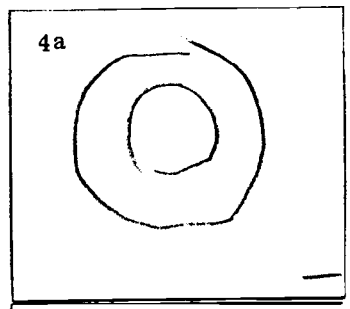
Experimental Group

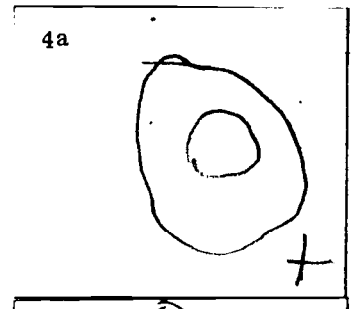
Item 4

Pre-test

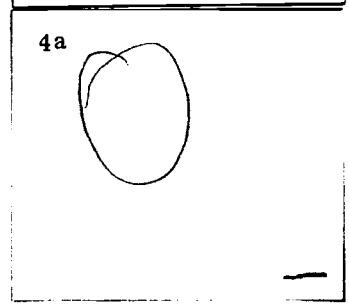
Post-test

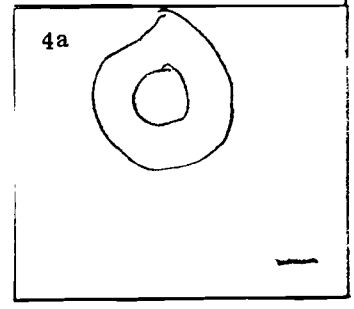
Student 1
Male





Student 2
Female





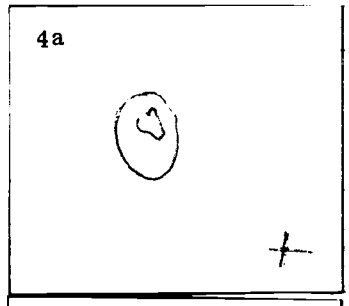
Control Group

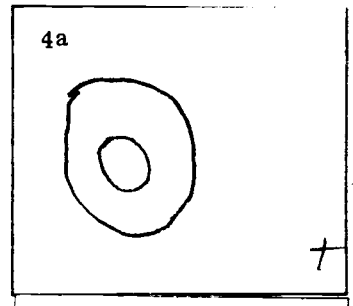
Item 4

Pre-test

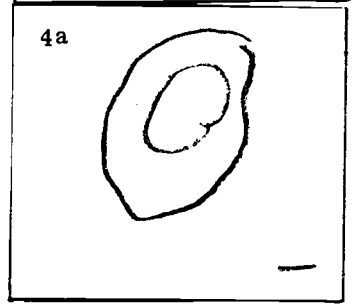
Post-test

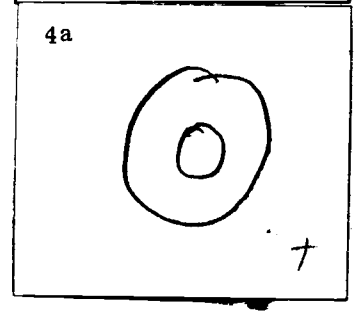
Student 1
Male



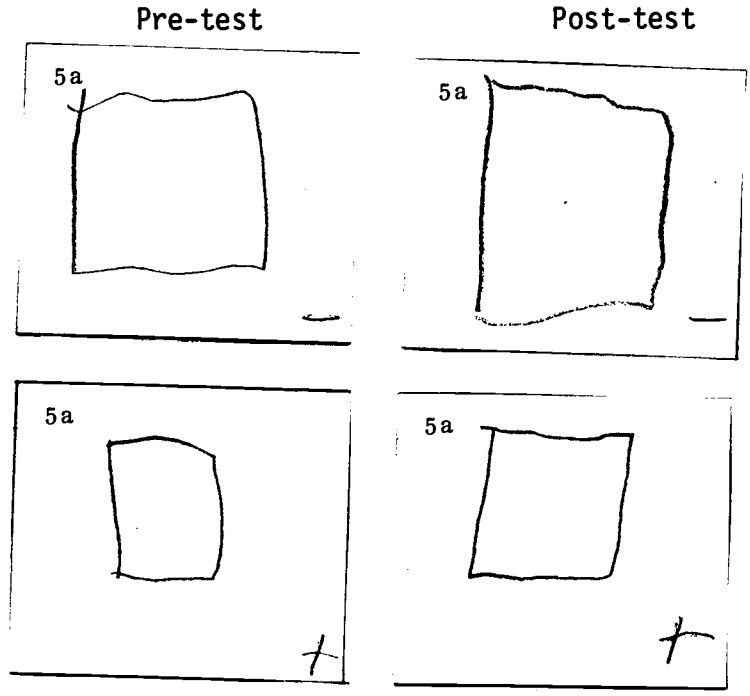


Student 2
Female

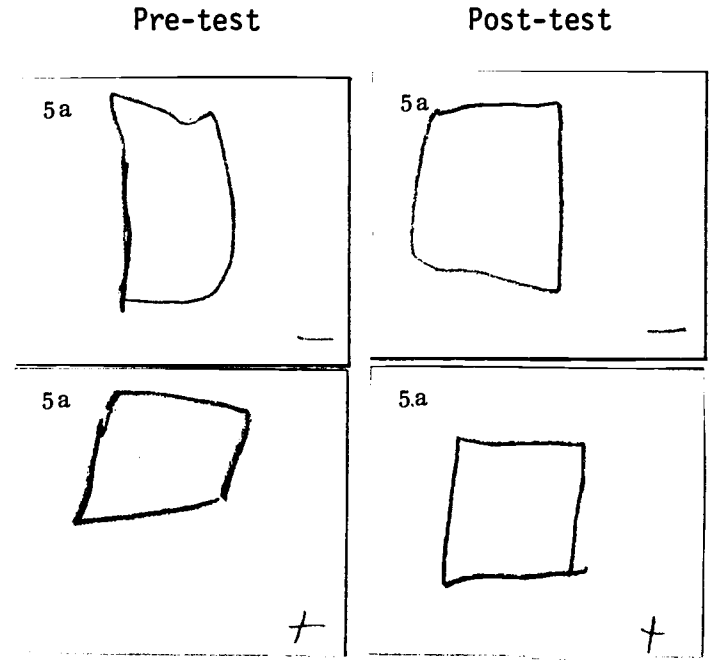




Experimental Group — Item 5



Control Group — Item 5



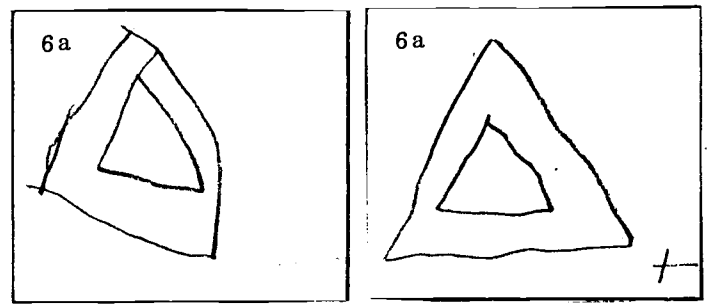
Experimental Group

Item 6

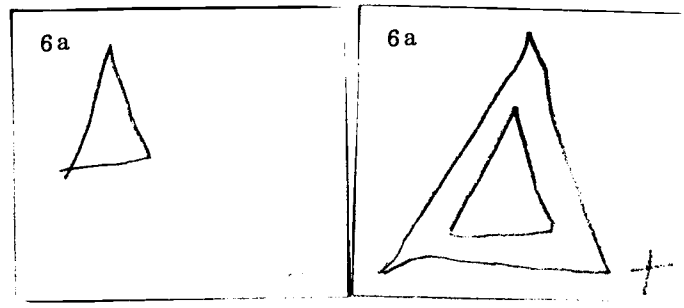
Pre-test

Post-test

Student 1
Male



Student 2
Female



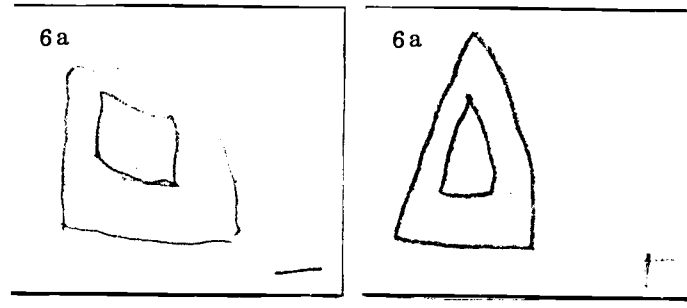
Control Group

Item 6

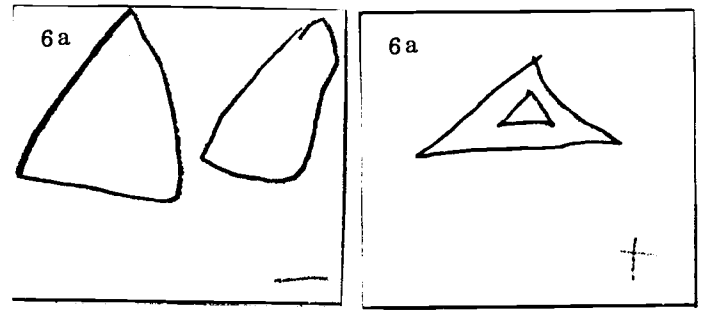
Pre-test

Post-test

Student 1
Male



Student 2
Female



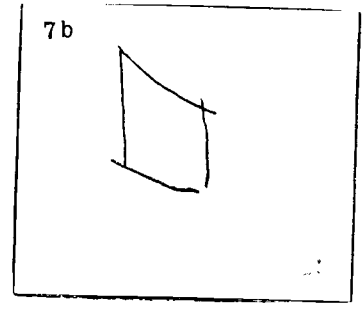
Experimental Group

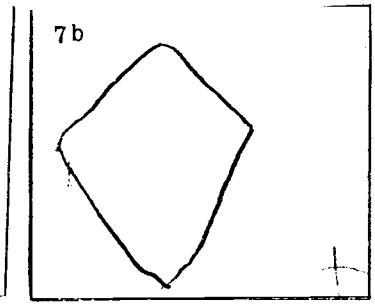
Item 7

Pre-test

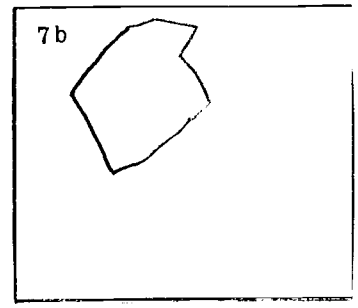
Post-test

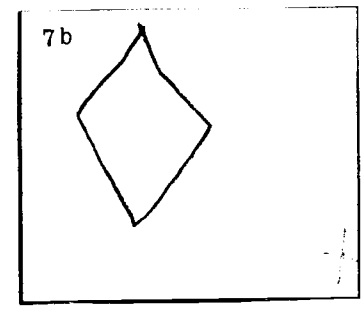
Student 1





Student 2





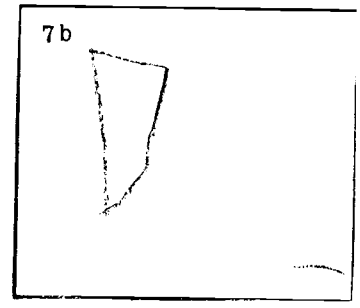
Control Group

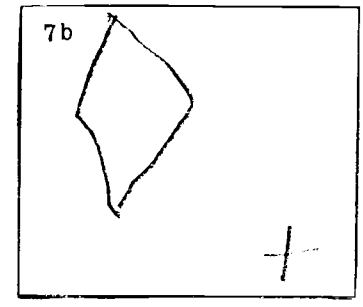
Item 7

Pre-test

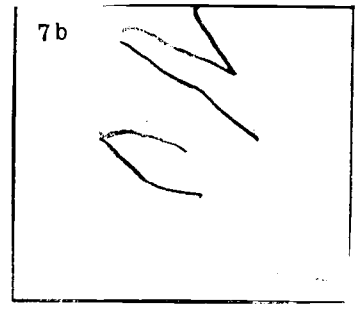
Post-test

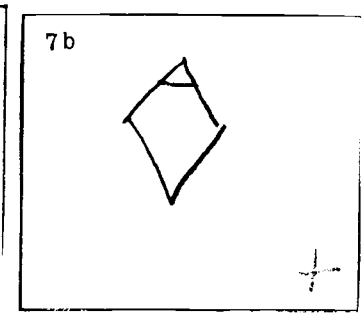
Student 1





Student 2





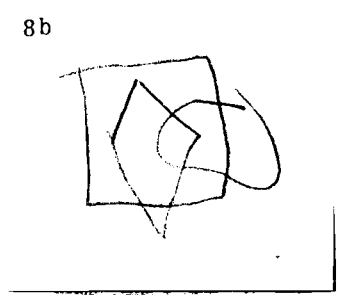
Experimental Group

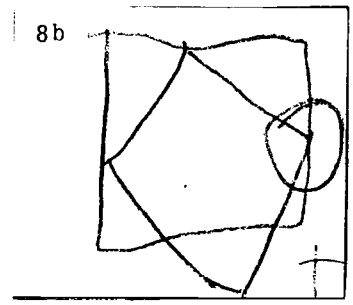
Item 8

Pre-test

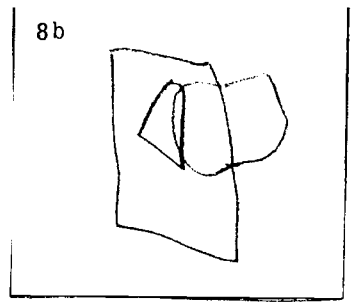
Post-test

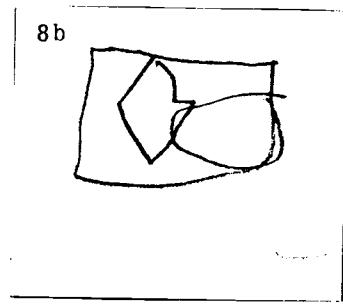
Student 1





Student 2





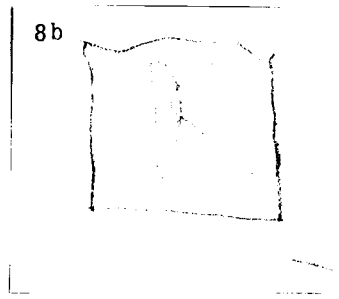
Control Group

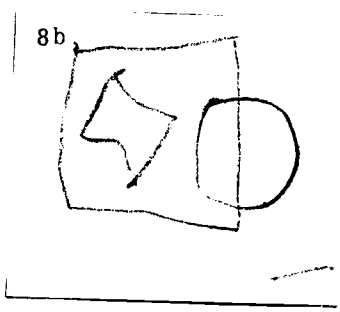
Item 8

Pre-test

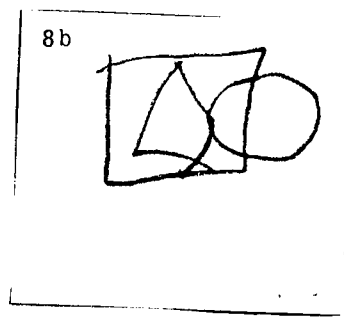
Post-test

Student 1

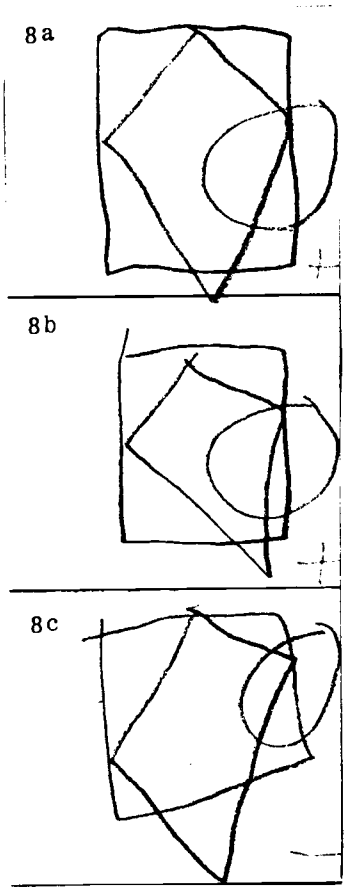




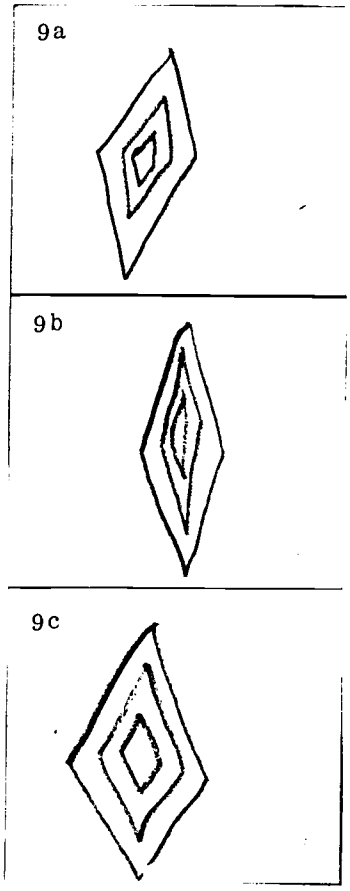
Student 2

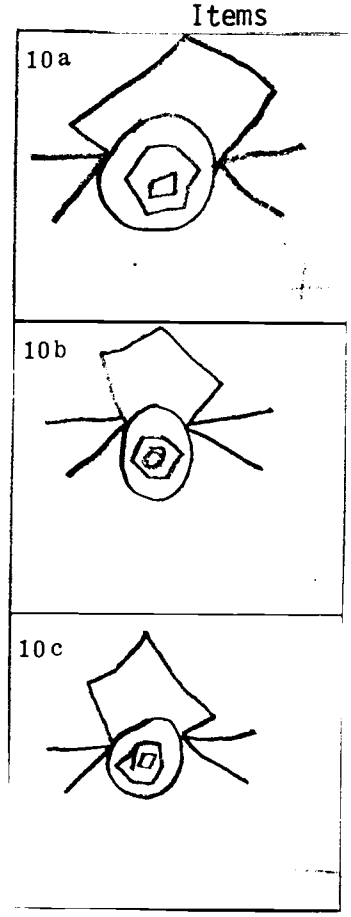


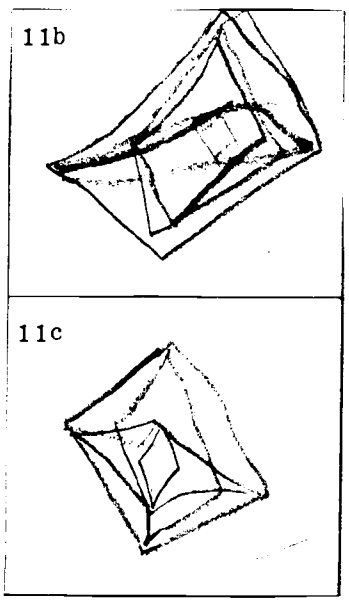
Experimental Group

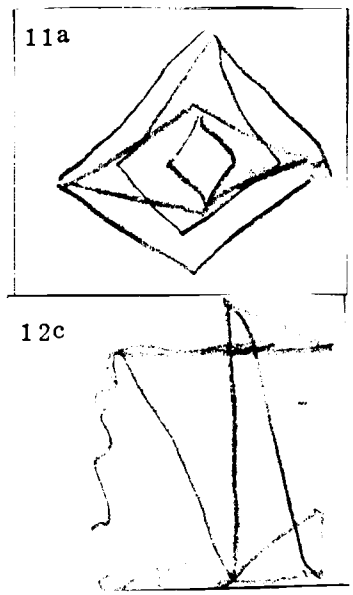


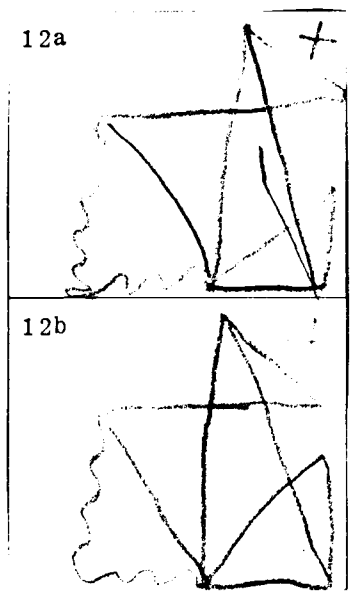
Miscellaneous Examples of Difficult Items





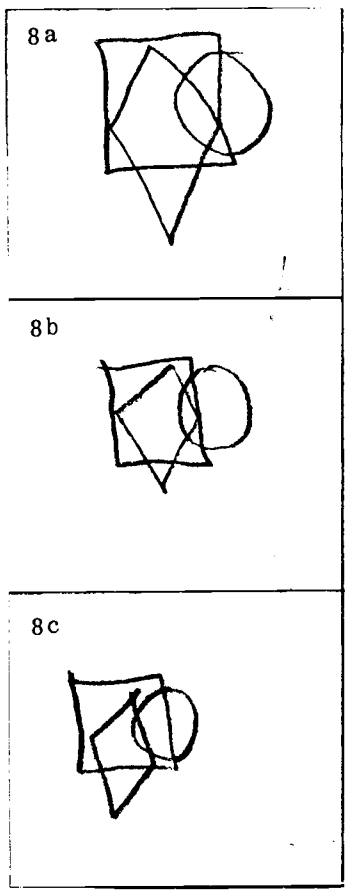


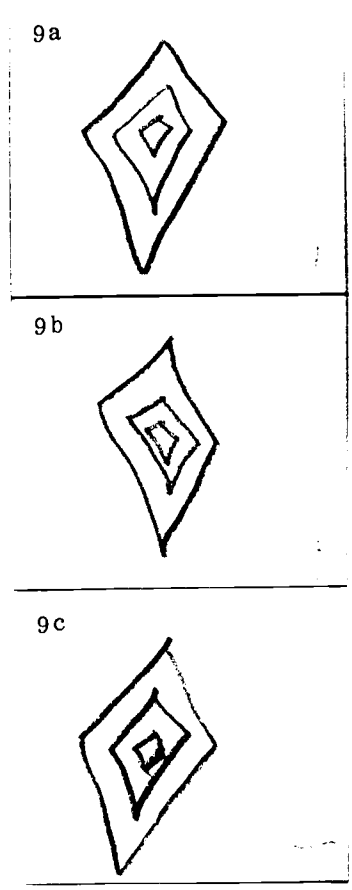


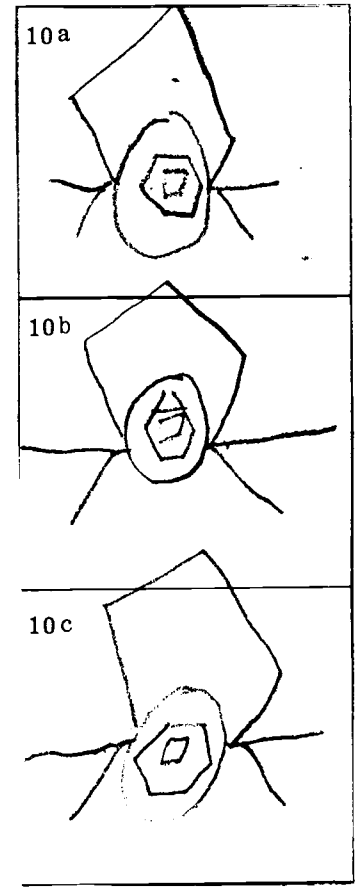


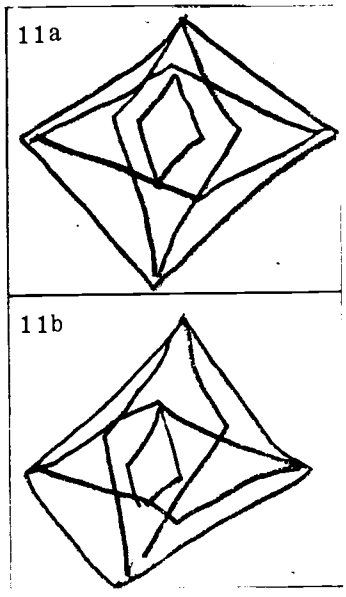
Control Group
Post-test

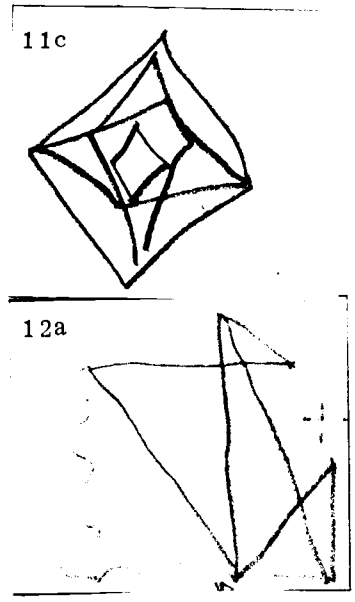
Miscellaneous Examples of Difficult Items

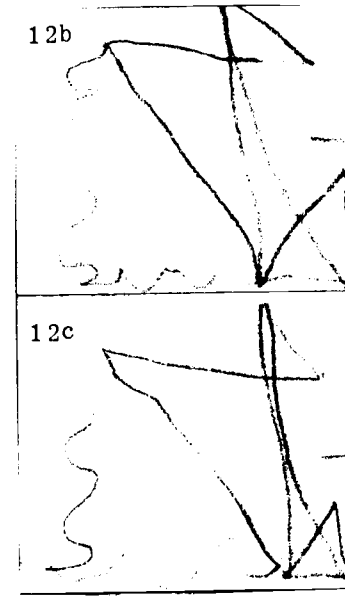












NAME [redacted] LAST FIRST

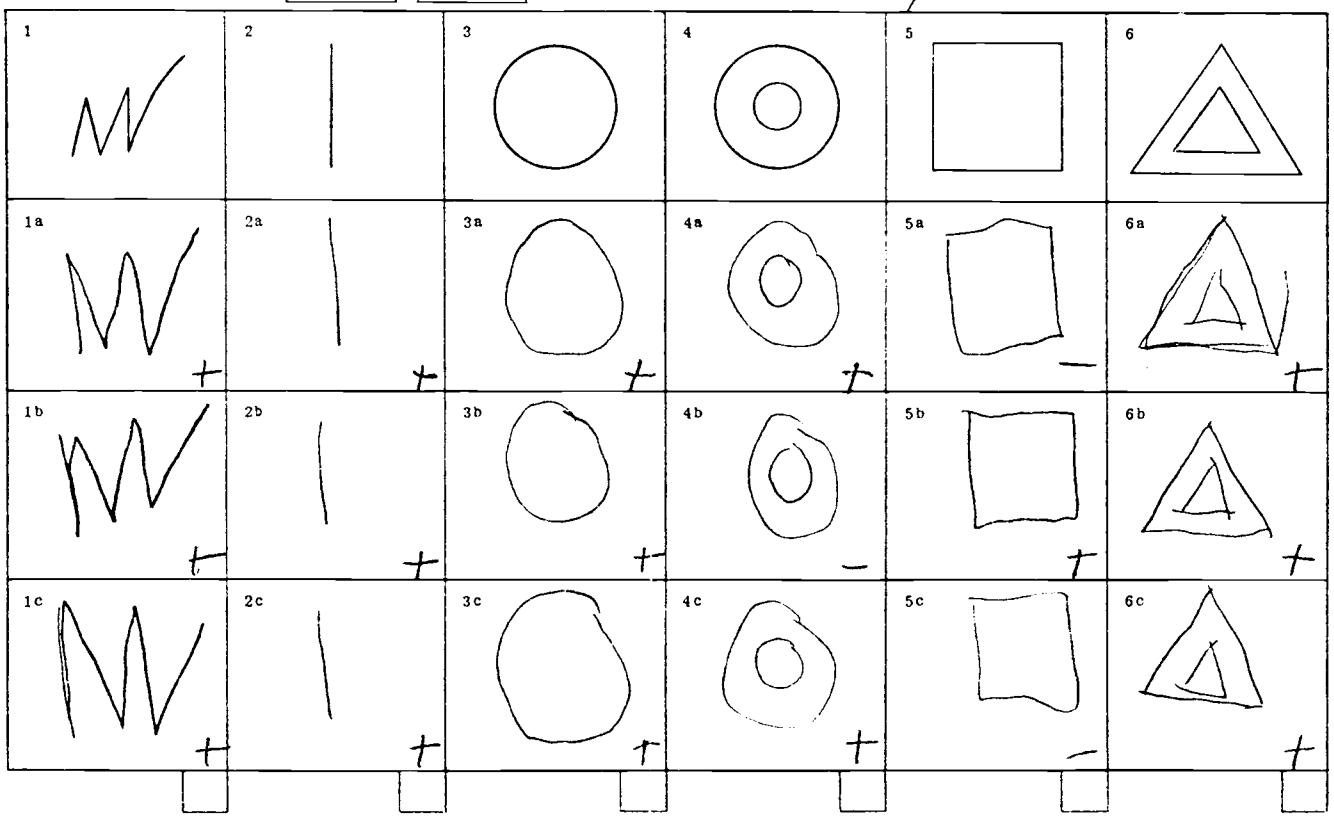
ADDRESS _____

Slosson Drawing Coordination Test (SDCT)
for
CHILDREN AND ADULTS

EXAMINER	SCORE ____ %
[redacted] 17	ERRORS ____

DATE April 1974 AGE _____

WEAR GLASSES DURING TEST? YES_____ NO_____ SCHOOL Laurel Elementary GRADE _____



PRINTED IN U.S.A.

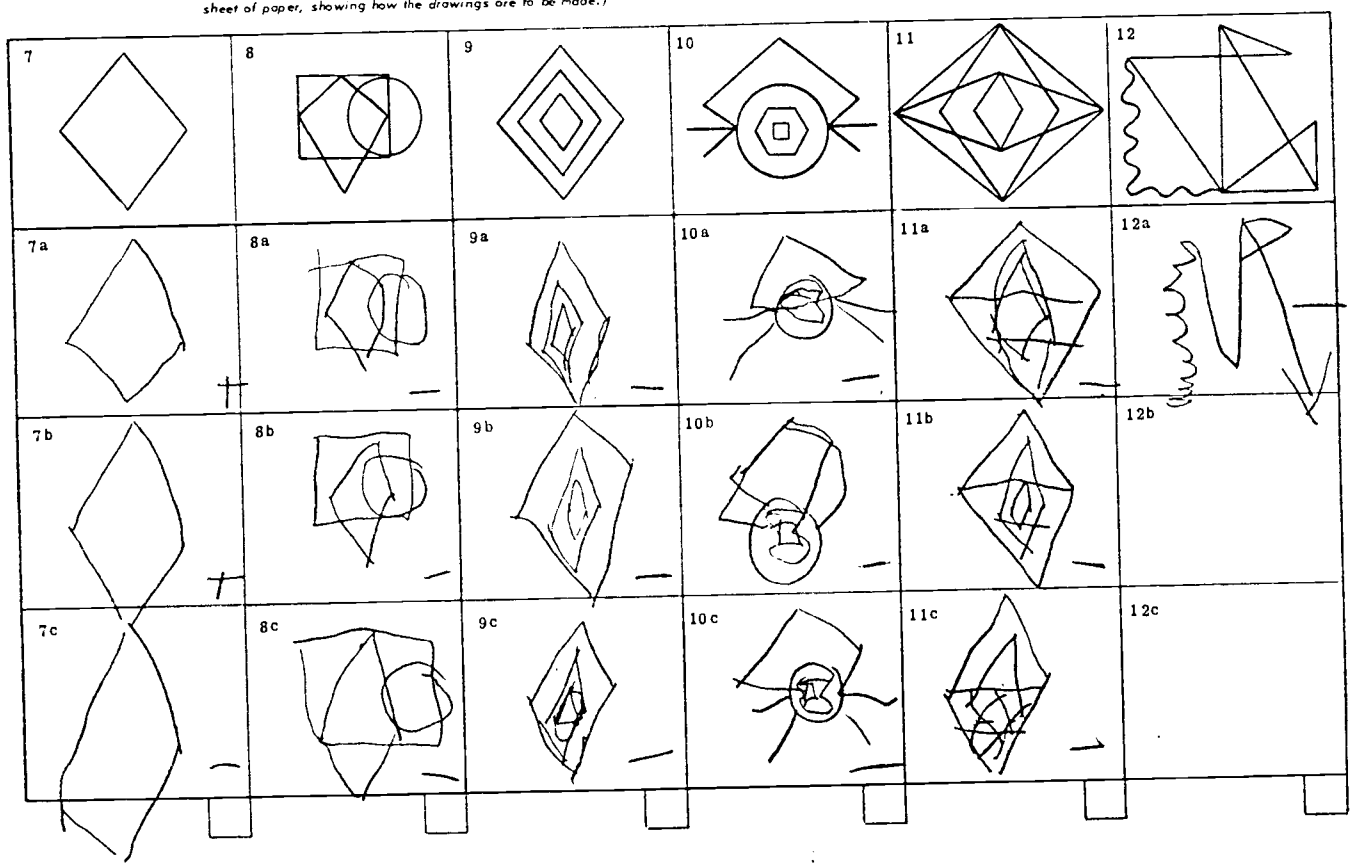
Slosson Educational Publications
538 Pine Street, East Aurora, N.Y. 14052

1967 EDITION

DIRECTIONS *"Your performance on this test gives some indication of your mental and perceptive ability as well as hand coordination. Copy as many figures as you are years of age. For example, if you are 9 years of age, copy figures one through nine. If you are 12 years of age or older, copy all 12 figures. Copy each figure three times in the boxes marked a, b, and c. Use pencil and not ink. Don't use ruler, compass or other aids.*

"Try to copy the lines, curves and angles just the way you see them without making mistakes as you are not allowed to use an eraser. If you should make mistakes, don't erase but draw heavy lines to show corrections. There is no time limit so don't feel hurried. But don't waste time. Start now with number one and make your drawings carefully."

(Children five years of age or younger, may use crayon and should be given a demonstration on blackboard or separate sheet of paper, showing how the drawings are to be made.)

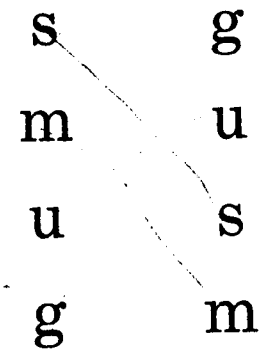


APPENDIX B

LEE-CLARK READING READINESS TEST

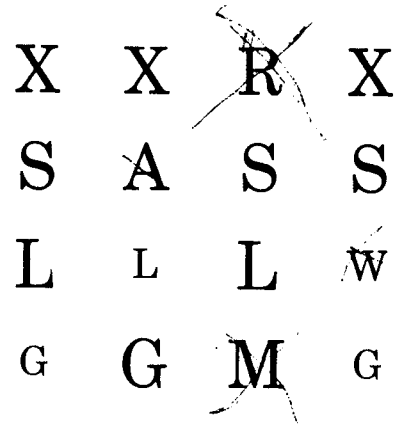
Test 1

Test 1 is a matching test consisting of twelve items with two letters each. The child is to match letters in the first column with corresponding letters in the second column. The test thus measures ability to discern similarities in letter forms.



Test 2

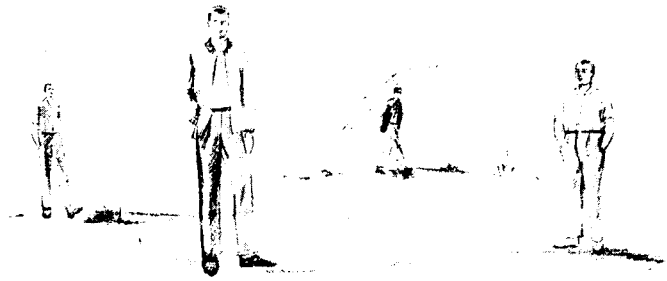
Test 2 also consists of twelve items, each with four letters (sometimes of varying size), and measures the child's ability to perceive differences in letter forms. The child looks at the four letters in each item and determines which of the four is not the same as the other three.



Test 3

Test 3 comprises twenty picture items. The number of pictures in each item ranges from two to five. The child is directed to mark a specific picture in each item. Thus, this test measures each pupil's oral vocabulary, his understanding of concepts, his ability to follow directions, and his knowledge of meanings.

14



Test 4

Test 4 consists of twenty items with five words or letters in each. The child must be able to recognize the stimulus word or letter symbol among the four responses to the right of the line. The test measures ability to recognize both similarities and differences in letter and word formation, from the most simple type of gross difference to complex and minute variations.

3 b	b	d	p	q
4 at	to	of	it	at

(Lee and Clark, p. 3, 1962)

APPENDIX C

CALIFORNIA ACHIEVEMENT TEST: READING

Vocabulary

Word Skills: This section contains seven parts. The first part consists of 10 items which test recognition of the objects which words represent. For each item, the examiner reads a short sentence, and the student chooses one picture out of four which illustrates a word in the sentence.

The second part is a 10 item test which measures the student's ability to discriminate sounds and identify beginning letters of words. For each item, the student hears a word and then decides which of four letters stands for the sound that begins the word.

The third part is the same as the preceding test except that it measures the student's ability to identify the letters which end the words read aloud.

The 15 items in the fourth part are designed to test how well a student is able to recognize letters. Each item contains a key letter and a group of four letters. The student chooses the one letter out of the group that is the same as the key letter. Some items have only small letters; others have only capital letters. There are also items which have the key letter as either a capital or a small letter and the following group of letters as the reverse.

The fifth part consists of 10 pairs of words each followed by the letters S and D. In some pairs, the same words are pre-

sented, one in capital letters and the other in small letters. In other pairs, the two words actually differ in spelling and meaning although the visual difference is only slight. For each item, the student blacks out the S if he decides the words are the same word and the D if they are different words.

The next part is composed of 10 items each containing a picture followed by four words which look alike and/or sound similar. The student is asked to decide in each item which word is the correct symbol for the picture.

Twelve items of four words each comprise the last part. For each item, the examiner reads a word, and the student chooses the identical word in written form.

Words in Context: This section contains 15 items each consisting of a stem word in context and a list of four alternative words. The student's task is to choose the alternative that has the best meaning for the boldfaced word in the stem.

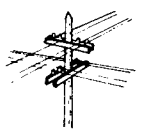
Reading Comprehension

This section presents four brief stories of increasing length and difficulty. Each story is followed by six multiple-choice items designed to measure the student's understanding and evaluation of the written material. (Tiegs and Clark, pp. 8-9, 1970)

Part 1

READING *Vocabulary*
WORD SKILLS *Part 1*

▶ Fill in the space by the picture that shows something the sentence is about.

A    

Response to sentence: "The bird flew to its nest"

Part 2

▶ Black out the letter that **begins** the word read aloud.

A (g) j q z

Response for word: "girl."

Part 3

▶ Black out the letter that **ends** the word read aloud.

A b h k (r)

Response for word: "car."

Part 4

▶ Black out the letter that is the same letter as the first letter on the line.

P q b g (P)

Part 5

▶ If two words in an item are the same word, black out the letter S.
If they are different words, black out the letter D.

A	dog	DOG	S	D
1	pal	lap	S	D

Part 6

▶ Fill in the space under the word that tells what the picture is.

A		bear	beat	bet	deer

Part 7

▶ Fill in the space under the word that you hear.

A	bad	back	bag	bake

Response to dictated word: "bag."

▶ For each item, choose the word with the **best** meaning for the word in darker type. Fill in the space next to the answer you choose.

A **pet** the cat

- feed
- ● pat
- see
- tie

B she was **happy**

- early
- ● glad
- lost
- pretty

Read each of the stories and do the items that follow. Fill in the space next to the answer you choose for each item.

A small boy named Henry lived in the city. He had a pet dog, a kitten, and two birds in his home. Henry liked to play with the dog best.

Henry lived in the

- city
- country
- forest
- mountains

Henry was

- large
- old
- sad
- small

Which animal did the boy like best?

- the bird
- the dog
- the kitten
- the turtle

When Henry takes care of his animals, he is

- busy
- lazy
- sorry
- worried

How many pets did Henry have?

- one
- two
- three
- four

Which of these is the best title for the story?

- "Books"
- "Dogs"
- "Parents"
- "Pets"