Perceptual-motor development and its relationship to academic achievement and/or cognitive development

Rita Haderer

Follow this and additional works at: https://digitalcommons.stritch.edu/etd

Part of the Education Commons

Recommended Citation
https://digitalcommons.stritch.edu/etd/576

This Research Paper is brought to you for free and open access by Stritch Shares. It has been accepted for inclusion in Master's Theses, Capstones, and Projects by an authorized administrator of Stritch Shares. For more information, please contact smbagley@stritch.edu.
PERCEPTUAL-MOTOR DEVELOPMENT AND ITS RELATIONSHIP TO ACADEMIC ACHIEVEMENT AND/OR COGNITIVE DEVELOPMENT

by

Sister Rita Haderer, O. S. F.

A RESEARCH PAPER
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS IN EDUCATION
(EDUCATION OF LEARNING DISABLED CHILDREN)
AT CARDINAL STRITCH COLLEGE
Milwaukee, Wisconsin
1976
This research paper has been approved for the Graduate Committee of Cardinal Stritch College by

[Signature]
(Advisor)

Date: Feb. 3, 1976
ACKNOWLEDGMENTS

This writer wishes to express her indebtedness to the many "special" children whom she has taught in the past years who have enriched this study more than any class, book or experimental study could.

My gratitude, too, to my congregation, the Sisters of St. Francis of Assisi, for their care and support of me during my work in Special Education and to the faculty of Cardinal Stritch College, Special Education Department, for their assistance in planning my course of studies.

Finally grateful appreciation is offered to my sister, Mrs. Janet Dimond, who spent many hours and much care in typing this research paper.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS. .................................. 111

CHAPTER

I. INTRODUCTION ..................................... 1

Definitions
Purpose of Research Study
Background Information
Limitations

II. THEORISTS, THEIR THEORIES AND PROGRAMS ....... 12

   Jean Piaget (Developmental Approach)
   Newell Kephart (Perceptual-Motor Approach)
   Elizabeth Freidus (Servo-Theory Approach)
   Marianne Frostig (Visual-Perception Approach)
   Ray Barsch (Perceptual-Motor Approach)
   Gerald Getman (Perceptual-Motor Approach)
   Carl Delacato (Neurological Organization Approach)

   Other Specialists:
   Bryant Cratty
   Jean Ayres
   Lydia Gerhardt
   Robert Valett

III. REVIEW OF RESEARCH STUDIES FROM 1969
    THROUGH 1974 ..................................... 54

   Studies Utilizing Kindergarten Subjects
   Studies Utilizing First-Grade Subjects
   Studies Utilizing Second-Grade and above Subjects

IV. SUMMARY AND CONCLUSIONS. ......................... 103

SELECTED REFERENCES ............................... 116
LIST OF ILLUSTRATIONS

1. Newell C. Kephart's Stages of Learning. ....................................... 24
2. Fifteen Interrelated Components of Movement Efficiency According to Ray H. Barsch. .............. 38
3. Gerald Getman's Visuomotor Model of Learning. ........ 40
4. Doman-Delacato Neurological Developmental Profile. .. 47
5. Nita Nunn and Charles Jones
   The Learning Pyramid: Potential Through Perception . ........................................ 100
CHAPTER I

INTRODUCTION

Educational specialists have estimated that between fifteen and twenty percent of the children in our school programs in this decade have exhibited learning disorders or disabilities to the extent that the quality of their achievement in school has been reduced either slightly or significantly. Because of the complexity, extent, and ramifications of this problem, a great number of educational specialists, neurologists, psychologists and other professionals have spent a great deal of time, money and effort in investigations. Due to the diversity of their backgrounds and approaches, a variety of ways have been developed to look at and remediate the problem of learning disabilities. Among the approaches is the multisensory system of William Cruickshank and Grace Fernald; the language development systems of Helmer Myklebust, Mildred Mc Ginnis and Barbara Bateman; the phonics system of Samuel Orton and Anna Gillingham; the controversial neurological system of Carl H. Delacato; the visual-perceptual approach of Marianne Frostig; and the perceptual-motor approach of Newell Kephart, Gerald N. Getman and Ray H. Barsch. Among these approaches, the latter one will be studied in this paper.

During the past decade, perceptual-motor programs have
been instituted with increasing frequency by school systems as both remedial services and as essential experiences for all students. Yet, the history of perceptual-motor programs emanates from attempts at alleviating learning disabilities, not at enhancing normal learning rates.

Perceptual-motor, defined, is a term which describes the interaction of the various channels of perception including the visual, auditory, tactual and kinesthetic channels. The process of comparing and collaborating the input data received through the motor system and the input data received through perception is called the perceptual-motor match. The basic concept of the perceptual-motor approach is that there are a sequence of learning stages that each child should attain during his development. These stages are hierarchical, each building on prior learning. As the child grows, he is constantly collecting, saving and processing information about his environment. If a breakdown occurs in one of these stages, later learning will be affected. A child develops from the earliest stage of using only motor movements to obtaining sensory information, through the stage during which perceptual exploration is verified by motor movements, into the stage of dealing with perceptions in groups, and finally to the advanced stage of conceptualization. The learning that takes

---

place at each of the levels is essential to the complete utilization of the next stage. Most educational specialists share this idea of a sequential relationship between perceptual-motor and conceptual acquisition.

Many major developmental theorists, applied developmental psychologists, neurologists and educational specialists assume mastery of lower perceptual motor processes as necessary prior to the development of higher cognitive processes and, hence, scholastic achievement.¹ This theoretical assumption is important because it has shaped both the methodological assumptions guiding research in the field and the clinical-pedagogical efforts of various specialists who attempt to offer remedial or therapeutic programs for children with learning disabilities. A direct implication of this theoretical assumption has been the widespread reliance on fostering, through various means, the lower levels of development or perceptual-motor readiness, as necessary precursors to various functions in school learning. A tremendous amount of time and effort is currently being spent on these remedial programs, all of which are derivatives of this theoretical assumption.

The theoretical foundation for these motor approaches to learning is developmental. Developmentalists such as Brearly and Litchfield, Gesell and Amatruda, Gesell and Ilg,

Hebb, Kephart and Piaget, have put forth the notion that the human organism develops according to a flexible process delayed or accelerated by the organism's experience with his environment. All of these theorists recognize motor activity as changing in its characteristics over the developmental process. Many consider these steps of the child's motor development to be directly related to the child's mental development.

Of importance to educators in the knowledge of what motor factors are related to achievement at different ages and how these factors may change with the developmental process. A great deal of work has been done with visual and perceptual disabilities and the relationship of both of these disabilities to achievement in school. Most of the remediation programs include components dealing with visual or perceptual abilities. Little has been done in the way of research to examine the motor characteristics of development alone as it relates to achievement in school or to any change in the structure of motor abilities in the developmental process. Most of the research in these areas now appears to join the perceptual approach to the motor approach and call it the perceptual-motor approach. Researchers then study the relationship of both of these factors joined and how together they change with the developmental process. When one views perception as the receiving of information by an organism from the environment

---

through the senses and a motoric response as an active movement by an organism as a result of a stimulus, one understands why these two factors have become joined. Some researchers feel that the perceptual and motoric components are so interdependent, one upon the other, that they are inseparable. Through combined motor and perceptual exploration, the two are matched so that perceptual information and motor information come to mean the same thing.

It was the purpose of this paper to study perceptual-motor development, and by so doing, to define more thoroughly the perceptual-motor relationship to academic achievement and/or cognitive learning.

Since the end of World War II, there has been a marked interest in this country, in Europe, and in other parts of the world, in the placement of physical activities within the total educational program for both normal and atypical children. Much of this interest has led to speculations that various kinds of movement experiences will exert a positive change upon various social, emotional, perceptual, and intellectual abilities.

Careful scrutiny of the literature discloses that various attempts have been made to pair physical activity with intellectual endeavors. In antiquity, the Greek mind-body idealism was manifested in art as well as in literature. Greek statues were marked by intelligent, keen-eyed faces atop a well-muscled torso. Plato has said that when teaching young children, one should train them by a kind of game and then one will be able to see more clearly the natural bend of each.
The humanists of later centuries also incorporated movement activities within the educational programs they espoused. The French writer Fénelon, who died in 1715, observed that some children could learn to read while playing. The close association between the child's mind and body espoused by Rousseau, Froebel, and others in later years is well known to students in educational philosophy.

Relationships between intellectual and physical functions were also explored by the first experimental psychologists in England, the United States, and Germany toward the latter part of the 1800's. Since some of the first psychological experiments by Wilhelm Wundt in Leipzig involved tests of simple sensory-motor functioning, tests of reaction time, visual following, and the accuracy of the "muscle sense", it seemed logical to some of his colleagues, as well as to J. McKeen Cattel in America and Sir Francis Galton in England, to determine whether these basic measures were in some way predictive of so-called "higher intellectual functions". They were aided in their search by Karl Pearson and others who began to develop and refine basic statistical tools. Observing the obvious motor incoordination in many retarded children, these early experimental psychologists sought to determine whether basic motor and sensory measures could predict the degree of academic and cognitive abilities possessed by individuals at several points along the scale of intelligence. Children with subnormal, average, or superior intelligence were found to reflect a wide variety of basic movement attributes when exposed to
Towards the turn of the century, Alfred Binet introduced the concept of mental levels. He used a battery of tests that sampled vocabulary, verbal comprehension, problem solving abilities, and quantitative operations to discriminate between intellectual functioning of children at various ages. During the same years, several educators persisted in the belief that placing the child in action would have educational advantages. Standardized IQ tests were expanded to include "performance" items, which were intended to tap certain perceptual and motor qualities. Educational strategies incorporating basic sensory and motor experiences were explored by such pioneers as Itard and Sequin from France and then by Maria Montessori in Rome during the first part of the twentieth century. Writings of Strauss and Lehitten shortly after World War II brought forth another burst of interest in the motor components of the human personality. These clinicians highlighted the fact that there are a considerable number of children competing within regular school classrooms who are less than adequate perceptually, often hyperactive, and in many cases evidenced motor coordination problems. During the years immediately following, some educators advocated a number of programs of motor activities which purportedly had effect

upon a child's total educational efforts.¹

From the late 1950's until the present, descriptions of these movement programs have been the subject of a great many books and journals and have attracted the attention of large numbers of parents and educators both in the United States and abroad. In general, these more recent theories relating movement to intellectual endeavors may be classified according to the nature of their theoretical underpinnings within the following four categories: (1) perceptual-motor approach, (2) neurological organization, (3) dynamic approach and (4) cognitive models.²

The perceptual-motor approach notes the manner in which infants seem to explore their world in direct ways. Those who espouse this approach have suggested that perceptual activities are imperative for the development of perceptual abilities, and the latter are the basic supports of all learning, including academic tasks requiring a higher level of intellectual functioning. Their programs advocate the extensive use of movement activities, sometimes paired with visual exploration, which will purportedly heighten the child's perceptual awareness of his world and lead to more successful functioning in a variety of endeavors. The cognitive model suggests that to enhance intellectual functions and academic operations through movement experiences, one must pair, in precise ways, the movement activities with the intellectual

¹Ibid., pp. 4-5.
²Ibid., p. 5.
qualities one hopes to change.¹

Theoreticians and researchers in learning disabilities traditionally have tended to highlight the significance of perceptual and perceptual-motor development in maldeveloped children. In fact, problems of a perceptual-motor nature have come to achieve priority among workers within the domain of learning disabilities. Dominance of the literature by perceptual-motor theorists does not indicate concern for perceptual disability per se. They are mostly concerned about the deleterious effects of such impairments upon children's learning and academic achievement. One hypothesis almost universally shared by members of the perceptual-motor school is that adequate conceptual development is dependent upon accurate perception. Concepts built upon inaccurate perceptions are bound to be inaccurate as well. Strauss and Werner laid the foundation of perceptual development in later cognitive growth, particularly Werner, who was fascinated by the relationship between perceptual and conceptual development in children. Both Strauss and Werner developed a course of child development in which early perceptual-motor activities were considered crucial to conceptual development. Werner hypothesized that the young child's thought was constructed on the basis of sensory-motor factors.²

¹Ibid., p. 6.

Perceptual-motor orientated theorists in learning disabilities find that the formulations of contemporary developmental theorists are replete with support for their views on the relationship between perception and conception. Perhaps the foremost developmental theorists, at least in terms of popularity, who addressed himself specifically to the issue of perceptual and cognitive development is Jean Piaget. Believing as does Kephart, that visual-perceptual development follows and is subordinated to haptic or tactual-kinesthetic perception, Piaget said that the child perceives objects in terms of actions that can be performed upon them. This led Piaget to the hypothesis that the origins of classifications and seriations are to be found in sensorimotor schemata as a whole. It is apparent that Piaget considered perceptual, and especially perceptual-motor development essential to concept development. Using Piaget's logic, a disability in perceptual-motor skills would result in cognitive problems. This view is consistent with that of Kephart, Getman, Barsch, Freidus, Frostig, Delacato and others. Because of their educational orientation, theorists in learning disabilities have naturally moved to their concern about the relatedness of perception to cognition factors and academic achievement in general.¹

Barsch, Frostig, Getman and Kephart have gained widespread popularity and acceptance on the educational scene as evidenced by their success on the educational materials market.

¹Ibid., p. 161.
Controlled experimental investigations of their materials and their effectiveness to enhance academic learning has lagged behind the clinicians by a number of years. Only in the past decade have there been attempts to use well-defined research strategies in order to determine the efficacy of perceptual-motor training. This paper presents, in chapter four, the results of such research studies done over a five-year time span, 1969 through 1974.
CHAPTER II

PERCEPTUAL-MOTOR THEORISTS,
THEIR THEORIES AND PROGRAMS

Our present concern for sensory-motor or perceptual-motor development is derived from a rich background of educational and experimental literature including contributions from Itard, Sequin, Montessori, and the writings of Strauss and Lehtinen shortly after World War II. The concern for motor development is a recurring theme throughout the history of special education. In this chapter, schools of theory representative of current sensory-motor or perceptual-motor approaches will be presented as they propose to influence cognitive development. Although each school of thought could cover an entire book in itself, the intent of this researcher is to present only the very basic theories of each and the remedial programs that they propose. Hopefully, this will enable the reader to better understand the third chapter which is a review of research studies which study and test the validity and reliability of the theories and programs themselves.

Theorists who are to be presented include Jean Piaget, a developmental theorist, the perceptual-motor theory of Newell Kephart, the model of learning of Elizabeth Freidus,
the perceptual approach to learning of Marianne Frostig, the moviegenic theory of Ray Barsch, the visuomotor theory of Gerald Getman and the patterning theory of neurological organization of G. Doman and Carl Delacato. The ideas proposed by educational specialists such as Bryant Cratty, Jean Ayres, Lydia Gerhardt, and Robert Valett will also be briefly presented in this chapter. These are not the only professionals who promote the area of perceptual-motor in learning disabilities but they are the most well-known ones and serve as a vehicle for discussion of the research in this area. Each of these men and women appears to arrive at his or her particular view through different routes. Similarities as well as differences are noted among their approaches.

Jean Piaget is perhaps the foremost developmental theorist who addressed himself specifically to the issue of perceptual-motor, perceptual and cognitive development. He regards intelligence as a specific instance of adaptive behavior, of coping with the environment and organizing and reorganizing thought and action. He has tried to show that the ability to use thought and action to adapt to the world goes through several stages of development. The first stage, the reflex or hereditary stage, is possessed by the infant at birth. Mental life is limited to the exercise of reflex apparatuses, of hereditarily determined sensory and motor combinations that correspond to instinctual needs such as nutrition. These reflexes manifest genuine activity. Gradually, they become refined and will play a role in sub-
sequent psychological development. The second stage consists of the first motor habits and of the first organized percepts as well as the first differentiated emotions. The previous reflexes give rise to a kind of generalized activity. The infant is not content to suck only when he nurses, he sucks at random. Systematic thumb-sucking belongs at this stage as does turning the head in the direction of a sound and following a moving object. Soon the child begins to recognize certain persons as distinct from others. Between three and six months, the infant grasps what he sees. This capacity for prehension and then for manipulation broadens his potentiality for acquiring new habits. The third stage is the stage of sensorimotor or practical intelligence. New motor systems and new perceptual organizations emerge. Intelligence appears well before language. It is an entirely practical intelligence based upon the manipulation of objects. In place of words and concepts, the child uses percepts and movement organized into action schemata. The acts of intelligence are constructed first of all as early behavior becomes increasingly elaborated and differentiated to the point where the infant acquires sufficient behavioral facility for him to notice the results of his actions. His next behaviors become capable of coordinating with one another. Four fundamental processes characterize the intellectual revolution. These are the construction of the categories of the object, of space, of causality, and of time. All four refer to pure practical or action categories and as yet not to ideas or
thinking. The fourth stage is the stage of intuitive intelligence or the pre-operational level. At this time the child is between the ages of approximately two to seven years old. With the appearance of language, behavior is profoundly modified intellectually. It allows the child verbal exchange and continuous communication among individuals. Intelligence is transformed from simple sensorimotor or practical intelligence to thought itself. It allows the child to reconstitute the past and to anticipate the future. Actions are replaced by words. This, then, is the point of departure for thought. Practically every form of psychological activity is initially enacted in play. Cognitive activity initiates play and play, in turn, reinforces cognitive activity. Among these children, we see symbolic play, imaginative play and imitative play. The child of this age is unable to verbalize his thoughts. His real domain is still that of action and manipulation. The fifth stage is the stage of concrete intellectual operations. The child is now from seven to twelve years of age. This stage marks a decisive turning point in mental development. New forms of organizations appear. At the age of seven, the child becomes capable of cooperation with others. He becomes able to make generalizations and deductions from actual experience. Integrated systems form. Advances in level of thinking progress to causality, concepts of conservation, mastery of time, rate, and space. Concepts are general schemata of thought rather than schemata of action or intuition. Rational operations appear. These are the actions which are
the starting point for operations and are thus rooted in the sensorimotor schemata. Before becoming operational, they constitute the substance of sensorimotor intelligence, then of intuition. Intuitions become transformed into operations as soon as they constitute groupings which are both composable and reversible. Classifications now develop. The sixth and final stage is the stage of abstract intellectual operations. The young adult is now able to construct systems and theories. He is interested in theoretical problems not related to everyday realities. This ability developed in a continuous fashion from the concrete thinking of early childhood. The turning point occurs at the age of twelve after which there is rapid progress in the direction of free reflection which is no longer attached to external reality. The child now becomes able to reason and to deal with formal logical operations.¹

Dr. Newell C. Kephart, an educator, psychologist, and author who has been long active in the field of special education and Director of the Glen Haven Achievement Center for children, believes firmly in the perceptual-motor approach to learning. Like Jean Piaget, Kephart has established general stages of learning that are recognized by authorities. He believes that the order in which the stages occur to be more important than when each one occurs. They are hierarchial, building upon themselves in a related series. He does recognize that there is some overlapping of the stages. He believes

that perceptual-motor learning is incomplete if the child's gross-motor learning has been distorted. Likewise, conceptual learning is hindered if areas of gross-motor and perceptual-motor learning has been omitted.¹

He states, "The major learning problem for the human organism is to come to some kind of acceptable terms with his environment."² Learning then takes place in terms of a number of encounters between the organism and the environment. Modifications of responses occur and are stored systematically within the organism in conjunction with the information available from the encounters. As a result of numerous such experiences, a correlated body of structured information is developed. Such environmental encounters begin very simply and increase in complexity as the child grows and develops.

The stages of learning as presented by Kephart are:

1. The Motor Stage. This stage begins with the child's initial encounters with the universe. The child moves and encounters his environment. These encounters are random and haphazard. Primarily, the child is concerned with his own movements and the nature and extent of this movement. The results of the movement are secondary. During this initial stage, the child learns the parts of his body, what responses

¹Marylou Ebersole, Newell C. Kephart and James B. Ebersole, Steps to Achievement for the Slow Learner (Columbus, Ohio: Charles E. Merrill Publishing Co., 1968), p. 65.

they make and how to produce movement responses. Basically, in this stage, the child is learning how to experience his environment.

(2) Motor-Perceptual Stage. During the initial stage, the child acquired a body of information. This information resulted from his motor experiences and subsequent contacts with his environment. As the development proceeded, the body of information was elaborated and expanded. It became increasingly systematized and coordinated. Beginning slightly later than the initial stage of development but running along with it was a second factor. Perceptual information was being received by the organism. Patterns of energy emanating from the environment were impinging upon the external sense organs. These external sense organs, in turn, discharged over the sensory nerves patterns of neurological impulses which were conveyed on the central nervous system. The child could not use, alter, or modify a response. Actually, he couldn't use it. It soon was apparent that certain motor responses which he had previously learned were closely associated with certain perceptual patterns or with alterations in perceptual patterns. Since the body of motor information was already beginning to be systematized, those closely correlated perceptual data could be put together according to the same system and thereby become meaningful to the organism. The child began the long process of matching perceptual data to motor data. In order for such matching to occur, data on both sides of the match must be relatively consistent. As
long as either motor data, on the one hand, or perceptual data, on the other, are obtained in a random or haphazard fashion, there is not sufficient control to permit a satisfactory match to be accomplished. All external sense organs involve a voluntary component which permits us to direct them towards the source of information, thereby, maximizing the amount of pertinent information received and minimizing the amount of non-pertinent information. The sense organ which presents probably the most extensive degree of voluntary control is the eye. The eye moves in an extensive arc within its socket. As the eye moves, one object after another in the outside environment occupies the central place in the visual field and the portion of the field which maximum information is delivered. Through voluntary control, one can impose consistency on the visual information received by the organism. It can be determined what will be seen by determining the direction of our eye. Such control is learned. Because the child cannot use information to monitor vision, the eye is out of control and therefore delivers random or haphazard information. Because the eye is out of control, a systematized body of perceptual information is impossible. Without such a systematized body of information, the eye cannot be controlled. The child first learns to control his eye by using some other function which is already under control, a stabilizer or governor. The most common function is the hand. The child now moves the hand and teaches the eye to follow this movement. He keeps the hand in the center of his visual field at all times. Thus, eye-hand
coordination develops first. The hand leads the eye and provides the control for the perceptual-motor exploration. Perceptual information is matched to the previously developed motor information. Motor information is the controlling factor. Perceptual information is manipulated against these motor data until consistency between the two sources of information is received. The eye begins to give the same information as the hand.

(3) Perceptual-Motor Stage. In this stage, Kephart explains that the perceptual exploration is more efficient than motor exploration. The eye gives a much greater quantity of information per unit of time than the hand does. The child, therefore, begins to depend more and more upon perceptual explorations. Because of the motor-perceptual learning that took place, the eye is now under control and can give systematic information about objects. At this stage, the primary information is perceptual. Motor information is used only to confirm. The eye now leads the hand.

(4) The Perceptual Stage. In the fourth stage, perceptions are manipulated against each other. The perceptions of one object is compared to another object. Similarities and differences are noted and relationships between objects are deduced. Such manipulation of perceptual against perception is quicker and more efficient than the perceptual-motor investigation. The child begins to deal with perceptions in groups. He identifies characteristics of objects through perception and manipulates these characteristics to elaborate an extensive
systematized body of information. He learns to predict happenings. The relationships between perceptions exist independently of the response of the organism. He can now skip the perceptual-motor match. He builds up a complex fund of perceptual information. The child is living in two worlds: a perceptual world in which he sees, hears, tastes, smells, etc. and a motor world in which he behaves and responds. In each world, he has a massive body of information which is relatively well structured. The two bodies of information are not matched though. The child cannot use his perceptual activity to guide or influence his behavior or responses.

(5) Perceptual-Conceptual Stage. As perceptions are compared with each other, certain similarities appear. These similarities can be collected together and integrated into a new whole. The initial concepts formed by the child are the result of these abstracted similarities among perceptions. Out of a myriad of perceptions, he identifies common elements. These elements are brought together and integrated into a new whole. In the concept, no actual elements of perception are present. The concept is an abstraction which is composed of relationships between perceptions. The concept is thus a true abstraction but one which developed out of a large number of perceptions. Thus, the perceptions give rise to the sixth stage.

(6) The Conceptual Stage. In this stage, the child manipulates one concept against another. He observes the relationships between concepts as he previously observed the
relationships between percepts. He is able to manipulate large clusters of information against each other with ease and therefore, include many more data to the solution of his problems. The concept involves both immediate perceptual information and past information as well. All such information, both past and present, is integrated and systematized. It is only in so far as such information is achieved that abstractions can emerge. Information becomes schematized and is dealt with systematically. Not only is past perceptual information applied in a concept but due to the feedback mechanism, past response information is also implied. Information not pertinent is eliminated. In the solution of any problem, large quantities of information can be handled quickly and with a minimum of effort. Beginning with the perceptual stage of development, language is an important function. Through the symbolic function of language, a single sign, the word, is attached to the conceptual abstraction. These signs can be manipulated more readily than the abstractions themselves. The manipulation of the sign yields the same results as the manipulation of the perception. Words are assigned to concepts to serve as symbols representing the abstraction underlying the concepts. These symbols can be manipulated as the abstractions themselves with the same results. Along this vein of thought, it might be well to note that if the manipulation of language symbols are to be efficient, the abstractions underlying the symbols must be clear-cut and well formed. The importance of the perceptual-
motor and perceptual-conceptual stages is obvious. The child may achieve the conceptual level without adequate grounding in the perceptual-conceptual level. Then the child develops concepts which he manipulates against each other but without reference to the behavior of the organism. This child may become highly verbal. He probably will be able to read or listen to information. He is able to manipulate symbols involved in this information against each other readily and extensively. He cannot, though, translate the results of this symbolic manipulation into behavior or response.

(7) Conceptual-Perceptual Stage. The seventh and final stage of learning presented by Kephart is the conceptual-perceptual stage. As the child develops an increasing number of concepts, he comes to depend more and more extensively on conceptual manipulations of information. He uses perception less and less as a primary source of information and more and more as a confirming function. Conception here takes over and controls the perceptions. In this stage, the concept has the leading role and perceptions are fit into conceptual relations. Perceptions which are incomplete and meager will be distorted or altered to fit the demands of the concepts. In other words, the perceptual information is deleted, augmented, or altered to fit the concept.

Kephart believes that normally a child proceeds through these developmental stages in the order given, solidifying the

---

1Ibid., pp. 19-34.
ILLUSTRATION 1 - Newell Kephart's Stages of Learning

activities and generalizations appropriate to each stage before moving to the next. Sometimes an interference with learning occurs that makes it extremely difficult for the child to achieve at a particular stage. Growth, though, doesn't stop to take account of the learning problem. The child finds himself pressured to perform at the next higher stage of development even though the present stage has not been completed. He finds it necessary to act or behave as though he had progressed to the next stage. Kephart says that since the learnings at each stage are essential to and assumed in the learning of previous stages, confusion develops and difficulties arise that are compounded as time goes on. The child may have difficulty establishing form perceptions, figure-ground relationships will be weak and inconsistent, and the relationships between elements in a form will not be apparent to him. As a result, the child will deal with details of form rather than the form as a whole. When children manifest problems in learning, it is necessary to determine the point in the developmental sequence where his achievement was broken down. This point of failure will be manifested either by increasing confusion in performance or by a lack of integration of subsequent learnings with previous learnings.

Treatment procedures suggested by Kephart are derived through the administration of the Perceptual Motor Rating Scale (Kephart, 1960) which emphasizes the assessment of sensorimotor learning, ocular control and form perception. Part III of his manual for classroom teachers is devoted to
training activities and is divided into four major sections. The first section involves chalkboard training which is visual in nature and begins with random scribbling, progressing through directional exercises, crossing the midline, orientation exercises of copying forms, reproducing from memory and various reproductions with respect to size, speed and direction. Throughout these activities, the child is taught to attach verbal symbols to productions. Sensory-motor training is the second major section. Emphasis is first placed upon the development of balance but progresses through the development of body image. Bilaterality and unilaterality are also stressed. Training equipment and activities include the walking board, balance board, trampolines, games such as "angels-in-the-snow", scribbling, fingerpainting, midline crossing exercises, dot-to-dot drawing and bilateral and unilateral exercises. Ocular training is the third section of the manual devoted to training exercises. The remedial technique here is devoted to activities in the area of the control of the eyes. Ocular control is developed in a sequential fashion through the use of monocular training, rotary pursuits and ball activities. The fourth and final section is form perception training. The child with poor construction form perception does exercises utilizing chalkboard activities, puzzles, matchstick figures and pegboard designs.1

In 1966, Kephart and Roach developed the Purdue

Perceptual-Motor Survey which helps locate perceptual-motor problems.

The analysis of learning disabilities and the attendant remediation proposed by Elizabeth Freidus are dependent upon the utilization of the servo-theory. She has drawn upon the ideas of Kephart, Strauss, Lehtinen, Piaget and Bruner for her conclusions. Freidus sees information being received and compared with other information already stored, the rise of a response pattern, the response proper, and the feedback of part of the response to the input side of the model so that the process is self-correcting. Her model is comprised of seven stages. In the first stage, information is received through the senses. Deficits in visual or auditory acuity have far reaching consequences in terms of learning. Second, sensory information is attended to by the individual. Freidus' concern is whether the child listens, looks, is aware of sensory information, and is constantly and efficiently attentive. She is concerned whether the child can shift his focus, separate stimuli from its background and analyze a form and distinguish it as a whole. Third, the sensory information received is associated with other information previously received, stored and invested with meaning. Can the child do this utilizing auditory and visual channels? Can he comprehend it? If he is unable to store and retrieve information, a significant difficulty in comprehension will result. Fourth, an appropriate response pattern is organized. One may find the child has the sensory acuity to hear, that he has listened,
and that he has understood the sensory signal but that he is not able to organize and sequence a response pattern appropriate to the data obtained. Response organization is learned by the child initially during the early motor learning stage of development and continues through the stages of speech and language development. Freidus, because she is developmentalistic in outlook and orientation, feels that the earlier stages of development must be adequately and fully completed if the child is to succeed at later levels. She says that children need knowledge about themselves and their relation to the physical environment. They need adequate experiences, awareness, and integration of experiences. Fifth, the response pattern is effected and the overt response occurs. Once the response pattern has been organized, the child is ready to produce an overt response in the form of a motor act, speech production, or in writing. Sixth, the overt response is monitored for quality and correctness. Once a motor act has been learned, it is not monitored, but instead, becomes a habit chain, an automatic process. Children, when they are learning, must consciously monitor their responses. Once the act is learned or overlearned, the response becomes automatic and is no longer monitored. Thus, seventh, the results of the monitoring function are stored to aid in future association.¹

Freidus' concern is with the stage within the learning process at which the child has difficulties. In analyzing learning disorders she says one should try to determine where the model broke down.

Marianne Frostig has developed a visual-perception approach to learning. She, too, feels that movement skills contribute to the total emotional, intellectual and social development of the growing child.

A child's physical fitness and the quality of his movements influence all of his psychological abilities: His ability to communicate, to perceive, and to solve problems - the way he feels and interacts with others.¹

Frostig believed that certain abilities develop in a definite sequence and this sequence is fixed. She delineated four phases to this sequence and felt it was important for parents and teachers to know these phases when certain abilities should develop so that they are able to choose the most appropriate curriculum and teaching methods.

The first phase she called the sensory-motor phase and said it occurred before eighteen to twenty-four months. She pointed out that four distinct skills are learned in this phase. The infant recognizes features of his environment. He becomes aware of being distinct from his environment. He learns to change body position and move in space and finally, he learns to grasp, hold, release and manipulate objects at will. Mastery of these four sensory-motor skills constitutes

the child's first step toward independence, ability to adjust to the demands of the environment and toward future learning. Sensory-motor abilities, Frostig believes were an important aspect of education. She felt that all children needed training in sensory-motor functions. The second significant phase lasts until the ages of three or four years and is known as the phase of language development. She says that movement education promotes language development in the normal child as well as in the child with learning disabilities, the culturally deprived, the child with specific language deficiencies and the neurologically handicapped child. The third phase of learning is perception. Frostig believed that the maximum development of perceptual abilities takes place between the ages of approximately three and one-half to seven years old. The child tries to understand the world around him. The child's experiences have accumulated during the past so that much of what he hears and sees can be perceived immediately by an unconscious comparison with the memories of past experiences with the pictures he has stored in his mind. Thus he now understands the world around him mainly with the help of his distance receptors (eyes, ears) and he no longer needs to touch, handle, taste, or smell to recognize objects. The final phase is the phase of higher cognitive functions. The physical manipulation by the infant, the later explorations through listening and looking are followed by explorations of the environment through thought.¹

¹Ibid., pp. 23-26.
Frostig was a confirmed believer in movement education. "Movement education can beneficially affect academic learning directly and indirectly."¹ Directly, games and techniques employing whole-body movements can be used to teach mathematics, reading and other academic subjects. Physical movement is particularly helpful for teaching academic skills involving perception and spatial relationships. Indirectly, motor efficiency affects the total ability to learn by influencing the self image, by promoting basic abilities, such as memory, perceptual skills, concentration, orientation in time and space, associative processes, and the ability to solve problems.

Marianne Frostig developed the Developmental Test of Visual Perception which can be used as a screening device for nursery school, kindergarten and first grade children or as a clinical evaluative instrument for older children who have learning difficulties. The test screens these areas: (1) eye motor coordination, (2) figure ground, (3) form constancy, (4) positions in space and (5) spatial relations.²

While the Frostig's test contributed to the diagnosis of the child's perceptual assets and disabilities, the Frostig-Horne (1964) materials provided a structured developmental program aimed at remediation of the specific areas of perceptual weakness discovered on the test. The materials are recommended

¹Ibid., p. 92.
by Frostig for use with children in kindergarten and first-grade as preparation for reading and other more complex visual activities as well as for use with children who have problems in perception. Modifications are included in the manual for most types of exceptional children. The program may be used remedially as well as developmentally.

Not only does the program provide training in each of the five areas of visual perception measured by her test, but it also suggests techniques for developing gross and fine muscle coordination, training eye movements, and enhancing body image and concepts, skills which are basic to adequate perceptual functioning.¹

Ray Barsch, known for his theory of moviegenics, has written,

Man considered not merely as an organized being but as a rational agent and as a member of society is perhaps the most wonderfully contrived and to us the most interesting specimen of Divine wisdom that we have knowledge of.²

Further on Barsch writes,

The concept of explorations into outer space by manned space vehicles capable of rendezvous, landing on other planets and advancing man's knowledge of the universe has passed from the pages of science fiction to science reality in the short span of little more than a decade. The imagination of an entire world has been captivated by the exploits of the astronauts and


cosmonauts. Another frontier of ignorance is giving way to man's irrepressible desire to know his universe and understand his relationships to it. Historians have already christened this era in mankind's time as the Age of Space and every school child has incorporated a wide assortment of 'space' terms into his everyday vocabulary.

Space exploration is a miracle of modern science. Remarkable as these astronautic adventures may be, they are surpassed by the daily miracle of the newborn infant's conquest of terrestrial space. With all the collective genius of men combined to achieve the necessary technological advances necessary to explore outer space and claim it's conquest, the world of inner space has always been his domain. Actually, every infant born can be considered a terranaut automatically receiving such a commission as a human birthright. His exploits in space rival those of the astronauts in complexity. In his explorations of terrestrial space, each child will conquer the spatial mysteries of climbing stairs, running uphill, pedaling a bicycle, batting a ball, skating on blades or wheels, writing his name, drawing a form, and will resolve other spatial dilemmas. Each child leads an extremely busy exploratory existence. He moves to objects, transports objects from one place to another, experiments with height, depth, and width. He moves constantly to acquire information. Each child is a space pioneer. Through experience, he learns Newton's Law of Motion. The thrill experienced by the child when he achieves independent walking

\[1\] Ibid., p. 17.
across space must be as exhilarating to him as a walk in space is to the astronaut. "The whole world stretches before him to be discovered bit by bit in increasing complexity."1

Man has always been a space-orientated being. He is exquisitely designed to move in order that he might act, that is, explore space. He moves in space according to the directions of his intelligence and thus directed moves from a state of ignorance to a state of knowledge about his universe. Barsch states that three major terrains of space must be traveled by every individual: (1) the primary terrain which begins at infancy. (2) The academic space terrain bounded by the markers of elementary, secondary and collegiate schooling in preparation for his lengthy journey on the terrain of (3) adulthood.2

Movigenics, is a theory of movement developed by Barsch, as it relates to learning. The name resulted from a combination of two Latin words, movere, to move and genesis, origins and development. Barsch writes,

The fundamental proposition of Movigenics is that a penetrating analysis of movement at both the physical and cognitive levels, treating learning as a movement phenomenon, will provide a meaningful model for involving and enhancing the learning of all performers.3

1Ibid., p. 18.
2Ibid., pp. 19-30.
Ten constructs of human behavior are delineated which are intended to establish the foundation stones upon which a curriculum can be erected. Construct one is the fundamental principle underlying the design of the human organism toward movement efficiency. Construct two, the primary objective of movement efficiency, is to economically promote the survival of the organism. Construct three, movement efficiency, is derived from the information the organism is able to process from an energy surrounding it. The child seeks out significant information. It searches, scans and selects. Construct four, the human mechanism for transducing energy forms into information is the percepto-cognitive system. The six senses are responsible for this as systems of sensitivity. They are avenues of access for information. Each sense contains some form of receiving surface, a mechanism for transmitting the arrival of appropriate headquarters within the cortex. Man's movements are directed by his perceptions. By design, the six channels of the percepto-cognitive system were intended to be fully operative in man toward his use in gaining the necessary information to efficiently promote his survival in an energy surround. Construct five is the terrain of movement or space. Space is filled with energy forms, masses called objects or bodies, and a dynamic organism called man. Since man must move in space, we can refer to space as the terrain on which man must evolve his survival strategies and develop his movement efficiency. Construct six, the developmental momentum provides a constant forward thrust.
toward maturity and demands an equilibrium to maintain direction. Man is compelled to move forward. He designated this a developmental momentum or a powerful thrusting force projected along a line from simplicity to complexity. In construct seven, movement efficiency is developed in a climate of stress. Man lives in a climate of stress. Each moment of his life, some stimulus is testing his yield tolerance. He must yield to some forces and resist others. His tolerance level for stress must be equal to the demands placed upon him. Each individual has a tolerance threshold for stress that varies according to the type of demand which confronts him. Construct eight, the adequacy of the feedback system is critical in the development of movement efficiency. Every individual has a feedback system. For some, the informational exchange requires a high degree of efficiency and they are able to maintain a directional course towards performance proficiency. For others, the feedback system is less efficient and the reduction of performance errors is difficult to achieve. All learners err. More efficient learners improve after early errors. Construct nine says the development of movement efficiency occurs in segments of sequential expansion. Development proceeds in an orderly sequential progression. The design of the hierarchy brings man to cognition, memory, invention, creativity, synthesis and the full utilization of intelligence. Development is continuous and temporarily synchronized. The timetable was set by the Original Designer. Development has a rhythm and a sequence. Each new stage or level of advancement is founded on a previous step. All
developmental change increases the child's equipment for dealing efficiently with movement demands. Barsch's final construct, construct ten, states that movement efficiency is symbolically communicated through the visual-spatial phenomenon called language. Man can economically represent his experience to himself and others by employing symbols. A symbol is a form used by man to "stand for", to "stand in place of" or to represent an experience, event, circumstance, or happening. Its employment is governed by the principle of economy. Only as the child's world expands, does the task of accounting for himself, and all things around him, require the use of symbols. The child is not required to invent his own symbol system. He learns it by imitation from others. He learns the labels for experiences, motion, and existence. His language develops as man develops. As man moves to act, he symbolizes his actions to economically record his experiences. His language reflects his efficiency in movement. Symbolic fluency thus becomes the ultimate criterion of movement efficiency. It is the final synthesizer of the previous nine constructs of moviogenics.\(^1\)

A twelve dimensional curriculum called, *A Movigenetic Curriculum*, was devised by Barsch. This curriculum was sponsored by the Wisconsin State Department of Public Instruction. No provision is made in the curriculum for differential treatment of individual children. The program assumes that each child will receive instruction in each dimension and that no

\(^1\)Barsch, *Achieving Perceptual-Motor Efficiency*, pp. 35-64.
ILLUSTRATION 2:

Fifteen Interrelated Components of Movement Efficiency
According to Ray H. Barsch

other program will be included. The twelve dimensions presented are: Dimension I, Muscular Strength; Dimension II, Dynamic Balance; Dimension III, Spatial Awareness; Dimension IV, Body Awareness; Dimension V, Visual Dynamics; Dimension VI, Auditory Dynamics; Dimension VII, Kinesthesia; Dimension VIII, Tactual Dynamics; Dimension IX, Bilaterality; Dimension X, Rhythm; Dimension XI, Flexibility; and Dimension XII, Motor Planning.¹

A model of the development of the motor system and its interaction with learning has been devised by Getman (1965). It has become known as the visuomotor theory. Because Getman is an optometrist, the approach reflects his prime interest in the development of vision, which is equated in this model to perception.

The visuomotor model of Getman attempts to illustrate the developmental sequences of a child's performance in acquiring motor and perceptual skills. The model is designed to illustrate the dependence of each successive stage of development upon an earlier level. Each level or row is composed of a number of separate activities. The rows or levels as seen on the illustration of the learning diagram in his model are described below.

Row A are the innate response systems. The responses in this system are unlearned and reasonably intact and operable at birth. As noted on the diagram, they include tonic

neck reflex, startle reflex, light reflex, grasp reflex, reciprocal reflex, stato-kinetic reflex, and mystatic reflex. Row B is the general motor system of locomotion or mobility skills. Skills involved are creeping, walking, running, jumping, skipping, and hopping. Row C is the special motor system. Skills of this system are more selective and elaborate combinations of motor skills such as eye-hand relationships, combinations of two hands working together, hand foot relationships, voice and gesture relationships. Row D is ocular motor systems. The movement of eyes must be developed and controlled in a special manner for success in classroom tasks. The skills involved are fixation, the ability to visually locate a target; saccadics, the visual movement from one target to another; pursuits, the ability to have both eyes follow a moving target; and rotation, free movement of both eyes in any and all directions. Row E explains the speech-motor system and refers to speech. Areas covered are the motor and auditory integration system of babbling, imitative speech and original speech. Row F is the visualization system. It refers to the ability to recall or remember not only what has been previously seen by the eye, but also what has been heard, touched or felt; immediate whereby we can see as we feel, post-future whereby we can review an event that happened yesterday or a previous event which will occur tomorrow. Row G is vision or perception and is dependent upon the result of intact and complete learning in the supporting developmental levels. $P_1$ is a single perceptual event. $P_2$ is another perceptual event reached through a
comparable pyramid of experiences. The final row, Row H, is cognition and is reached through the process of integrating many perceptions. The three higher levels seen on the diagram above cognition represent the higher symbolic and more abstract mental processes leading to intellectual development. Line X, before Row H, is used to differentiate the process by means of which children treat the information that comes to them through their receptors. The successful receipt and manipulation of highly abstract and symbolic information input would indicate the child treating the information in a psychophysiological manner. We can also use the dotted line between the erect and inverted pyramids to denote that the child's process of concrete and realistic information that comes from the world about him cannot be accomplished in a physiopsychological manner. As explained earlier, Row H is the cognitive act which is in reality the acquisition of new knowledge. The two A's above are analogs and abstractions. The information is transformed to suit new tasks and decisions. These transformations then present opportunities for elaborations upon the informational input by utilizing the process of imagination, creativity and expression. These in turn, with their interrelationships and reciprocities, contribute to intellectual development. ¹

Getman intended that the pyramid shape would indicate

that a solid base of learning is required at each level before the next level could be added with security. Each level of motor learning is more precise and exacting than the preceding level. Getman believes that many learning programs being utilized today approach the child as if he had successfully achieved the motor and perceptual levels and was moving toward the cognitive levels. Such programs may not succeed if the foundation is not solidly built, because cognitive learning will then be insecure and shaky. The implications then are that many children need more experience in the base level of motor development.

It is this author's deep and sincere conviction that the models presented here may well give us the guidelines for the enrichment programs and the mind-body training that will assist us to guide children toward their maximum growth.¹

Getman has developed a training program that follows his visuomotor model of learning. His original training program has been revised and arranged into a more formal, structured format twice. The first program was titled, The Physiology of Readiness: An Action Program for the Development of Perception for Children (1964).² This program, revised, is now called Developing Learning Readiness (1968).³ The foundation

¹Ibid., p. 74.


of Getman's training program is the basic sequence of growth and development associated with the first five years of life. This sequence is organized into six sequential and interrelated developmental areas or stages, briefly discussed below. The first stage is the general movement patterns stage. When a child moves, he learns. Without movement, learning does not take place. The body learns to explore. The eyes become the steering mechanism, the bones frame the supporting structure, the nervous system the start-control-stop circuit, and the muscles the anatomical parts for action. The second stage is special movement patterns. General movements are extended to include synchronized use of body parts and manipulation. Eye-hand coordination is achieved early and sets the pattern for subsequent integration within the body's perceptual system. Eye movement patterns follow. Vision replaces general and special movements and the hands are freed for more economical use. The less manipulation the hands must exercise, the more available they are to produce shapes, forms and symbols with greater and greater steering from the visual system. The acquisition of information involves less and less manipulation. The fourth stage is communication or visual language patterns. For the mastery of speech, considerable control of lips, mouth, tongue and throat muscles must be acquired. According to Getman, nonverbal communication is related to eye movement patterns and other special movement patterns. Suggestion is made that children with inadequate eye movement development evidence much difficulty with words of distance, direction,
and position. Language communication gives the child opportunity to verify visual discriminations. Visualization patterns, the fifth stage, is sometimes called visual memory. Visualization involves (1) the recall of previous learnings, (2) the matching of new learning against those already known and (3) the inspection and interpretations of new learnings. Therefore, visualization patterns substitute for action, speech and time. The sixth stage, visual perceptual organization, is a level of development that makes it possible for an individual to interchange body mechanisms while interpreting the environment. By touching the object, certain reliable inferences can be made about its appearance. Vision remains most important in interpretation since it characteristically provides more accurate distance reception than audition and yields information in texture, size, shape, direction and color.¹

In the discussion of and remediation of the perceptual-motor systems discussed previously, the implication is that these functions are closely related and that improvement in one area stimulates improvement in the other. Specific tasks were designed to make use of both abilities simultaneously which resulted in increased integration between perception and motor response. In one system to be discussed now, the emphasis of training is upon the development of motoric integration and coordination, the inference being that perception is to a considerable extent the by-product of motoric adequacy. ¹

This system is the patterning theory of neurological organization of Doman and Delacato. The essential tenets of the theory and practice of neurological organization were developed between 1955 and 1962. The concept of neurological organization is based on the theory that neurological development follows the biogenetic postulate that "ontogeny recapitulates phylogeny", that is, that individual human development repeats the pattern of man's evolutionary development.

Neurological organization is that physiologically optimum condition which exists uniquely and most completely in man and is the result of a total and uninterrupted ontogenetic neural development. The development recapitulates the phylogenetic neural development of man.¹

Basically, neurological organization assumes that:

(1) Ontogeny, the process of individual development, recapitulates phylogeny, the process of species development. (2) The development of the individual proceeds in an orderly way, anatomically, in the central nervous system, progressing through the medulla and spinal cord, pons, mid-brain, and cortex which culminates in hemispheric dominance. (3) The individual's mobility, vision, audition and language parallels and is functionally related to his anatomical progress.

Delacato suggests that the development of the human brain follows a fairly consistent pattern. Beginning before birth and ending around the eighth year of life, neurological

# Developmental Profile

**Illustration 4 - Domain-Delacato Neuropsychologcal**

| Domain-Delacato Neuropsychological Profile | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
functions gradually develop vertically from spinal cord to cortex as myelinization takes place.\textsuperscript{1} Delacato's basic premise is that if man does not follow the sequential continuum of neurological development, he will exhibit problems of mobility and/or communication.

Establishment of the level of dysfunction, using the Doman-Delacato neurological developmental profile, is followed by therapy which is based on the assumption that a specific therapeutic experience will affect the development of a specific brain level. Treatment begins at the child's diagnostically determined level of neurological development, at which the child fails. The child must master each successive level before he moves on to the next level. Treatment techniques proceed as follows: Medulla Level. The opportunity is provided to use the basic reflex movements by placing the child on the floor for most of the day. In addition, fishlike movements are imposed on the child's body for prescribed periods of the day. Pons level. The same procedures are used at the level of pons with homolateral patterning being administered. Several adults work the child's limbs for him rhythmically while he lies face down on a table. One person turns his head from side to side while another flexes the arm and leg on the side to which the head has been turned, and a third person extends the limbs on the opposite side. Proper sleeping patterns are prescribed for the child. The development

of biocular vision is aided by having the child follow a self-directed visual stimulus with each eye being occluded for three or four one-minute periods a day for two or three weeks. Midbrain Level. At the midbrain level, the aim of treatment is the mastery of bilateral activity. Some useful activities recommended include cross-pattern creeping, which varies in practice time from ten minutes to one hour per day. Training for visual yoking of the eyes is facilitated when the child follows a visual stimulus which he or others is moving. Music, tonal discrimination and memory, and sound games are used with children who have articulation and phonetic element problems. Early Cortical Level. At the cortical level, patterning consists of daily ten-minute or more practice periods in cross-pattern walking. The child, visually, should be developing stereopsis through playground games which require that he learn about spatial relations. He must also develop near-point vision if he is to become ready to read. Table activities such as crayoning can be useful. Cortical Hemispheric Dominance. The final stage of neurological development, according to Delacato, is attained when hemispheric dominance is established. At this level, patterns of sleep consistent with sidedness are emphasized. To help develop a dominant foot, activities such as kicking, stepping off, and hurdling are helpful. Skills such as cutting, throwing, using tools and picking up objects are used to develop handedness. Eye dominance is taught. Telescopes are used for point vision and microscopes for near-point vision. Delacato also favors
the use of a device called a Stereo-Reader manufactured by Keystone View Company. It gives the effect of occlusion while giving the illusion that both eyes are seeing the training material. The material consists of exercise cards of visual-motor activities, word families, visual discrimination, phrase reading, reading for interest and speed reading. Two twenty minute periods per day are usually prescribed.¹

When the neurological organization is complete, the problem, Delacato says, is over. The only function of the remedial teacher is to bring the child up to a level which will enable him to go into a regular class as quickly as possible.

Bryant J. Cratty, author of the book, Intelligence in Action, can be ranked among those who advocate perceptual-motor programs. He, like the men previously discussed, believes movement is central to education. He feels that learning should be a happy experience by involving in the learning process, various games and physical activities.

He doesn't believe games represent some kind of educational cure-all but he does feel they enhance academic abilities. His book, Active Learning, illustrates fun-filled techniques for teaching basic academic operations that have formerly been taught in much less than happy ways. Cratty inculcates virtually any intellectual ability into a lesson in which movement experiences are a main ingredient. He suggests many intellectual operations that can be improved

¹Ibid., pp. 276-280.
with specific games. They include memorization, categorization, language communication, evaluation, problem solving and thoughtful rules.¹

Movement games may help the child with learning problems, may aid the active normal child to learn better, and may improve the academic progress of the culturally deprived and retarded child.²

He has designed a developmental sequence of perceptual-motor tasks of movement activities for neurologically handicapped and retarded children and youth that consists of sixteen developmental steps. Its primary goal is the formation of body image and the body's position in space.³

Jean Ayres, another educational specialist, is also a proponent of the perceptual-motor approach to learning. Her major concern deals with deficits in the perceptual-motor system and how these deficits affect children. She lists five types of syndromes that are the result of types of perceptual-motor deficits in children with learning disabilities. The five syndromes she lists are apraxia, deficit in perception of forms and position in space, laterality, deficits in visual figure-ground perception, and perceptual disturbances. Her main concern lies with the development of tactile perception.


She feels that if a child has a deficit in tactile perception, he is apt to have deficits in other types as well.¹

Lydia A. Gerhardt, author of the book, Moving and Knowing, also stresses the importance of perceptual-motor development to cognitive development. She says that body movement is being actively recognized as an underlying and essential component in the child's learning. Her contention is that life begins with movement. The ultimate uniting of sperm and egg is dependent upon movement. During the prenatal development, embryo and fetus are in constant motion. When a child is born, his survival forces him to move. He acts to maintain an equilibrium within his body and simultaneously responds to the external world. Hence, life reflects a creative interaction between the child and his world. Movement is both cause and effect. Movement has also been responsible for man's progress. Body movement stimulated early man to think, it directed man's achievements and thoughts, and thoughts in turn directed his movement. Movement, therefore, is apparently essential to one's ability to cope with the world. It stimulates man's thinking process and it has played a vital role in the development of knowledge. Gerhardt says movement is responsible for the development of man's perceptions, the formation of images, the development of thinking and the development of language.²


Robert Valett has developed a screening device for the detection of learning disabilities which is largely based on perceptual-motor principles. Valett lists ten factors that he considers important and essential: visual acuity, visual coordination and pursuit, visual form discrimination, visual figure-ground discrimination, visual memory, visual-motor fine muscle coordination, visual-spatial form manipulation, visual-motor speed of learning, and visual-motor integration. Valett's work is a good example of the state of the art of perceptual-motor training. It contains a list of perceptual subcategories based on intuition and logic rather than on research. Valett goes farther by actually asking his readers to help do the needed research. Accompanying each category of perceptions are recommended diagnostic and then remedial devices. He asks his readers to send him notes on how they work.¹

CHAPTER III

REVIEW OF RESEARCH STUDIES
FROM 1969 THROUGH 1974

The research articles in this chapter were chosen primarily from literature of 1969 through 1974. They were taken from many and various major periodicals which presented studies pertaining to the topic under discussion. This chapter encompasses virtually all the studies that this researcher could locate of this five-year period which focused on the effectiveness of perceptual-motor training. None of the articles was selected on the basis of prior knowledge of their results or methodology. This researcher feels that generalizations may be made about the research findings of the entire field of perceptual-motor programs which were studied. The selection procedure was intended to insure, as accurate as possible, a presentation of the most recent literature concerning the subject matter.

The population under study, regardless of the particular approach employed, dealt with studies on children who are mentally retarded, children who display learning disabilities, children who have been identified as culturally or economically disadvantaged and children in regular classrooms who have not been differentiated in any way and are thus assumed
to fall, for the most part, in a normal distribution with regard to measured IQ, learning disabilities and socio-economic status.

The order of presentation of these studies will be according to grade level beginning with subjects in the kindergarten level and progressing forward.

Falik designed a study to determine if providing a group of kindergarten children with a specially designed curriculum based on principles of perceptual-motor development would have any differential effect on their readiness for reading at the end of the kindergarten year and whether there would be any significant effect on their reading skills once they had begun to learn to read. The Anton Brenner Development Gestalt Test of School Readiness was administered to approximately ninety children entering kindergarten. Their scores were ranked and the top third was removed. The remaining sixty children were randomly divided into two groups, keeping the number of boys and girls balanced. One group was the experimental group, the other became the control group. The scores of the two groups initially were not significant differentially. A planning committee attempted to take the standard kindergarten curriculum and fit it into a developmental sequence which emphasized (1) gross-motor development, (2) eye-hand coordination and (3) visualization patterns. The part of the curriculum which as most clearly associated with perceptual-motor development was designed after the work of Kephart. This group composed the experimental group. The
control group spent the kindergarten year using only standard kindergarten curriculum adding only a semi-structured experience designed to correspond in setting the general activity to the experience of the experimental group. At the end of the year, all the children were retested with the Brenner Gestalt Test used in the initial screening, the Metropolitan Readiness Test and a specially devised test of basic perceptual-motor development. One and a half years later the investigators returned to administer the reading section of the Metropolitan Achievement Test, Primary II Battery, Form B. The results showed that there was no significant difference between the experimental and control groups at the end of the kindergarten year on any of the three test variables. The mean scores for the two groups on the perception test were so significantly close as to be non-significantly different. Nor were there significant differences between the two groups on the Metropolitan Readiness Test. A lack of significant difference continued to hold up when these children were tested at the middle of the second-grade. In conclusion, the perceptual-motor program's effect on reading was absent.

Smith initiated a project to determine to what extent children entering kindergarten are ready for first grade reading experiences after having been engaged in perceptual-motor skills on the reading readiness of randomly placed kindergarten children who were enrolled in twelve kindergarten classes from six schools. All of these children had similar

---

socio-economic background experiences. All were administered the Metropolitan Readiness Test - Form A at the beginning of the project. The classes participated in perceptual movement patterns an average of three days a week, twenty-minutes per day for twenty-five weeks. Two days each week were spent in regular physical education. The classes ranged from twenty-six to thirty-three students. All of the classes were taught identical movement skills using a multisensory approach. Visual, audio, and tactile receptors were continually activated as the children became involved in many movements with specific directional orientation. The twelve classes were divided into three groups of four classes each. The major differences in the groups was the teacher's method of presentation. Four classes (group I) were taught using a method in which the teacher directed the children to do specific movements and related these movements to directions of up, down, forward, backward, left and right. Four classes (group II) were taught using a semi-problem solving approach in which the children were asked questions which they attempted to solve through movement. The teacher provided the clue and would demonstrate to the children if the problem took too long to solve. All movements were related specifically to directions of up, down, forward, backward, left and right. The final four classes (group III) did identical movement patterns and skills to the two groups previously described. The only difference was that during the time, the directions of up, down, forward, backward, left and right were never mentioned. The directional movements
were related to color coded targets or names (green, red, yellow, and blue targets). The activities and movement patterns used in this project were selected to test the theory: If perceptual movement patterns have a direct relationship to learning, and since reading is a perceptual skill involving bilateral movements, then concentration on bilateral movement patterns for twenty-five weeks during kindergarten will improve the reading readiness of children. At the end of the experiment, Metropolitan Readiness Test - Form B was administered to all the children. The results of this project showed that 35% of all the children were average or above, indicating readiness for first grade. No significant difference appeared between the directed and problem solving methods of teaching according to a comparison of the mean score of improvement. There was a 8.73 percent greater mean score gain in the combined directed and problem solving groups (groups I and II) when compared to group III. It appeared that there is a greater understanding and transfer of learning if direction of each movement is used to reinforce the movement. The researcher concluded with the statement that a perceptual-motor program was effective in his project.¹

Again using kindergarten subjects, Jensen and King compared the effects on reading of three different kinds of visual-motor training: (1) tactual word tracing, (2) rearrange-

ment of individual letters to form words and (3) visual matching of word forms with one of four choices. Each subject was asked to read words for which he had been trained during a training and testing period of about twenty-five minutes. The authors found that tracing was significantly easier than rearranging. They found no significant difference on the reading task favoring either of the three types of training. They concluded that no one teaching method is best for all children and that instructional methods must be individually tailored for each child. They cautioned against accepting programs that claim superior results in reading achievement as the result of visual-motor training. It should be noted that the lack of a control group deprived of visual-motor training makes it presumptuous to conclude from this study that visual-motor training does not improve reading performance. The twenty-five minute training period, type of perceptual-motor training, and testing period also weakens this argument.\(^1\)

On the basis of the Bender Visual-Motor Gestalt Test, Keim selected a group of seventy-four kindergarten children with visual-motor deficiencies. Half were at that time assigned to a group that received the Winter Haven Program in addition to regular programming, while the other half formed a control group which received ordinary kindergarten training. A second control group consisted of children evi-

dancing no visual-motor problems. Pretest and posttest measures showed no significant differences between the groups on the Peabody Picture Vocabulary Test, the Stanford-Binet Test or the Bender Visual-Motor Gestalt Test. The group receiving the Winter Haven Program did not score significantly differently on any of the subtest of the Metropolitan Readiness Test. Of possible significance was Keim's report that teachers using the Winter Haven Program were dissatisfied with many of the aspects of its program.¹ Methodological weakness and lack of information in his reporting indicated a need for caution in interpreting the findings. Keim did not mention the basis for identification of the seventy-four children with supposed motor problems according to the Bender-Gestalt. Without cutoff scores, one would be unable to specify the extent of disability in those children. One cannot conclude from the information given that perceptual-motor training did not have an influence on academic achievement.

Turner and Fisher investigated the effects of a program on perceptual-motor development and academic readiness that was initiated to provide disadvantaged kindergarten children with experiences they needed. Seventy-six disadvantaged kindergarten children were the subjects of the study, twenty-six of whom composed the control group. All of the children were pre- and posttested on the Slosson Intelligence Test, the Metropolitan Readiness Test - Form A, Frostig's Developmental

Test of Visual Perception and Kephart's Purdue Perceptual-Motor Survey. The children who composed the experimental group used Kephart's developmental program for half of each school day for seven months. The control group participated in a conventional kindergarten program. The results of this study uncovered no significant gain scores between the two groups on the Slosson Intelligence Test. Mean posttest differences on the Metropolitan Test were significant favoring the experimental group. The Kephart Survey revealed no significance between group differences. The program proved to be more effective at improving fine motor behavior than gross motor behaviors. Fine motor behaviors correlate highly with successful reading and writing activities. Intensive exposure to verbal concepts, paired with concrete example and movements, may have been a major program effect.

Using a canonical analysis, Chissom, investigated the relationship between perceptual-motor abilities as defined by the Shape-O Ball Test and the Frostig Developmental Test of Visual Perception and intellectual abilities as defined by a complex teacher rating scale used in previous studies by this same author. Thirty-eight kindergarten children from the Marvin Pittman Laboratory School at Georgia Southern College were the subjects of this study. The mean age of the participants was 68.3 months at the time of the test administration.

The Shape-O Ball Test consists of a hollow plastic sphere six inches in diameter with different geometrically shaped holes in the surface of the sphere. Plastic geometric pieces matching the holes are inserted into the sphere by the examinee as rapidly as possible. The subjects completed four timed trials of the test, the sum of which was the performance. The Frostig Developmental Test of Visual Perception consists of five subjects: eye-motor coordination, figure ground, form constancy, position in space and spatial relations. Each subtest is designed to measure separate visual-motor areas. The academic criterion measure consisted of a complex teacher rating scale in which the teacher rated her students from a high of nine to a low of one in four separate areas: reading readiness, quantitative, verbal and listening. A reliability estimate of the four separate teacher ratings, calculated by Cronback's Alpha was .96. Two canonical analysis' were conducted. Results of the first canonical analysis between the perceptual-motor domain (Shape-O Ball and the Frostig Test) and the four part intellectual criterion showed a significant (p. 01) canonical of .70. The Shape-O Ball Test made the most significant contribution from the perceptual-motor domain, while reading readiness and verbal ability offered the greatest contribution from the intellectual domain. The second canonical analysis used the five Frostig subtests as predictors of the four-part intellectual criterion. A significant canonical correlation (p. 02) of .78 was obtained. The subtests, positions in space and spatial relations, were the major contributors from
the Frostig battery while the verbal rating was the major intellectual contributor.¹

Pryzwansky investigated the effects of various perceptual-motor training programs and manuscript training on kindergarten children's test scores in the area of reading readiness. Five hundred and fifty-nine subjects from six schools in the suburbs of the large metropolitan city of Philadelphia were involved. Three of the schools composed the experimental group and the other three served as the control group. One week prior to the commencement of the study and during the week that followed the completion of the training, the Gates - McGenitie Reading Skills Test was administered to all subjects. During the study the experimental schools used three commercially available perceptual training programs: Template Training (Sutphin, 1964), Frostig Developmental Book of Visual Perception, Intermediate Level (Frostig & Homme, 1966), and Patterson Handwriting System. All three perceptual programs emphasized the development of fine-motor skills. All of the training was done at the desk except for the Template training done at the blackboard. In addition, Kephart's developmental activities for drawing and copying were incorporated into the programs. Fine motor training began in February and lasted thirteen weeks. Fifteen minutes a day were devoted to the exercises. Each of the three control schools

chose the program they wanted and each employed readiness material from a basal reading program. One control school also made limited use of Continental Press material in addition to readiness reading texts. The results showed that improvement by all pupils exposed to all three perceptual-motor training programs was not statistically significant at the .001 level when compared to the scores achieved by the control program. The improvement shown by children in the manuscript program was significant when compared with scores of the other two perceptual-motor training exercises. The improvement shown by the children in the manuscript group was significant (p. 001) over the control schools. It might be well to note that it could be possible that any one of the experimental groups in this study may show a latent advantage in reading as the result of their training once words became the prime focal point of interest in first grade.

As has been reported, many researchers have probed the affects of perceptual-motor development with kindergarten children and its affect upon their academic achievement. Likewise, the studies that follow utilizing first grade children as subjects probe the same question.

A study concerned with the degree to which supplementary intervention affects the acquisition of reading skills in beginning readers was conducted by Belmont, Flegenheimer and

---

Birch. Frostig, Horne and Kephart feel perceptual-motor training will prevent or correct initial reading failure. Cohen and Bateman argue that the surest way to teach children is to teach them letters and words and to do it thoroughly. This study attempts to probe these opinions. The subjects of the study were two groups of sixteen children each who had equivalent degrees of risk in reading failure. This poorness in functioning was determined by the scores obtained from the N. Y. City Pre-Reading Assessment Test. The researchers decided that one-half of the children would receive supplementary perceptual-motor training in addition to remedial reading instructions and that the other half would receive remedial reading instructions only. The children met in subgroups of five or six children each for four, one-half hour daily sessions per week for seven months. The reading ability for all the children was assessed after the program on four tests: Metropolitan Achievement Test, Wide Range Achievement Test, Gates - McGenitie Reading Test, Gates - McKillop Reading Diagnostic Test. The results showed that all of the children made equivalent advances in their reading level. The children who received perceptual training tended to make fewer attempts to pronounce difficult words and omitted words more frequently. The children who were provided only remedial instruction attempted more of the difficult words. The results showed that actually the two instructional methods had similar and positive effects on children's ability to read. This leads us to acknowledge that more research is needed on how to help
high risk children with reading.¹

Hedges wanted to provide information on the effect that the program, *Physiology of Readiness* (Getman & Kane, 1964) would have on general academic achievement. The program, *Physiology of Readiness*, is intended to develop a child's body and also his sensory functions. General academic achievement was defined in this study as word reading, paragraph meaning, spelling and arithmetic as measured by the Stanford Achievement Test. The subjects of this study were one hundred and fifty-two first-grade students in five elementary schools in Clayton, Missouri. These students were randomly assigned to either an experimental or control group. During the first week in November, the Stanford-Binet Intelligence Scale and Stanford Achievement Test was administered to all subjects. Following that, the experimental group underwent the *Physiology of Readiness* exercises for twenty minutes daily as well as working on regular classroom activities for twenty-one weeks. The control group worked on regular classroom activities only as they would have, had there been no experiment.

The results of the study indicated that growth or increase between pretesting and posttesting was not greater for the experimental group than for the control group, but was less in three out of the four areas: (1) word reading, (2) spelling and (3) arithmetic. The difference, however, was not

statistically significant even at the .05 level. The author concluded that all children should not be taught in the very same way and at the same rate of speed. He said that it may well be that there are specific children for whom the materials and exercises were beneficial.¹

A combined office-home perceptual-motor training program was arranged for two children, C.A. 6-10, by Seiderman. Both children were tested on the Wechsler Intelligence Scale for children and on the Slosson Intelligence Test. Their IQ scores fell in the high normal level of intellectual functioning. The children were also given the Metropolitan Achievement Test and the Frostig Developmental Test of Visual Perception. It was found that their gross and fine motor abilities were undeveloped. One child, (J.K.), came to the researcher's office once a week for ten months. The other child, (I.K.), visited the office once every other week for eleven months. The office visits were forty-five minutes each on a one-to-one basis. The parents were asked to work with their child at home for approximately twenty minutes daily. To complement the perceptual-motor training program, each child received assistance from a reading specialist. These hourly sessions were also on a one-to-one basis. J.K. attended seventeen sessions and I.K. attended thirty-four sessions. The initial phase of the perceptual-motor training program emphasized the development of gross-motor and motor-planning. This was followed by work in

sensory processing in the various modalities. The development of form perception, body schema, visualization exercises, visual-motor coordination, visual synthesis and conceptualization was also included in the program. The results indicated that all gross-motor and motor planning tasks showed significant improvement. Fine motor improvement was also improved significantly. J. K. moved from a neurologically impaired class to a regular classroom. I. K. tested one and one-half years above her present level. Before the program began, I. K.'s reading level was minimal.¹

Serwer, Shapiro and Shapiro conducted a comparative effectiveness study utilizing four methods of instructions on the achievement of children with specific learning disabilities. Their purpose was to examine the relative effectiveness of three remedial techniques and a single control in terms of language arts and arithmetic achievement of "high risk" first graders. The four group's remediation techniques were as follows: Group One used the D1star Reading Method by Engleman and Bruner. Group Two used an indirect method. The teacher, who was a perceptual-motor specialist, combined her techniques with those of Kephart. Group three used a combined method. Their time was divided equally between the D1star Method and the perceptual-motor specialist. Group four, the control group, received no remediation method at all. Sixty-two "high risk" first-grade children were the subjects of the experiment.

Their disability was determined by two intelligence tests, two achievement measures and one visual-motor integration test. The children were classified into five subgroups relating to the specific nature of the difficulty. Random assignments to the control group and to the three groups within each of the two special classes was made separately. The screening and treatment assignment was completed at the end of the kindergarten year. The treatment period itself extended over the subjects' entire first-grade experience in a two-phase sequence. Phase I began in September and ended in January. It consisted of the administration of a battery of pretests to each of the sixty-two subjects, the application of the treatment program for two and one-half hours a week and two interim posttests. Phase II began in February and ended in May. It consisted of the individualized treatment prescribed on the basis of the analysis of the diagnostic tests administered during Phase I. During this period, boundaries between direct, indirect and combined groups were adhered to. The direct group continued with Ddistar. The indirect group used perceptual-motor devices rather than direct reading of numbers and letters. The results showed no difference statistically between the four groups on any pretest measure. During the interim posttests, statistical differences were noted on only the word recognition test. The difference favored the indirect method first, the combined method second, the direct method third and the control group last. These results support the theoretical approach of Kephart, Frostig, Johnson and Myklebust that training in
perceptual-motor skills is effective with "high risk" children at this age. Final posttests on the Metropolitan Achievement Test arithmetic scores showed significant difference at the .05 level favoring the indirect method. In general, the indirect and combined groups showed better achievement than did the direct and control groups. If arithmetic and achievement are considered (in Piagetian terms) related to the attainment of the concrete operational stage, the effectiveness of motor training is theoretically sound at the age and developmental stage of this sample.\(^1\) As one considers this study, the small size of the sample and the short instructional period needs to be noted.

Hallewill and Sloan investigated the effectiveness of an extended, comprehensive, supplementary perceptual and perceptual-motor training program on the reading achievement of first-grade boys and girls who were designated as potential reading problems. Three groups of thirty-five students each composed the study. Two of the groups were experimental and one was the control group. Experimental group one, composed of students distributed throughout the school, were to participate in regular reading programs. They were also to be recipients of perceptual-motor training sessions conducted by the school reading personnel who had training six weeks prior

to the beginning of this experiment. The perceptual-motor training sessions of forty-five minute durations were scheduled twice a week from November 1st to May 20th. The sessions were conducted in small groups of students of three and four each and featured a training in sensory processing, intersensory development, fine and gross motor development, and developed the concepts of laterality and directionality. Experimental group two also consisted of students distributed throughout the school. In addition to their regular reading instruction, they were to be the recipients of special reading assistance conducted by the same school district reading personnel who worked with experimental group one and the control group. The sessions for these students were conducted for the same length of time, and the same type of small group setting. Special activities in the program were work recognition training, phonetic training, simple reading comprehension exercises, listening exercises and choral poetry. The control group of thirty-five received regular reading instruction only. All three groups were administered the Metropolitan Achievement Test, Primary I Battery, in May. The criterion of effectiveness was the reading comprehension subtest of the Metropolitan. The results of this study showed experimental group one to obtain the highest mean score in reading in each of the sex groups. The scores were of significant difference with the control group but not with the second experimental group. Experimental group two obtained higher reading scores than did the control group among the boys and the total group but
these scores were not significant. The control girls obtained higher reading scores than did the experimental two girls. In reading the study, four factors may have contributed to the results. The study used potential reading problem students, the personnel were well trained, they worked in small groups, and the perceptual-motor training supplemented the regular reading program. These factors may have contributed to the conflict in findings between this present study and previous studies which reported no significant superiority for perceptual-motor trained students.¹

To determine to what extent visual, motor, and perceptual training would improve the reading and general achievement of children with visual, motor, and perceptual deficiencies, Litchfield conducted the following study. Eighty first, second, and third-graders identified as having such handicaps by gross and fine screening instruments were randomly divided into experimental and control groups. One-half of a day for six months, training exercises and activities were conducted in the following categories: ocular, motor, movement skills, laterality and directionality, spatial judgements, eye-hand coordination and visualization. Posttests administered were the Fine Screening Instrument, Long-Thorndike IQ Test, Gates-McGinitie Reading Test, and the Stanford Achievement Test. The results of the IQ and achievement tests showed no gain of the experimental group over the control group. Fine screening

results showed more improvement in visual, motor, and perceptual functioning by the experimental group than by the control group. The control group had received regular reading instructions only. Anecdotal records kept by classroom teachers reported progress by nearly all the experimental students.  

Since form discrimination, visual-motor match, and fine-hand coordination have been identified as significant aspects for the identification of children with reading problems, the authors, Thomas and Chissom, developed a test designed to discriminate among reading levels. This test, the Shape-O Ball Test, has been shown to be an effective predictor of general academic ability. Plastic geometric pieces are inserted into the ball by the subject as rapidly as possible. The test was designed to be a perceptual-motor test. The authors purpose of this study was two-fold. It was first to assess the relationship between two predictive measures, Shape-O Ball and the Otis-Lennon Mental Ability Test (1967) and two criteria: reading performance and general academic ability. Secondly, it attempted to classify students into reading groups by use of the predictor measures. Forty-eight first-grade children from Marvin Pittman Laboratory School at Georgia Southern College made up the class that was to reflect the total community population. The mean age of

the group was 81.67 months. The Shape-O Ball Test was administered to all subjects to determine their perceptual-motor level. The Otis-Lennon Mental Ability Test, Primary I Level was administered to obtain a measure of general mental ability or scholastic aptitude. The two criterion measures were the reading group to which the subject was assigned and a four-part teacher rating scale. The teacher rating scale was composed of four ability areas on which the classroom teacher rated their students from a low of one to a high of nine. The subjects were divided into four groups according to the test results: top group, best readers, bottom group and non-readers. The results showed that the Shape-O Ball Test is useful as a predictor of the two academic criterion. The Shape-O Ball was significantly related to both parts of the Otis-Lennon Mental Ability Test which is an objective measure of academic performance (Part I .62, Part II. 72). The Otis-Lennon correlated highly with the teachers relating scale (r=.81) and reading groups (r=.79).1

The following case study of Sloan and Seidermann attempts to study the hypothesis that cognitive development in the primary grades is dependent in part upon a child's ability to process information and that a child who is experiencing a lag in neurological maturation and perceptual-motor development is less able to cope with the problems in learning at the

primary level of education. The child chosen for this study characterized such disabilities after completing one year in kindergarten. It was realized that she was not prepared to proceed at a normal rate of learning in grade one. She was referred for diagnostic evaluation and was found to be deficient in visual processing, gross and fine motor coordination, auditory blending, sequencing, visual memory and visual motor and had directionality and spatial confusions. She was a perceptually deficient child. Training was provided for her in sensory processing, intersensory processing, gross and fine motor development, visual synthesis, visual motor and visual representation skills and particularly in eye-hand coordination. The results showed that with the assistance of the perceptual-motor training which was needed, this child performed admirably during grade one. The substantial population of children in almost any school system who have completed grade one and who cannot read and have comparable perceptual deficiencies serves as a clinical control in this case. The authors concluded that when deficiencies exist, perceptual and perceptual-motor training during the school years improves the intermodal relationships which customarily develop spontaneously. The resulting improvements in self-concept and sensory processing can enable the child to respond to instructions more effectively. This explains the significant improvement in this child's ability.¹

Lipton attempted to investigate if a special physical education program, commensurate with the levels of readiness of first-grade children with an emphasis on directionality of movement, would positively affect perceptual-motor development and produce improvements in visual perception and reading readiness. The ninety-two subjects in the study were in four first-grade classes in the Mt. Pleasant school district in New York state. The four classes were divided randomly into control and experimental groups. They were equated in terms of height, weight, age and sex within the limits of the sampling error at the .05 level. The experimental and control groups were evaluated to establish pre-experimental and post-experimental program scores in perceptual-motor development, visual perception and reading readiness using the Purdue Perceptual-Motor Survey (Kephart, 1966), the Developmental Test of Visual Perception (Frostig, 1963), and the Metropolitan Readiness Test. During the experimental program, both groups continued to participate in their regular classroom programs which included basic reading readiness as part of the curriculum. The two control classes participated in the conventional physical education program. All subjects in both groups met in physical education class for two, thirty minute periods each week during the experimental program of twelve weeks. The experimental program, designed to emphasize directionality of movement, took into account research which established those skills involved in perceptual-motor development. It utilized many of the aspects of the Kephart
program as well as ideas proposed by Barbara Godfrey, A. H. Ismail. Genevieve Painter's experimental program which suggested ideas for improving perceptual-motor spatial abilities in children was also used. To obtain the results, a two-way ANOVA, using difference scores (pre-and posttest) to analyze gains among classes where they occurred, was used to evaluate postexperimental program performance. When analyzing gains for scores on the Perceptual-Motor Survey, the differences for the experimental groups as compared to the control groups were significant beyond the .01 level. On the visual perception test, the differences for the experimental group as compared to the control groups were significantly better beyond the .01 level for treatment variable. On the reading readiness test, the difference for the experimental groups as compared to the control groups were significantly better beyond the .01 level for the treatment variable. In conclusion, the experimental physical education program which emphasized directionality of movement produced significantly greater gains in perceptual-motor development, visual perception, and reading readiness than the conventional curriculum which did not have this emphasis.¹

There have been some indications in the literature that motor proficiency is related to intellectual functioning and some investigators have reported increases in intelligence

test scores as a result of motor training. Fisher designed
a study to test these findings. He wanted to study the ef-
fectiveness of a structured program in perceptual-motor
training, following Kephart's principles, with educable
mentally retarded children. One hundred and two educable
mentally retarded children enrolled in public school special
classes in an urban area were tested with the Perceptual-Motor
Survey. Fifty-four were determined to be deficient in per-
ceptual-motor abilities. Each of the fifty-four were ran-
domly assigned to one of three groups. The groups were labeled
group T, group H, and group C. Group T (training) participated
in an individualized, structured program of perceptual-motor
training twice a week for four and one-half weeks. Group H
(Hawthorne) played table games instead of the perceptual-motor
training. Group C (control) maintained their regular class-
room schedules. All three groups were administered the Per-
ceptual-Motor Survey, the Wechsler Intelligence Scale for
Children, the Wide Range Achievement Test and the Stanford
Achievement Test before the training began. Following the
training, the Perceptual-Motor Survey and the Wechsler Intelli-
gence Scale for Children were again administered to all child-
ren. Two months later, two achievement tests were administered
to the same groups. The results showed that improvement of
perceptual-motor abilities as a result of training was not
significant. Children under ten years did reveal a signifi-
cant difference in favor of group T over group C. Group T
and group H was close to statistical significance at .05
probability level in favor of group T. The predicted improvement in intellectual performance was not supported either. All three groups did demonstrate significant improvement from pretest to posttest on Perceptual-Motor Survey total scores and on achievement tests. Group T and H showed statistically significant improvement on the Wechsler Intelligence Scale full scale score IQ suggesting the importance of the Hawthorne effect on intelligence test performance. The reader must keep in mind that this was a short term study which may have influenced the findings.

Clark and Dodd conducted the following study to try to determine what influence auditory factors had in visual-motor testing and training. The subjects were children in the first three grades of one elementary school. The school is located in a low-socioeconomic, predominantly Negro neighborhood. Each of three classes were randomly divided into three groups, two experimental and one control group. The three treatments were matched with the three groups on a random basis. Each child previously received a physical examination. No child had both auditory and visual acuity problems. The visual and hearing problems that were noted were minor. All of the children were administered the SRA Achievement Test before and after the study. Eleven children were placed in the control group. Ten were in the auditory group and thirteen were in the visual group. All three groups received

special attention for a period of twenty minutes daily for three consecutive weeks. The auditory group, which was the prime experimental group, received exercises devoted to auditory decoding, association, sequencing, memory, and motor abilities. In the visual-motor group, stress was placed on form discrimination and fine motor coordination. They were taught primarily through their visual channel. The areas of visual memory, motor memory, motor coordination, fine muscle coordination and visual discrimination were stressed. The control group was involved in a variety of activities such as listening to music, stories, drawing, cutting pictures, watching films, playing games, reading books, and taking a walk. Following the experimental treatment, the Winter Haven Perceptual Forms Test was administered to all of the children as a posttest. The results of the SRA Achievement Test and Winter Haven Perceptual Forms Test were as follows: The control group's mean score was significantly higher (.05) than the auditory group's. It was not significantly higher than the visual-motor group's. The auditory group had the lowest median score, followed by the visual-motor group, with the control group having the highest median score. The results indicate that performance on what is considered primarily a visual-motor test can be significantly affected by instructions in auditory perception.¹ One should note that the use of a single visual-motor test, the Winter Haven or a similar test

as a screening device for learning disabilities in primary grades is questionable. It should also be remembered that gains seen in visual-motor training programs may be due to improved auditory functioning rather than visual-motor coordination.

Through the use of a correlational analysis, Chissom attempted to examine and by so doing to define more thoroughly the motor relationships to academic achievement and academic aptitude. Chissom made thorough use of the cluster sampling, done. One hundred and sixty-nine first and third-grade boys representing fifty percent of the target population from five elementary schools were the subjects of the study. The mean age of the first-graders was 80.5 months. The mean age of the third-graders was 107.9 months. Three tests were selected for each of the three categories: (1) balance, (2) dynamic strength and (3) gross-motor coordination. The two criterion measures that were used in the study were the Otis-Lennon Mental Ability Test, Elementary I, Form J, which served as the measure of academic aptitude and a teacher rating scale which composed four areas of achievement: (1) reading (2) quantitative (3) verbal and (4) listening. The teacher was to assign a rating of from one to nine in each area. The ratings were them summed over the four categories to provide a total of the achievement rating for each subject. All motor tests were administered in February on the school playground. The Otis-Lennon Mental Ability Test was administered at the completion of the motor test battery in each school. The teacher rating
measure of academic achievement was obtained for each child from his regular classroom teacher. The results of the first-graders showed the multiple correlations of .43 for the criterion of academic achievement and .30 for the criterion of academic aptitude were significant at the .01 level. The equation predicting achievement used all three factors, while the equation predicting aptitude required only two. The strength factor was not included in the second equation predicting academic aptitude. The multiple correlations obtained for the third graders were .22 for the academic achievement criterion and .17 for the academic aptitude criterion. Neither of these multiple correlations was significant. The motor factor structure of the boys in grade one was the same as that for grade three. The relationships between the motor abilities and academic achievement and academic aptitude was significant at the first-grade level but not significant for the third-grade group. The results of this study therefore, support the relationship between the motor factors of balance and motor coordination and the criterion of academic achievement and academic aptitude for boys in the first grade.1 It would seem from these results that perceptual-motor theories are more applicable to improve intellectual ability for younger children than for older children.

Dietrick wanted to determine the relative effectiveness of perceptual-motor training and individualized reading

instruction on the reading achievement, perceptual-motor
development, and behavior adjustment of children with reading
problems. His subjects were forty-four children between the
ages of seven and eleven years who were attending a non-graded
elementary school program at the Gesell Institute of the Uni-
versity of Wisconsin - Stevens Point. These children were
selected on the basis of their falling in the lower half of
their respective age group in reading achievement. Their
mean IQ score was 116 with a range of 81 to 144. Twenty-five
boys and nineteen girls were involved. They were ranked accord-
ing to age and reading achievement and then randomly assigned
within levels of age and reading achievement to either the
experimental or control groups. They were compared by means
of analysis of variance on age, IQ, reading achievement, per-
ceptual-motor ability, and school behavior adjustment. No
significant differences existed among the groups on any of
these variables. Reading achievement was measured by the
Stanford Achievement Test, Reading Sections: word meaning,
paragraph meaning, and word study skills. Perceptual-motor
ability was evaluated by means of the Purdue Perceptual-
Motor Survey. Behavior adjustment was measured by means of
the School Behavior Profile. Each instrument was administered
in October and April, before and after the experimental treat-
ments. The method of instruction consisted of three experi-
mental classes, which were a reading group, a perceptual-
motor group and one placebo control group. Each group met
daily for thirty-five minute periods during the five-day school
week from October to April. The reading group had a balanced program of reading exercises. The perceptual-motor group were engaged in perceptual-motor exercises. The control group had a series of activity units including holidays, crafts, and good sportsmanship. The results showed that the reading group performed above the other two groups in reading achievement, but there was not significant differences. No significant gains in perceptual-motor ability were found for any group including the perceptual-motor group. The perceptual-motor group performed below the level of the other two groups on reading achievement and behavioral adjustment. It appeared that reading treatment was the most effective condition but did not produce significant gains. The reading and the control groups were the most effective in producing gains in behavioral adjustments.

A nine-year old black boy, organically impaired, deficient in visual-motor analyzing, in synthesizing ability, unable to perceive spatial relations, mixed laterality, unable to sequence, and possessing figure ground problems was studied by Emerick. The Wechsler Intelligence Scale for children was administered and revealed a full range IQ for 91 but a twenty-nine point discrepancy was obtained between the Verbal IQ of 105 and the Performance IQ of 76. The Peabody Picture Vocabulary Test showed an IQ score of 108. This boy was also

---

given the Visual Motor Gestalt Test. He was seen at the university psychological setting in New York City for six months. He had thirty-nine treatment sessions three times a week for twenty minutes and one, forty minute play period at the end of each week. The various sessions consisted of one of the following activities: acquiring the notion of category using brightly colored cards; asked to represent verbal abstractions pictorially, in order to involve motor as well as visual modalities; the selecting of objects in the room according to instructions that were given in coded language; the use of Frostig's exercises from the Developmental Test of Visual Perception involving visual-motor operations; putting puzzles together; exercises from Coordinated Mathematics Science Series; synthesizing and organizing designs in standard Raven Progressive Matrices; and the use of materials from Haar Hoolin Perception games which involve the sorting and matching of exercises and the development of visual analysis and synthesis. Since none of the material of the Wechsler Intelligence Scale for Children was used in the treatment, the effectiveness of this program could be measured by a second administration of the test. The retest showed that this boy improved significantly (.05) on overall performance and significantly (.01) on the subtest, picture arrangement. He also improved significantly (.01) on the similarities subtest which is a measure of verbal concept formation. The significant drop (.05) in the arithmetic subtest may be accounted for by the interfering anxiety that
Further evidence for a relationship between perceptual-motor ability and academic achievement comes from the Skubic and Anderson study. The purpose of their study was to determine the relationship of a perceptual-motor battery of tests to academic achievement and to intelligence in fourth grade boys and girls. Their subjects involved eighty-six fourth graders of normal intelligence. Following their classification on the basis of the Stanford Achievement Test, forty-five high and forty-one low achievers were asked to perform eleven perceptual-motor tasks devised by the authors to assess abilities involving both gross and fine-motor movements. The study showed that the high achievers were significantly superior to the low achievers on six of the eleven perceptual-motor tests. Performance on the perceptual-motor battery was positively and significantly correlated (around .50) to the performance on the Stanford Achievement Test and on the California Test of Mental Maturity. Correlation data for the relationship between perceptual-motor ability and academic achievement was obtained.²

Many theorist, psychologist and specialists in education assume that mastery of perceptual-motor process is necessary prior to acquisition of higher cognitive process, and


hence, to scholastic achievement. Bibace developed an experimental design allowing for variation in perceptual-motor functioning and scholastic ability to test this assumption. The experimental design consisted of three variables: (1) age of subject, (2) level of scholastic achievement and (3) level of perceptual-motor achievement. The subjects were boys aged seven and eight years and twelve years. They were selected in this way in order that the assumption could be investigated for both those who had only recently acquired the higher cognitive process and those in whom such processes should have been well established. The level of scholastic achievement and perceptual-motor achievement allowed them to establish the following four-cell design: high perceptual-motor, high scholastic; low perceptual-motor, low achievement; high perceptual-motor, low scholastic; and low perceptual-motor, high scholastic. A total of eight boys were tested. One from each age group was placed in one of the above categories according to the test results. To differentiate high from low scholastic achievement for the group design, the child's most recent report card and any pertinent information about his academic record were examined. High achievers received grades of A's and B's in most subjects, particularly reading and math. Low academic achievement was indicated by D's and F's. The Kephart Perceptual-Motor Survey was the first test administered and served to insure the level of perceptual-motor achievement. Those subjects classified as high perceptual-motor achievers attained scores between 69 and 85 out of a possible 88 points. Scores between 39 and 57
were indicative of low perceptual-motor achievement. The mean for high perceptual-motor achievers was 77 and 45 for low achievers. Although the Perceptual-Motor Survey allows one to assess the child's ability in various areas, it does not indicate how the child will perform on learning tasks involving specifiable cognitive means for solving a task. Therefore, three learning tasks were administered, each of which is developmentally organized such that lower or higher conceptual means of functioning may be recognized in the performance. All three tasks had previously been found by the authors to validly discriminate among groups differing in their levels of cognitive functioning. The first task, developed by Janet Switzer, allows the child to use perceptual-motor means (pointing to locations) or conceptual means (naming colors) to identify a sequence of six different colored lights randomly ordered. The second task, used by Blum and Braverman, is the serial learning of the Stroop Color-Word Test. It consists of color words, red, blue, and green in (1) black, (2) color patches of, (3) incongruous inks. The third task, designed by Frank Clarkson, involves either motor or conceptual learning of the proper paths for finger mazes traced while blindfolded. Three mazes are presented of increasing difficulty. The results of the study showed that the subjects who are high in scholastic achievement rely predominantly on conceptual means. The subjects who are low in scholastic achievement utilize predominantly perceptual-motor means. There were no significant differences between groups when their performance on the three experimental
tasks is categorized in terms of high or low perceptual-motor achievement as measured by the Kephart Survey. The difference between groups attributable to the level of perceptual-motor achievement was not supported. Low scholastic achievement was related to low perceptual-motor achievement. Both younger and older children were found who showed gross deficits in perceptual-motor abilities and who, despite these deficits, were able to function very well in school and who did not reveal reliance on conceptual means in the experimental tasks.\(^1\) In conclusion, the study indicates both that the theoretical assumption must be at least qualified and that the clinical-pedagogical practices based on the assumption needs to be reexamined.

Maloney, Ball, and Edgar investigated perceptual-motor techniques which had been developed by Kephart. They used an experimental group of sixteen organically impaired, mentally retarded children who received sensory-motor training based upon the theory and techniques of Kephart. An attention-comparison group of fourteen, whose participants received individual attention and social reinforcement but no sensory-motor training in a structured setting composed the control group. The control group was given as much social reinforcement as the experimental group. The sensory-motor training group and attention-comparison control group were equated for age (around 14 years) and IQ (around 42) and exhibited a wide range of diagnostic categories. The sensory-motor group was

trained for forty minutes a day, three days a week, for two months. The attention-comparison subjects were seen for the same period of time. As has been stated, the sensory-motor subjects utilized Kephart's perceptual-motor techniques. The attention-comparison subjects engaged in activities involving equal amounts of interpersonal interaction, physical contact, with the experimenters and social reinforcement for attending to and/or succeeding at the activities. The tasks for this group, in the experimenters' judgements, required a minimum of sensory-motor skills. The following results were obtained on three pre- and posttest measures. On the Purdue Perceptual-Motor Survey, both groups made significant gains with the most significant gains for the sensory-motor group. On a modification of the Personal Orientation Test, both groups increased their scores markedly with greater significant gains for the sensory-motor group. On a modified version of the Eye, Hand and Ear Test, only the sensory-motor group achieved significant gains. Five dependent variables, motor development, language development, social development, perceptual-motor development and body image were improved while adaptive behavior and finger localization were not. On the basis of the results from the Eye, Hand and Ear Test and the Personal Orientation Test, the authors supported Kephart's claim that sensory-motor training develops body image.¹

In a follow up study of the previous work by Maloney

et al, Maloney and Payne studied the sixteen subjects who had received sensory-motor training and the fourteen subjects in the control group. After eight months, it was found that the experimental group maintained its superior performance over the control group on the Eye, Hand and Ear Test and on the Personal Orientation Test. The authors stated that there was crudence, then in saying that the sensory-motor training effectiveness in promoting body image will remain stable for at least eight months after the initial training period. The N for the experimental group reflected an attrition rate of twenty percent while the N for the control group showed a loss of twenty-six percent.\(^1\) No explanation was reported for these substantial losses, but they require that the results be interpreted with some caution.

One of the most widely known and clinically employed tests of visual-motor perception has been the Bender Visual Motor Gestalt Test. Kippitz added to the prolific research literature on the Bender Test by developing a refined scoring system for school age children. Several studies have reported the use of the Developmental Bender Scoring System as a predictor of achievement in the regular classroom. Bender scores were correlated with a standardized reading achievement test, a group achievement test, and human figure drawings. The result indicated that developmental Bender performance was significantly related to prediction of arithmetic achievement.

The purpose of this study then, was to determine whether there would be an increase in prediction of academic achievement among students by using both the Wechsler Intelligence Test scores and the developmental Bender scores and covarying age. The study was confined to select sample of seventy-four educable mentally handicapped students in Illinois, forty-five were boys and twenty-nine were girls. Their average age was eight years and four months, with a range of about four years. The psychometric criteria employed to select the subjects were: (1) the Wechsler Intelligence Scale for Children, all sub-tests, (2) the Wide Range Achievement Test, Reading, Spelling and Arithmetic and (3) the Bender Visual Motor Gestalt Test. The mean Wechsler Verbal and Performance IQs for the group were 73.4 and 71.3 respectively. The mean Full Scale Wechsler IQ was 69.6. The average educational levels in reading, spelling, and arithmetic were 1.4, 1.2, and 1.5, respectively, with scores ranging to the mid-third grade level. A multiple regression analysis was completed, controlling for chronological age differences. The Wechsler Verbal and Performance IQs and derived developmental Bender scores were used in the prediction of education achievement in reading, spelling, and arithmetic. The partial regression weights arrived at by multiple regression techniques minimized the error sum. The results showed that the Developmental Bender scores were negatively correlated beyond the .001 level of significance with chronological age (r=-.57), reading (r=-.41), spelling (r=-.44), and arithmetic (r=-.51). These findings would indicate
that among educable mentally handicapped children, the older the student the better the educational skills and the fewer the perceptual-motor problems are evident. The Bender scores were significantly related to Wechsler Performance IQs ($r = .38, p.001$), but unrelated to the Verbal IQs. Both the Verbal and Performance IQs were significantly related to the achievement tests. Chronological age, itself, provided an adequate measure with which to estimate educational achievement with $r$'s from .38 on spelling to .52 on reading. Gross exposure to the educational system appeared to be a viable predictor of educational achievement. Educational achievement measures for the educable retarded child were also significantly related to one another: reading and spelling ($r = .85, p.001$), reading and arithmetic ($r = .64, p.001$), and spelling and arithmetic ($r = .60, p.001$). By changing the focus of analysis from correlative measures in simple relationships to predictive measures, a closer assessment could be made of the developmental Bender scores as they relate to attainment in the educationally handicapped child. The question remains, given the chronological age and intelligence of the child, do perceptual-motor scores increase the available information sufficiently to warrant their use in educational placement and planning? A series of multiple regression equations were developed which would covary chronological age and allow for the prediction of educational achievement, with reading, spelling, and arithmetic tests being the dependent variable. The independent variables were Bender scores
and Wechsler IQ scores (Verbal, Performance, and Full Scale). Chronological age was held at a constant. By holding age constant, the equations were designed to determine if among the educable mentally handicapped level children, Bender scores would add to the understanding of educational achievement. In reading, the Bender scores did not add significantly to the prediction of reading behavior. In fact, CA alone is substantially more related to reading behavior than Bender scores: twenty-seven percent predictive variance for CA vs. seventeen percent predictive variance for Bender scores. Spelling scores were more highly related to CA than Verbal IQ, r's = .38 and .26 respectively. About nineteen percent of the predictive variance could be accounted for on the basis of Bender scores alone. The finding indicated that Bender scores did not add substantially to the prediction of spelling scores among the educable mentally handicapped sample population of this study. In arithmetic, approximately thirty-five percent of the predictive variance could be accounted in the prediction of scores although about twenty percent of the variance is accounted for on the basis of CA alone. This was the only criteria where Bender scores added to the predictive equation, increasing to thirty-nine percent the amount of the variance accounted for. Taking into consideration the results of the entire study, one notes that the finding indicates that among the educable mentally handicapped students, visual-motor skills are significantly related to attainment in arithmetic, given both chronological age and
Sullivan's study is concerned with the effects of Kephart's perceptual-motor training procedures upon a reading clinic sample, some of whom were visually handicapped with binocular fusion difficulties. Specifically, the purpose of the study was to determine the effects of Kephart's perceptual-motor training exercises upon the reading performance of eighty-two poor readers from a clinic population of average or above average intelligence, in school grades four to twelve. Second, it compared the effectiveness of training upon the reading performance of children with binocular fusion difficulties and children with no apparent visual defect. The screening method consisted of the use of the Gray Oral Reading of Paragraphs; STEP Reading Tests, forms 2A, 3A and 4A; Morrison-McCall Spelling Scale, Test 1; Wechsler Intelligence Scale for Children; and the Keystone Visual Survey Tests. One hundred and thirteen pupils (sixty-nine boys and forty-four girls) from grades four through twelve were the subjects. These pupils were treated at three instructional levels: elementary, junior high, and senior high. From that population, only remedial readers were to be included in the experiment. The final sample then included eighty-two students. Forty-one were in the experimental group and forty-one in the control group. Their IQ scores ranged from 90 to 131. The mean IQ of the experimental group

was 107.3 and 113.4 for the control group. The subjects ranged from 8.3 to 18.0 years with the mean age being 15.4 years. Most of the subjects were in the junior or senior high age range. The experimental and control groups matched in all three levels of age, grade and IQ. All of the pupils received two hours of reading instructions daily. There were six pupils in a group and four groups per instruction level. One instructor taught two reading groups. Half of the students were in the experimental group and half made up the control group. The experimental subjects were given perceptual-motor training in addition to their reading instruction. The control group received reading instruction only. The perceptual-motor exercises were conducted one-half an hour daily for six weeks. Three instructors conducted the training sessions, each working with two pupils per session. The three types of training exercises they used from Kephart's program included chalkboard exercises, ocular pursuit exercises, and sensory-motor exercises. The results of the program showed that perceptual-motor training had little effect on poor readers. Oral reading scores were close to significant (.10p.05). The Kephart perceptual-motor exercises did not improve reading performance of children with binocular fusion difficulties. It appeared that readers in the middle and upper grades do not benefit from perceptual motor training. ¹

Anthony and Edgington feel that classroom performance

is improved through movement. They say that physical co-
ordination and academic achievement are related and are to no
longer be considered speculative. In fact they go so far as
to say that this is an established fact. Their basic ideas
about perceptual-motor development are explained as it is
related to academic achievement. The same intellectual
abilities that are needed for academics must be tapped in a
physical-development program that teaches body awareness and
control, spatial relations, balance, coordination, rhythm and
learning. They say that these aspects of coordination are
not here as they are in physical-education programs which are
concerned with training that develops speed, strength, and
endurance. The child's ability to control his body parts,
separately and together, in response to verbal and/or visual
commands, involves the gross, internal controls and responses
which must be developed before the controls that are needed
for fine motor acts of academics can be expected. Every move-
ment, every physical activity, they say, is a mental experience.
Body control, coordination and organization must be learned
in a sequential order and can be taught. Organization of
self comes before organization of things and a well-organized
person is a successful person in school and in life. The rule,
then, is that training should follow an organized, gross-to-
fine sequence since all higher forms of the child's perceptual
and conceptual learning are based on his physical experiences
during his early years. Anthony and Edginton continue saying
that movements involve the reception of stimuli through the
multisensory channels which are stored and related to other stimuli that have been received. They believe that an early, well-planned, consistent, physical-coordination program will prevent the skips and gaps in the child's physical development and will produce the internal body controls that are necessary for his successful movement through life. They say that it should never be taken for granted, or expected, that elementary school students have the gross coordination and body control necessary for school success. This is not learned by osmosis. It must be taught and learned in sequential order. These authors have developed such a program built upon their ideas about early education. Three-hundred and fifty students, ranging from two and a half years through the sixth grade are trained. The beginning of the training movement develops separate parts of the body while the children are seated on the floor. Then as training progresses, movements such as "angels in the snow", crawling, creeping, rolling, walking, running, hopping, skipping, walking board, side-straddle-hop, jump the rope, obstacle walk, trampoline, volleyball skills, basketball skills and many other coordinated activities are included. They feel that skating is one of the very best physical coordination activities. It, they say, develops balance and specific motor-movement patterns that incorporate the whole body. The children in their program who are four years and older are taken through sequence activities that teach them how to skate. In their program, they find short, daily physical development accomplishes more than longer periods of two
or three times a week. In conclusion, they state that careful, sequential development of these exercises takes time and involves expense. But they say,

...the positive results are more than worth the cost, for children who receive such development programs will show improvement in body control and in classroom performance.

The learning pyramid, Potential Through Perception, has been developed as a learning program for children with specific learning disabilities and is the result of more than three years of intensive observation of children with learning disabilities, detection of their specific deficits, and the development of activities and routines designed to eliminate or compensate for each deficit. Essential for children with learning disabilities, the program has proved to be beneficial for every child, regardless of the area of exceptionality wherein he may fall, in establishing the basic motor skills necessary in forming a sound foundation for the total learning process. The program initially was implemented in a public school setting in Lubback, Texas during the 1967-68 school year. The program in its entirety was first utilized at the Heritage Hall Private School for children with learning disabilities in Lubback. At the present time, the program has been implemented into more than seven hundred and fifty individual school programs throughout the United States and in a program in England. The program was based on the following assump-

ILLUSTRATION 5

The Learning Pyramid: Potential Through Perception

Motor responses, during the first moments of life, are the basis of the learning process elevating the child from one level of achievement to the next until his full potential has been realized. It is often assumed that from the initial motor response, a sequential learning process will follow. This is not always the case, especially with the learning disability child. If there is an interruption in the development of the neurological system, varying degrees of dysfunction will be noted. The severity of the interruption will determine the degree of dysfunction, which, in turn, identifies the learning disability in the individual child. The overall objective of the program is to develop in each child the basic perceptual-motor skills necessary for progress and upward achievement in the classroom and to make necessary transference of these skills into each academic learning situation, keeping in mind that each individual skill is merely a component part in the total growth and learning process of the child.¹

Bryant J. Cratty has a clinical program called the Perceptual-Motor Learning Laboratory at the University of California in Los Angeles, California. He believes that one of the more obvious ways in which intellectual and movement capacities converge is in tasks involving the transcribing of thoughts to paper in the form of handwriting. He has worked with several children in his clinical program during the

past several years whose verbal IQs are from forty to fifty points above their performance IQs. These children evidence a considerable amount of frustration when attempting to transcribe their thoughts quickly to paper or to rapidly finish an arithmetic assignment. Their cognitive processes are average or superior, while their ability to express their thoughts in a school assignment are inferior. Yet most school tests and assignments are performed under the stress of speed. Children with visual-motor problems have great difficulty in these kinds of situations. Cratty believes that children can be aided through concrete steps to improve their visual-motor skills including tasks involving finger dexterity, hand-eye coordination and tasks designed to aid them to perceive their hands and fingers. At the same time, he says that alternate methods of expression should be open to them. Cratty believes that one of the important work methods underlying academic performance involves the ability to express the intellect through the accurate movement of the hand.¹

CHAPTER IV

SUMMARY AND CONCLUSIONS

Since the years in which perceptual-motor programs have been developed by educators and utilized with children in a school or clinical setting, there has been little agreement among optometrists, ophthalmologists, psychologists, and educators concerning the effectiveness of the use of these programs on the enhancement of academic performance and/or the cognitive development of these children.

At present, confusion seems to characterize the field. In fact, a number of visual specialists do not even agree upon their concept of vision. Some consider it a sensory function while others view it as part of a larger intersensory process. Those who are convinced of the effectiveness of perceptual-motor development and its relationship to intellectual development have developed and proposed perceptual-motor theories and perceptual-motor programs to promote their beliefs. Some other professionals who have studied this same area uphold these theories and programs, others are skeptical of or interested in them, and then there are others who are definitely opposed to them.

Since the development of these theories and the subsequent programs which are based upon the theories, researchers have been concerned and interested in them and their effective-
ness, and a great number of researchers have attempted to study the children who are being affected through the use of the program in their academic setting. This paper, which attempted to present and study the research done on these perceptual-motor programs over a five year period, 1969 through 1974, found a wide discrepancy in research findings. Some researchers who studied the effectiveness of perceptual-motor programs and their relationship to academic learning found that a significant relationship did exist: that is, that the perceptual-motor program in question did have a direct, positive and significant relationship to academic achievement. An equal number of others found that no significant relationship existed and a third group almost equal in size to the other two groups found that only an indirect or slight relationship appeared to exist. A few concluded their studies leaving the question wide open as their evidence was not sufficient to make any definitive statement. Many of the researchers concluded their studies suggesting that further research in this area was needed.

One may wonder why the studies on this topic have been so inclusive. Why did the researchers find such a variety of results? Why did no one result hold strength above the others? This researcher found a number of reasons that could explain this. First, one must consider the duration of the various programs which the researcher studied. Some of the studies were conducted over a time span of just several weeks. Others covered a year or more of experimentation. Others were backed up by several posttests which intended to follow up the effec-
tiveness of the perceptual-motor program in the years that followed its use. It is reasonable to assume that the studies which covered a longer time span were more effective and produced results which were more reliable than those which were conducted over a very short duration.

Secondly, one must look at the components of the programs which were studied. Even though each study involved the use of a perceptual-motor training program, the many programs that were used varied widely and lacked consistency in the types of training exercises that were utilized. Each professional who devised a perceptual-motor program, devised it differently according to his own orientation and frame of reference. Some of the researchers used a program which had already been established by a theorist such as Kephart or Getman. Others used only a portion of the exercises from such an already established program. Others used a section of an established and published program along with exercises they devised on their own. Finally, some researchers devised and studied the use of their own or some other unpublished and unknown program. This undoubtedly influenced and accounted for the various kinds of results which were obtained.

Another variable to be considered was the manner of selection of the population to be studied and how subjects were placed in the experimental and control groups. The location in the United States where the population lived who were subjects in the study needs to be taken into consideration. Often this was not reported in the studies; sometimes it was. Whether
or not the subjects had a learning handicap is an important factor that needs to be considered while critically reading these studies. As one noted, some children had no accounted learning handicap, many had specific learning disabilities, some were educable mentally retarded and some came from low socioeconomic backgrounds. This is an important factor. In each study, the grade level of the subjects was reported but most often the mean or median age was not. How the subjects were chosen and placed in either control or experimental groups is a consideration that needs to be taken into account. In some studies the population came from a school district and were chosen at random. Others were tested and the bottom two-thirds were the population studied. In other cases, the children from a certain institution were selected. In each study the procedure varied and needs to be considered to understand the research results. The percentages of boys and girls who were the subjects of the study most often was reported but in several cases this was not done. The number of subjects in the study also needs to be considered. A few studies involved one or more subjects and others included hundreds.

The types of tests used in the studies, their reliability and validity, and proper use also affects the results obtained in these studies. A great variety of tests was utilized for IQ testing, achievement testing, and the assessment of perceptual-motor skills. This researcher will mention most of the ones used to show the variety and multitude involved. Different researchers chose different tests to use for his cri-
terion purpose and the intent of the study itself. For IQ testing purposes, the tests varied from the use of the Slosson Intelligence Test, the Stanford-Binet Intelligence Test, the Wechsler Intelligence Scale for Children, the Lorge-Thorndike IQ Test and the Peabody Picture Vocabulary Test. The Wechsler Intelligence Scale for Children appeared to be used most often. Tests used for achievement testing purposes varied also. Tests varied from the use of the Stanford Achievement Test, the Metropolitan Achievement Test, the California Test of Mental Maturity, the Gates-McGenitie Reading Test, the N. Y. City Pre-Reading Assessment Test, the Wide Range Achievement Test, the Gates-McKillop Reading Diagnostic Test, the California Achievement Test, the Otis-Lennon Mental Ability Test, the SRA Achievement Test, to a complex teacher rating scale. The tests and diagnostic measurement instruments used for perceptual-motor evaluation also represented a variety of tests such as the Brenner Developmental Gestalt Test, the Bender Visual-Motor Gestalt Test, the Frostig Developmental Test of Visual Perception, the Kephart Purdue Perceptual-Motor Survey, the Shape-O Ball Test, the Eye, Hand and Ear Test, the Personal Orientation Test, and the Winter Haven Perceptual Forms Test. The tests that appeared to be used most often were the Bender Visual-Motor Gestalt Test, the Purdue Perceptual-Motor Survey, and the Frostig Developmental Test of Visual Perception.

One will note that the perceptual-motor programs utilized in the studies varied even to a greater extent than the tests used to assess these programs. Perceptual-motor programs
utilized include Kephart's perceptual-motor training program, the Winter-Haven Program, the Frostig Program for Development of Visual Perception, Template Training, Patterson Handwriting System, Physiology of Readiness (Getman and Kane), exercises and ideas proposed by Barbara Godfrey and A. H. Ismail, a perceptual-motor program developed by Genevieve Painter, perceptual-motor tasks developed by Janet Switzer, ones by Blum and Braverman, ones developed by Frank Clarkson and many other perceptual-motor programs which were developed by the researchers themselves. The perceptual-motor program that appeared to be utilized most often in the literature is the one developed by Newell Kephart. Taking all of this into consideration, one can better understand why no definitive results were able to be obtained. Since the perceptual-motor programs and the instruments used to evaluate the programs differed so widely among the studies themselves, it would be almost impossible to obtain one definite conclusion. If one was to be obtained, it ought to be seriously questioned.

Another consideration to be dealt with is whether the perceptual-motor program utilized by the researcher supplanted in whole, in part, or not at all the regular academic program in the classroom. In most of the cases studied, the perceptual-motor program was utilized along with but at a different time than the academic program whether it involved reading, mathematics, spelling, penmanship, etc. In most cases the perceptual-motor program did not supplant the regular academic program at all. The perceptual-motor program was often utilized in a dif-
ferent setting, at a different time of the day, or during the
regular physical education time at the school. It was even
utilized in the home setting.

One must investigate the types of pre-training that
the teachers were engaged in prior to the beginning of the
study. Some of the perceptual-motor programs, such as Kep-
hart's, are of such a nature that a pre-training program for
teachers who utilize the program seems an absolute necessity
for its effectiveness. Yet, in most of the research reports
this was not even mentioned. It seemed almost as if when read-
ing the literature, that this was presumptive. This may not
have been the case because this researcher does not know. In
a few studies, mention was made that a pre-training program was
held for those teachers who utilized the perceptual-motor train-
ing program. In a few cases, it was stated that well trained
physical education teachers, sometimes with a master's degree
in physical education, presided over and directed the percep-
tual-motor training of the children. In other cases, classroom
exercises involved a training program that was developed and set
up by the researcher himself. One would hope that the research-
er trained his teachers. This factor cannot be assumed and un-
less the researcher reports this, it remains unanswered.

Another vital consideration is whether the program that
was specifically designed to aid and be of benefit to a parti-
cular group of children (usually handicapped) was utilized with
this group only in the study. Many of the programs utilized
which were often designed by the researchers themselves or by
other researchers, claimed no intent on its use with a particular group of children. Theorists like Kephart, Getman, Barsch, and an educational specialist like Frostig, claim that their programs may be utilized and effective with children having no handicap. Yet at the time they designed their programs, they had a particular group of children in mind. Often it was those children who had neurological dysfunctions, gross and fine motor problems and those who had specific learning disabilities. Even though this researcher noted that the perceptual-motor programs were usually utilized with the children it was specifically designed for, instances were also noted when it was used with other types of children for whom it was not specifically designed. One has to read each of these studies with caution because of this factor. It should be kept in mind and considered when reading the results and findings of this study.

One notes, as he studies the developmental patterns of a child, that the ability to develop certain skills emerges at different phases in the growing child's life. One skill builds upon another. Unless one skill is developed, often another cannot and will not develop. Unless the young child learns to crawl and stand, the ability and skills needed to walk and run are hampered. According to research, the acquisition of motor skills is necessary in the life of a child if he is to learn. All men, Barsch says, are explorers of the mystery which their world holds. As they explore these mysteries, they learn. They learn in order to improve the efficiency
of future explorations. The greater efficiency they achieve through learning, the greater is their explorative proficiency.

Yet our affluent society with its elaborately furnished homes and preoccupied parents tends to greatly curtail the motor experiences in young children. Research tends to disclose that if these motor skills are hindered, if the child is unable to freely move about and explore his world of space, his ability to perceive is hindered. Perception skills, the ability to see and know objects by seeing, hearing, feeling, touching, etc., are directly linked to motor skills. Perceptual-motor learning tends to be the basis of all learning. A number of studies indicated that when a child's perceptual-motor skills were not developed when they normally should be, the child experienced difficulty in learning. Most children develop various perceptual-motor skills simply through trial-and-error. Some children require special training if they are to become successful with these skills. Research has shown that if the growing child is deficient in gross and fine motor coordination, his perception of forms and positions in space, his sense of body awareness, his sense of laterality and of directionality, and his figure-ground perceptions, ultimately his future learning may be hindered. Studies also show that if any of these skills are not developed, the most beneficial time for their development and remediation occurs at the pre-school or primary grade levels. Hence, the importance of kindergarten can be seen. Early intervention is important because although research does not point out a
direct relationship between perceptual-motor development and academic learning, few educators would deny that there is an indirect and necessary relationship there. Numerous studies of young children with specific learning disabilities substantiate this point.

Research also indicates that it is very difficult for one to predict the level of behavioral and educational adequacy which children with deficient perceptual and motor organization may achieve. While one may be justified in ascribing behavioral or educational inadequacy in children to deficiencies in perceptual and motor organization, one can only predict poor achievement in children on the basis of very severe deficiencies in these functions. Studies have shown that many children have a compensatory potential available to them and are able to use this potential. Therefore, educators should be aware of a child's strengths as well as his weaknesses. Education should be directed at both the child's strengths and his weaknesses because of this ability to use strengths to compensate for weaknesses and because the strengths can help to build up the weaknesses.

A basic overview of the research on the relation between measurable perceptual-motor skills in children and academic achievement points to the following:

Perceptual-motor skills are significant in the learning process yet perceptual-motor ability does not show a high correlation with school success but an indirect and necessary one. Research evidence strongly indicated the child needs to
learn how to apply his sensory and motor organization skills to the special educational task. Help for failure in basic educational attainments would therefore seem to be best directed at those attainments themselves. It is worth pursuing the implications of this statement, because they can, in fact, lead one back to the need for training in sensory and motor organization. While the basic premises of the two special educational orientations are very different; (1) teach reading if the child cannot read, (2) use perceptual-motor training exercises to aid reading, it is interesting to note that the practical outcomes of their applications are not so dissimilar. If one looks at the child's failings in basic educational attainment and analysis of what he can and cannot do, one may well trace the child's problem back to deficiencies in the perceptual-motor organization components of the educational task. One may find himself teaching visual or auditory or motor organization.

Remediation of perceptual-motor deficits can be accomplished through specific training programs. The key to eliminating learning disabilities is not only in identifying and remediating perceptual-motor deficits. The child may be brought up to the level where he is perceptually ready, but this is no guarantee that he will automatically and immediately improve in academic achievement. He must further learn academic and conceptual skills if he is to improve in these areas too.

Perceptual-motor skills are translatable directly into identifiable kinds of competencies. They may not necessarily
be school related competencies though. A child with a perceptual-motor deficit may do quite well in school while another may not. While all academic problems cannot be traced to a perceptual-motor problem, some academically disabled students' problems are centered around perceptual-motor deficits.

A perceptual-motor deficit may be identified on a standardized test but yet many are not. Educators do not as yet know all the elements of the perceptual-motor ability.

Test of laterality, directionality, and dominance have shown that they are unreliable predictors of school reading success although many still believe they are very significant factors. Motoric training in laterality, directionality, balance, and body image have a high priority in the preschool curriculum. Perceptual-motor evaluation are in preschool programs to aid in the planning of an effective curriculum for young children. Research has shown that the younger the child is, the more he profits from perceptual-motor exercises. Children younger than eight to nine years old profit the most from these programs. The child whose major deficits are in the visual-motor channels of communication at either the integration or representational levels makes greater progress under a perceptual-motor program of training than the child with other types of learning disabilities.

Due to the great variety of inconsistencies noted among the many research studies and the unsound methodological procedures used by some of them, the safest conclusion that
can justly be reached at this time is that it is still too premature to draw any definitive conclusions regarding the relationship between perceptual-motor training programs and academic achievement and/or cognitive development. Further research in the immediate future, hopefully, will help educators draw more accurate conclusions.

Since it is understanding that sets man above the rest of sensible beings and gives him all the advantages and dominion which he has over them, it is certainly a subject worth the labor to inquire into.

John Lock (1960)
SELECTED REFERENCES

BOOKS


Ebersole, Marylou; Kephart, Newell C.; and Ebersole, James B. Steps to Achievement for the Slow Learner. Columbus, Ohio: Charles E. Merrill Publishing Co., 1968.


JOURNALS


Gruber, J. J. "Significance of Motor Experience as Basic Education." Education 93 (Summer 1972) 39-41.

HallewIll, W. and Solon, H. A. "Effects of a Supplemental Perceptual Training Program on Reading Achievement." Exceptional Children 38 (April 1972) 613-621.


Heath, Earl J. and Bender, Miriam L. "Developing Perceptual-Motor Skills." Academic Therapy 4 (Summer 1971) 413-416.


Serwer, Blanche L.; Shapiro, Bernard J. and Shapiro, Phyllis P. "The Comparative Effectiveness of Four Methods of Instructions on the Achievement of Children with Specific Learning Disabilities." Journal of Special Education 7 (Fall 1973) 241-248.

Shankman, A. L. "Are Poor Reading Skills a Symptom or Disease?" Academic Therapy 10 (Fall 1974) 83-91.


