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A COMPARISON OF VISUAL PERCEPTUAL ABILITIES
BETWEEN LEARNING DISABLED KINDERGARTEN
CHILDREN AND NON-LEARNING DISABLED
KINDERGARTEN CHILDREN

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CHAPTER I

INTRODUCTION

Each year children go through the regular educational curriculum and fail to reach the level expected from their chronological ages and apparent abilities. Various reasons for this failure to thrive academically have been advanced. One theory that has received wide attention in recent years is that the child who possesses average or better intelligence and fails to achieve may have failed to attain an average or greater level of perceptual development. Two frequently used terms in describing this condition are minimal cerebral dysfunction and/or learning disability. Estimates have been made that from twenty to thirty per cent of the present elementary school population is hampered by some perceptual dysfunction (Tyson, 1969; Tarnopol, 1969).

It is imperative to identify this condition in the child as early as possible in his school career. If the problem is diagnosed before the child learns to read, and if proper remediation is given the child has a greater chance for successful achievement. Emotional problems resulting from failure to learn can also confound the original issue and make later correction more complex. The longer the problem is undiagnosed and remediation is delayed the less are his chances for educational success.

> The percentage of children with learning disabilities who are habilitated is very high for those started by first grade and falls off each year beyond first grade. It has also been noted that after third grade the rehabilitation rate decreases quite rapidly (Tarnopol, 1968, p. 8).

Schools are faced with the problem of educating all the children that enter the system. For the children who do not progress it is necessary to recognize the areas of disability and make recommendations for correction or compensation for lowered performance.

The present study investigates the relationship between the visual perceptual abilities of kindergarten children and their level of academic performance. The following aspects will be considered.

1. The visual perceptual level of the student, in the areas of visual reception, visual association, visual sequential memory, visual closure and visual motor skill.

2. The student's academic achievement.

3. The student's measured intellectual level.

This investigation is designed to determine to what degree visual perceptual inability is related to failure to achieve academically at the kindergarten level. Also if significant correlations occur among the visual perceptual measures and the standardized instruments used in the school system, these instruments could be used as diagnostic indicators in the future. The focus in the school system should be early recognition of the behavioral manifestations of the various aspects of perceptual dysfunction. This is essential for correct placement and educational planning for remediation.

Background of the Problem

The review of the literature for this study falls in two major areas. The first is the basic work done in perception and brain injury. The second area is that of minimal cerebral dysfunction or learning disabilities. Much of this research has developed out of studies using brain-damaged individuals.

Basic Studies in Perception and Brain Injury

In 1947 Strauss and Lehtinen compiled the results of twenty years of research with children who showed intellectual and behavioral problems as a result of brain injury. The report emphasized the effects that brain injury had on perception.

They described perception as a mental activity, intermediate between sensation and thought. It is the process by which phenomena are organized and understood. Normal perception involves the ability to attend to a foreground figure against a background of simultaneous sensations. As the organism develops, the ability to organize and integrate proceeds from simple to complex structures, but it retains the same characteristics of wholeness and relatedness of parts to parts and figure to background. As the nervous system becomes more differentiated during growth, more details can be integrated and larger and more complex wholes are perceived.

In addition to the underlying physiological aspect of perceiving there are individual differences in perceptual functioning. For example, some individuals prefer visual cues rather than auditory in learning new skills. Other individuals may recall events in terms of kinesthetic cues rather than visual or auditory perceptions.

> These two aspects of perception, the genetic development and the differences of individual perceptual organization, should be kept in mind for the understanding of perceptual functions in an organism whose nervous system has been injured (Strauss and Lehtinen, 1947, p. 31).

Strauss and Kephart (1955) presented results from cases of brain-injury in children where a measured intelligence remained normal. They stated that the most important aspect of perception is to determine the relationships between things. The senses supply the information and the central nervous system analyzes these relationships. Perception involves integration from various sense modalities and between present and past sensory impressions. Perception involves both input and output. A disturbance in perception may occur in the sense organs, in the integration processes of the central nervous system, or in the response mechanisms.

Strauss and Kephart (1955, p. 78, 79) emphasized vision in their discussion on perception.

> Such a procedure is justified because of the extreme importance which vision has for our knowledge of the world around us. We depend on vision as on no other sense mode for data concerning our environment. We organize the impressions from the several modalities around vision in completing our perceptual impressions. Vision becomes the core of our perceptual world. The organism has selected vision for this primary role because of its unique efficiency and its ability to give us more information more quickly than any other sense mode.

Piaget (Flavell, 1963; Piaget, 1969) has proposed a theory concerning intellectual development. He has described major developmental periods and the operations found in each. The period of preparation for and organization of concrete operations is from ages two to eleven. The subperiod of preoperational representations is from ages two to seven and this subperiod is divided into three stages.

> (1) Beginnings of representational thought (2-4); (2) simple representations or intuitions ($4-5\frac{1}{2}$); (3) articulated representations or intuitions ($5\frac{1}{2}-7$) (Flavell, 1963, p. 86).

During the preoperational subperiod the child changes from using sensory-motor, overt functions as his most intelligent acts to use of inner symbolic manipulations of reality as his highest cognitive function. Adequacy of sensory-motor development is needed for higher intellectual development.

Piaget (1969) discussed the relationship between perception and intelligence. He stated perceptual mechanisms have their roots in the physiology of the nervous system and the several levels of perceptual activity merge into elementary adaptations of intelligence. Sensory-motor intelligence precedes representational intelligence, while perceptual activity does not precede sensory-motor activity but is contemporaneous with it. It is a special case of sensory-motor activity.

A concept of perceptual equilibrium was presented by Piaget (1969). He described it as an interaction process between subject and object due to an endless construction of new schemas by the subject during his development.

> What, then, is the nature of such exchanges, and to what extent do they allow us to think of perception as being adequate to the object? The same conclusions apply to perception as to all knowledge: (1) objectivity is constructed on the basis of, and in proportion to, the activities of the subject; (2) the initial state of each process does not provide the properties of the object but an undifferentiated mixture of the contributions of the subject and of the object; (3) it is by decentering himself from these initial states that the subject succeeds in gaining control over his structures, by coordinating them, and in simultaneously attaining the specific characteristics of the object by correcting deformations produced by his initial centrations. . . . Thus the dual nature of perception recurs throughout this work. Source of systematic errors on the one hand, but mirror and indirect prefiguration of intelligence on the other, perception enjoys no special privileges in conquest of the object. To the extent that it attains the object here and now, which is its original function, it runs the constant risk of deforming it, as in the effects of centration; to the extent that it grasps the object with a relative adequacy, it takes its place in the general current of cognitive structures which, from sensory-motor to operational levels, obey common

> functional conditions, one of the most remarkable of which is that of decentration (Piaget, 1969, p. 364, 366).

Perception is an integral part of the cognitive process. Injury to the brain has been found to have a disruptive effect on an individual's perceptual functioning ability.

Studies of Minimal Brain Dysfunction

Blumberg (1967) reviewed the historical literature on minimal brain dysfunction and found studies prior to 1920 were limited and focused mainly on adults. Studies concerning children with epilepsy, cerebral palsy or mental retardation developed the understanding of specific differences in perceptual, educational, and personality characteristics among these different groups.

In their clinical observations of children, Strauss and Lehtinen (1947) found some who exhibited behavior similar to brain-injured adults. Further investigation of children with "peculiar perceptual responses" showed a history of injury to the brain. Observation of many cases clearly supported the notion that the perceptual disturbances were causally related to the brain-injury (Strauss and Lehtinen, 1947, p. 30).

To gain a better understanding of these observations they constructed tests requiring solution by visual perception, and expression of the solution by a motor act on a marble board test so that the process could be observed. They were able to differentiate three kinds of procedures.

The first was an orderly and global type of procedure that is found in young normal children or in mentally retarded children, whose defectiveness was not caused by brain injury. Improvement in correctness and completeness was in relation to genetic levels of visuomotor development. The second type was a disconnected and erratic procedure which was used by brain-injured children with normal intelligence or brain-injured mentally retarded children. They termed the third type as the constructive kind of procedure and it was used by children with exceptional visuomotor performance. Incorrect performance of the global type was attributed to immature perceptual organization,

> . . . which is adequate at certain developmental levels, which will proceed toward higher organization and articulation with growth in mental age. The incoherent performance of brain-injured children is the result of pathological disturbances of nervous integration and has no parallel in the incorrect procedure of immature normal or subnormal children (Strauss and Lehtinen, 1947, p. 34).

In other studies by Strauss and Lehtinen (1947) brain-injured children showed perceptual disturbances in auditory and tactual-motor sense modalities as well as the visual perceptual area. A major observable symptom of perceptual dysfunction was distractibility. They also described perseveration as a second clinical symptom often found in brain-injured children.

Strauss and Kephart (1955) discussed the possibility of one sense taking over for another when the latter is impaired. They stated that other senses can take over only to a degree if a higher sensory modality cannot function.

> For this reason, in brain-injured children, where perception is very frequently impaired, we must make every effort to increase the efficiency of the highest impaired sense rather than attempt to substitute another sense modality. Hence the extreme importance of visual perceptual training in the brain-injured child (Strauss and Kephart, 1955, p. 88).

Blumberg (1967) noted a growing awareness since the early 1950's of the similarities between children with learning disabilities and youngsters with clear-cut brain dysfunction, not resulting in cerebral palsy or mental retardation. Professionals working with children who had neurological or behavioral indications of perceptual dysfunction started compiling research results and educational techniques in an attempt to coordinate their efforts.

In 1962 the Second National Northwest Summer Conference was held and a publication edited by Hellmuth (1964), presented the results. This volume brought together theories on diagnosis, treatment and education of the neurologically impaired, mentally retarded and learning disabled child. The conference was designed to aid professionals involved in various diagnostic and treatment programs of these children.

Getman (Hellmuth, 1964) discussed the importance of the visuomotor complex in the acquisition of learning skills. He stated that visual perception is learned and is based upon developmental sequences of physiological actions of the child. He stressed the importance of realizing that vision evolves from actions of the entire organism. For example, there is a strong visual component within the speech-auditory complex.

> This component is called visualization by optometrists, and visual-memory or visual imagery by psychologists. Whichever term is most suitable, it now appears that some sort of recall of either specific detail, or relatedness to significant details that can be associated to the problem of the moment, is essential to the completion of the cognitive act . . . The Speech-Auditory Process then is the relationship that can be developed by the child between his primary experiences and his actual or visualized participations in all aspects of language. When this visual component is fully developed, language can then become the economical and effective substitute for actions and decisions involved in orientations and communications with others (Getman, in Hellmuth, 1964, p. 53, 56).

Blumberg (1967) cited a conference held at the University of Illinois in January of 1963, as presenting special emphasis on children with minimal brain impairment. One of the important concepts presented was that the affected sense modality causes lack of control and distraction in the child and a resulting difficulty in sustaining attention.

Since 1963 there has been a marked increase in recognition of the child with average or above average intellectual ability who failed to learn because of some sensory impairment. More attention was focused on the child's lack of functioning, especially in the academic area, rather than on the cause of the dysfunction and the term learning disability developed. With some youngsters who are not achieving academically there is no clear-cut evidence of neurological impairment.

Yates (1966) reviewed the literature from 1960 to 1964 on brain-injury and performance in adults and children.

Many areas were covered with special attention to the minimal brain damage syndrome in children. In his review Yates defined minimal brain damage as effects of trauma before or during birth on brain integrity or efficiency of functioning. A relationship was found to exist between the effects of pre- and post-natal trauma and perceptual-motor impairment. Yates stated that progress in developing tests in this area has been slow because of the difficulty of separating the brain-injured from the retarded child.

Soviet studies (Zaporozhets, 1965) in the development of perception have aroused much interest. Soviet researchers concluded that a child's ability to solve various sensory problems depends upon the development of the child's perceptive activity or ability to acquaint himself with the objects he perceives. Zaporozhets (1965) stressed that a child's perception does not develop spontaneously,

> . . . it takes place under the influence of practice and learning, in the course of which the child assimilates social sensory experience and joins the sensory culture created by mankind . . . Our studies show that the process of sensory learning can flow chaotically and not be productive. But if you can organize the process in accordance with the psychological regularities of the stage of formation of perceptive actions, the effectiveness of learning can be raised (pp. 101-102).

Flavell and Hill (1969) noted in a review of the literature on the cognitive processes in perception that studies of spatial orientation and intermodal phenomena have dominated perceptual development literature in recent years. Part of the impetus has been to understand the perceptual problems involved in reading. They reviewed research in discrimination learning which involved the capacity of five and six year old children to perceptually register the differences between forms.

> It appears that if the child is required to create and store a representation of the stimulus (e.g., to draw it, to re-identify or recognize it over trials), he is likely to experience considerable difficulty. On the other hand, if he must simply indicate by gesture the directional or orientational properties of each member or match one of them to a standard he performs much better (Flavell and Hill, 1969, p. 8).

To attain academic success children are often required to store and reproduce stimuli. Ability below the level expected of children this age could be a detriment to learning. In their review Flavell and Hill concluded there are large gaps in understanding how the various senses interact to produce knowledge of the world.

Elkind and Sameroff (1970) in a review of the literature on perception presented results which showed preschool children had more difficulty attending to incoming stimuli than did older children or adults. Other studies reviewed suggested scanning activity is related to ability to judge similarities and differences with respect to visual stimuli. By utilization of eye movement photography it was found that children below age six failed to scan the configurations systematically and made many errors. Zaporozhets (1965) reviewed a series of Russian studies and reported similar results from photographing eye movements of children. Elkind and Sameroff (1970) presented results which suggested that scanning was improved in preschool children when they were given cognitive structuring in the form of a story about the stimulus. This suggests that educational techniques could be developed to aid scanning activities.

Studies with adults contributed to understanding some aspects of brain dysfunction. Birch and Belmont (1964) examined sixteen normal and eighteen brain-damaged adults. The two groups did not differ significantly in intrasensory abilities but the differences were significant on intersensory tasks. Later stages were more effected by brain damage than primary capacities. In normals there was a positive relationship between the ability to perceptually analyze and to utilize intersensory abilities. Some brain-damaged patients retain perceptual analytic ability but cannot use intersensory information.

Wunderlich (1967) explored the developmental aspects of learning disorders. He stated:

> In order to have complete neurologic, perceptual, and behavioral function, an individual must be totally neurologically differentiated. Differentiation of ability is a function of basic brain quality, rate and adequacy of myelination of nerve tissue, endogenous growth and maturation, environmental opportunity for practice, and an awareness of what one is doing . . . Cerebral dysfunction is a roadblock of varying proportion which interferes with change; it is a major cause of failure to progress across developmental barriers. Cerebral dysfunction is often responsible for poor school achievement (pp. 701; 705).

This lack of achievement can be from the secondary effects rather than the basic dysfunction. The attitudes and feelings of those around the child engendered by his failure to learn may result in negative interactions with others and a lowered self-esteem of the child.

> Years later, it becomes difficult to separate the secondary psychic symptoms, the effects of chronic deprivation, the perceptual inadequacies, and the malformed ego, from the primary neurologic deficit (Wunderlich, 1967, p. 706).

Realization of the many far reaching effects makes early and accurate diagnosis of primary importance. The diagnosis must have the purpose of aiding the child in attaining better learning experiences and not be used as a means of labeling the child. The possibility exists that a child who is performing well according to his abilities could be labeled as having a learning disorder because he cannot fulfill parental expectations.

> The common denominator in most learning disorders is a developmental fixation at a primitive level of function. This seems to hold true here whether the prime problem is brain damage, improper environment, chronic psychic stress, or heredity. Consider the frequent application of the term 'immature' to children who have problems in the classroom. This concept of failure to progress beyond certain developmental levels is a useful one and may refer to total overall function, or only to an isolated skill (Wunderlich, 1967, p. 707).

Ames (1969) examined the relationship between perceptual problems and developmental level as measured by the Gesell Incomplete Man Test and the Lowenfield Mosaic. Ames recognized the close relationship between development and perception.

> Perceptual level and developmental level are intricately intertwined. Many of the tests which measure developmental level, even as many so-called projective tests, do depend on perceptual functioning, which in itself depends on how far the child has developed (Ames, 1969, p. 32).

Twenty-five second graders from each of two schools were judged to be in need of perceptual training. These two groups were compared with a control group of twenty-five second graders from a third school. She found that children judged perceptually immature or inadequate on the Bender Gestalt test also measured below expected level on developmental tests. The developmental responses of these children were improved as a result of perceptual training in the classroom. This does not mean a child's development was speeded up but that he was able to perform at the higher part of the developmental range that was available to him.

> Equally important is the obvious fact that children who are way behind developmentally, unless some curative measure such as repeating a grade or perceptual training is provided, fall increasingly far behind as time goes on (Ames, 1969, p. 32).

The emphasis of the present study is on examining the visual perceptual developmental level of kindergarten children. Frostig (1963) and Frostig and Maslow (1968) have done extensive work in this area. Frostig (1963) stated that one of the major causes of perceptual disabilities in children was undoubtedly brain damage. In her discussion of remediation, Frostig concluded it was more important to know the quality of the deficit than to know its cause. The primary goal is to gain the information in the preschool and early school years when perceptual development is at its maximum. The results obtained from using the Developmental Test of Visual Perception with 2000 public school children showed that different visual perceptual areas were disturbed separately and in varying degrees, indicating that perceptual disturbances are not always a general category. Frostig concluded:

> These findings all seem to confirm our impression that the development of visual-perceptual processes is the major function of the growing child between the ages of three and seven, and that at this age level perceptual development becomes a sensitive indicator of the developmental status of the child as a whole. If a child with perceptual disabilities can be detected and specific perceptual training initiated, he might be expected to benefit in toto, rather than in perception alone (1963, p. 671).

In recent years extensive studies have been compiled examining the various facets of brain damage or learning disability in children. Tymchuk and Knights (1969) published a two thousand item bibliography to provide a reference list for those interested in classifying, determining causes, diagnosing, and treating children who are termed as having brain damage or learning problems. In 1969 Chalfant and Scheffelin (1969) published the results of a two year study reviewing scientific knowledge regarding children with learning disabilities. Five thousand articles were reviewed. The purpose was to summarize current knowledge and indicate gaps in understanding. One of the major problems encountered in compiling this review was the large amount of literature. The published work cited 848 references and a total of over 3000 references are on file. The report focused attention on behaviors that are attributed to dysfunction of a central processing mechanism.

> More specifically, this report attempts to summarize the present status of knowledge and identify future research needs with respect to the analysis, storage, synthesis and the symbolic use of information (Chalfant and Scheffelin, 1969, p. 2).

In their review of research on visual processing they described visual perception as the process for receiving, integrating, and interpreting or decoding visual stimuli. The chapter was concerned with subjects who can see but experience difficulty in some part of the visual perceptual process. The visual processing mechanism was seen as consisting of "(a) the ocular-musculature as an adjustor; (b) the eye as a transducer; and (c) the cortex as a visual processor" (Chalfant and Scheffelin, 1969, p. 21).

Visual processing tasks range from the reception of visual stimuli to the cognitive tasks which require analysis and synthesis of visual information. Motor development is considered an essential component in the development of vision.

> There are several assumptions which have been made about the interrelationship between visual perception and motor ability. The first assumption is that visual perception is dependent upon learning gross motor skills . . . Another assumption which has been made with respect to the development of perceptual-motor skills is that if a stage of the developmental sequence is not attained, failure will be experienced at higher stages. Brain-injured children who have failed to develop motor

> abilities, for example, are believed to have gaps in their developmental patterns (Chalfant and Scheffelin, 1969, p. 27).

Research supporting the hypothesis that basic perceptual-motor training will result in improved academic performance or perceptual-motor skills was not found to be conclusive.

Visual discrimination tasks were found to be easier to answer if the subject was given time to study the stimulus figure. Visual discrimination was described as one of the first steps in visual processing. It is often used as one of the first steps in assessing performance and/or possible disturbances in the visual processing complex.

Chalfant and Scheffelin (1969) stated that there have been few studies which attempted to differentiate the visual-perceptual performance of brain-injured children from the performance of non-brain-injured subjects. Many of the studies done to date have compared brain-injured with retarded rather than normal subjects.

There are a variety of disorders that interfere with visual processing. The behavioral symptoms that ensue from the various dysfunctions represent different kinds of cognitive tasks. This indicates a differential approach to treatment and compensation is necessary. Visual processing tasks with which the child is successful should be noted as well as those that are unsuccessful.

Since visual perceptual skill is necessary for achievement in academic areas it is necessary to learn more about this ability in children as they encounter the formal educational process. To date this area has received little attention.

> Most of the research on dysfunctions in the processing of visual stimuli has been done with the adult population. Comparatively little work has been done with children. An important issue which needs to be resolved through future research is whether or not certain dysfunctions can be ameliorated through remediation as opposed to providing compensatory mechanisms for adjustment in the subject's areas of strength (Chalfant and Scheffelin, 1969, p. 35).

Several studies have focused on visual-perceptual ability and its relation to reading skills. Birch and Belmont (1960) relate inability to read to inadequate visual-perceptual ability at the higher integrative levels of analysis and synthesis. They consider perception to be a developmental process with the basic level being discrimination, the next level being visual analysis and a later level being visual synthesis. They report that neurological damage interferes least with the discrimination level but can cause difficulty in the other perceptual levels.

Birch and his associates have done extensive work in the development of perceptual abilities in the brain-injured and in the normal child. Their theory is that development is lawful and age-specific with regard to the ability to utilize information.

> Normal children are characterized by the development of increasingly effective equivalence among the sensory systems, the course of which appears to be as regular as that found for normal somatic growth (Birch and Belmont, 1965, p. 135).

Inability in normal sensory integration results in learning difficulties. The ability to integrate information from one sensory modality seems to be more primitive than ability to integrate information from two or more sensory modalities (Birch and Lefford, 1964).

Birch and Bortner (1966) reviewed sorting and grouping behavior of normal and brain-injured children at different developmental levels. They found that younger children were inclined to sort by stimulus properties. Older children sorted on the basis of membership in a class or function. Their conclusion was that brain-damaged children and younger children tend to be less abstract and more concrete in their approach to problem solving.

Birch and Lefford (1967) conducted a study using a group of normal children, 73 boys and 72 girls, ages 5 through 11 years. They used tasks designed to examine a child's visual-perceptual ability in three levels of perceptual organization: recognition, analysis, and synthesis. They discovered three general changes which characterized the perceptual and motor functioning of children between the ages of 5 and 11: (1) Ability to integrate information from different sense modalities increased with age, reflecting improved development in intersensory integration and a fundamental change of afferent processing with age. (2) Children from the ages 5 to 11 improved in their ability to deal with differential aspects of visual stimuli. (3) As age increased the child became increasingly capable of treating ancillary visual information as a facilitator rather than as a distractor in motor performance.

> We would prefer to interpret the developmental process as one in which the core dynamic factor of development underlying the functions studied is the improvement in intersensory relation. Such a view would be in accord with the phylogenetic evidence, which suggests that improved intersensory organization is critical for the development of refined and modulated adaptation to the surrounding environment (Birch and Lefford, 1967, p. 81).

From Birch's studies he concluded that intersensory growth curves ascend at a slower rate in brain-damaged children. This incapacity limits their ability to learn.

Deutsch and Schumer (1970) conducted an extensive modality-oriented exploration of performance of brain-damaged children. They studied the performance of brain-injured children of normal intelligence who lived at home and attended public schools. They were compared to a group of 39 intact children of average intelligence, who were matched with the other children on age, sex, and socioeconomic variables. Each child was given an extensive battery of tests involving unimodal, multimodal and perceptual-motor procedures. They found brain-damaged children performed near the level of the intact comparison group on simple or unimodal tasks in the visual and auditory areas but not in the tactual modality. Also, significant differences between groups were found on the two perceptual-motor tasks. These tasks required intersensory integration. They found that the characterization of the brain-injured child as having a general perceptual impairment was not borne out by their data. Some of their findings indicate:

> Training and education for attention, sustained set and discrimination may be one of the most effective methods for improving general performance levels (Deutsch and Schumer, 1970, p. 145).

The methods for teaching these skills to brain-injured children may differ from those used with intact children. Also the decision needs to be made whether the assets or deficits should receive the focus.

Greenberg (1969) studied the correlation between visual analysis and synthesis and the relationships of each to more complex tasks in a group of 80 children in the 5 to 7 year range. Visual analysis and visual synthesis ability were found to effectively predict performance on the complex tasks independent of verbal ability and social class.

> Piaget's theory holding that the development of perceptual decentration and increased flexibility lead to greater accuracy, was considered the best explanation of the underlying relationship between performance in Visual Synthesis and Analysis. Results underlined the close interrelationships between perceptual and intellectual processes. Perceptual accuracy was needed to solve the complex tasks, but, also, the level of operational thinking and conceptual understanding probably influenced the accuracy of perception, as Piaget claimed (Greenberg, 1969, p. 4274-A).

How visual perceptual level effects academic performance was examined by Coleman (1968). He tested the hypothesis that language development and reading skill deficiencies in children are related to their visual perceptual development. Eighty-seven children in grades one through six with severe language and reading deficits were evaluated to determine their visual perceptual developmental level. Nearly half of the group had significant visual perceptual dysfunctions that were severe enough to interfere with learning. Coleman (1968) stated that a great deal of evidence indicated visual perceptual abilities are major keys in a child's development and the development of his ability to learn. He concluded:

> It is the author's contention that a thorough analysis of the visual perceptual aspects of the child will aid in an understanding of his educational potential, reveal hidden disability, and establish a base for compensatory educational techniques to aid in overcoming these deficits without loss of ability or ego strength (Coleman, 1968, p. 121).

Silver and Hagin (1970) also described children with language skills below their intellectual level and educational experience and with intact peripheral sensory apparatus.

> The defects in visual perception that are associated with delayed acquisition of reading include defect in visual discrimination, in visual-motor ability, and in visual memory (Silver and Hagin, 1970, p. 446).

Silver and Hagin conducted some studies to discover what happened to children with reading disabilities after maturation. A follow-up study was done on twenty-four subjects originally diagnosed ten to twelve years previously. They found that as young adults this group still maintained a deficit in reading skills.

Tyson (1969) discussed the role of the educational psychologist who is involved with children displaying delayed visual perception. She stated that research indicated nearly 20% of the children in school have problems in following the regular curriculum. Since visual perceptual skills are necessary for some of the basic school tasks, such as reading, they need to be recognized. Tyson quoted research stating there is a positive correlation between visual perceptual ability and learning to read of the same order as that between reading progress and mental age.

Erickson (1969) devised a study using 325 seventh grade males, measuring those students who were inclined toward vision and visual imagery and those who preferred to use kinesthetic and tactile sensory experiences. He found that the non-visual seventh graders were more than a year below the visually-oriented group in mean reading level. Erickson concluded that the preference for the non-visual modalities at this age level was due in part to a failure in early perceptual development.

In summary of the preceding review of the literature some basic concepts can be formulated. Perceptual dysfunction has been shown to be one of the major causes for failure to achieve academically among children with average intelligence. In recent years children who are in this category have been designated as having a learning disability or a minimal cerebral dysfunction (see Appendix I). Disturbances in perceptual development hinder ability to function at an optimal level and appear to effect intersensory ability. It is important to diagnose these dysfunctions at an early age so correct placement and remediation can be implemented before the child begins to experience failure and secondary problems arise. Visual perceptual development is crucial to the ability to learn and a deficit in this area may be one of the primary reasons children of average intelligence fail to achieve academic success.

Recognition of the importance of early detection of perceptual handicaps caused attention to be turned to methods for diagnosis. Deutsch and Schumer (1970) reviewed the literature on testing brain-injured groups and concluded that testing of specific rather than general factors was more informative in obtaining information to be used in training and education.

The present study focused on visual perceptual development in kindergarten children. The remaining review of the literature concentrates on the instruments used in the present study. The instruments were the Bender Visual-Motor Gestalt Test and the visual subtests from the Illinois Test of Psycholinguistic Abilities.

Bender Visual-Motor Gestalt Test

The Bender Visual-Motor Gestalt Test was developed as a clinical test to assess visual-motor perceptual functioning. Bender (1938) stated that the test showed a visual-motor maturation level in children.

> The visual motor Gestalt function is a fundamental function associated with language ability and closely associated with various functions of intelligence such as

> visual perception, manual motor ability, memory, temporal and spatial concepts, and organization or representation. (Bender, 1938, p. 112.)

In 1962, Clements and Peters published an article stressing the importance of heeding subtle organic deviations. They used the Bender Gestalt Test as a measure of visual perception and visual-motor coordination and stated that they regarded it as essential in obtaining a correct diagnosis.

Koppitz (1964) integrated the research on children and published the results of a series of studies exploring the use of the Bender Gestalt Test as a perceptual and projective test for all children ranging in age from 5 to 10 years. The published work, The Bender Gestalt Test for Young Children, presents an objective scoring system which was standardized on more than 1200 public school children. Bender scores decreased steadily between the ages five and nine reflecting the effect of visual-motor maturation during this period. Bender distortions occur normally at some point in a child's development. It is the presence of a deviation past the expected age and level of maturation that becomes diagnostically significant.

The Bender test has also been used as an indicator of emotional disturbance in children. Koppitz (1964) reviewed several studies, conducted her own research, and concluded the Bender could differentiate significantly between emotionally disturbed and non-emotionally disturbed children. However, this use of the Bender has been questioned by other studies. For example, McConnell (1967) and Quast (1961) conducted studies assessing the Bender's ability to detect organicity and emotional disturbances. Both studies found the Bender scores related significantly to organic but not emotional problems.

Tarnopol (1969) and Clements (1969) included the Bender Gestalt test as an essential measure to be used in assessing the presence of educational handicap. Silver and Hagin (1967) also successfully used the Bender Gestalt Test to assess visual perceptual integration ability in the visual-motor area.

Willis (1970) compared kindergarten, first, and second grade lower class and middle class children on conceptual and perceptual tasks. It was found that Bender scores decreased progressively with age. Social class was found to have an influence on Bender scores at each age level.

> Results of the Bender data clearly demonstrate that LC [lower class] Ss function less efficiently on visual motor perceptual tasks, though the results do not determine what cultural and socio-economic factors influence performance on the Bender (Willis, 1970, p. 75).

<u>Illinois Test of Psycholinguistic Abilities (ITPA)</u>

A developmental analysis of minimal brain dysfunction was outlined by Schwalb, Blau and Blau (1969). They maintained that the examination should be designed to discover a child's abilities as well as deficiencies in order to give information enabling the educator to devise educational and remedial techniques. They stated that part of a successful educational program is further analysis of deficit areas by such an instrument as the ITPA. The four visual subtests of the ITPA, Visual Association, Visual Reception, Visual Sequential Memory, and Visual Closure, were used in the present study. Tarnopol (1969), Clements (1969) and Frostig (1963) included the ITPA as an essential measure to be used in assessing a child's abilities and specific disabilities.

The ITPA was developed by Samuel Kirk and published in experimental form in 1961. It originally contained 9 subtests and later was expanded to include 12. This revised form was published in 1968. Kirk explained that the test was developed to fulfill a need for a diagnostic instrument in "symbolic and nonsymbolic psychological processes which will give cues to remediation" (Kirk, 1966, p. 17).

Bateman (1965) reviewed ITPA research and found most of it had been done with cerebral palsied, aphasic, deaf, and/or mentally retarded children. She reported a relation between reading disability and deficits in the integrating abilities of closure, sequential memory, and recognition rate. Blumberg (1967) reviewed research to date with the ITPA and noted the limited scope of the studies and stated the obvious need for investigation among children with minimal brain dysfunction.

The ITPA is one of the most widely used instruments aimed at both diagnosis and planning of remediation of learning disabilities. The normative data was developed from 700 children equally divided by sex. Socioeconomic level was controlled to reflect a cross section found in the United States. No negro children or students from parochial schools were used.

The following conclusions summarize the related literature:

1. Normal or greater perceptual development is essential to adequate learning and optimal interaction with the environment.

2. Visual perceptual ability is an essential component in this learning and interacting process.

3. It is essential to detect the presence and nature of visual perceptual dysfunction early in a child's school career.

4. Standardized measures of various facets of visual perceptual ability exist in the Bender Visual Motor Gestalt Test and the Illinois Test of Psycholinguistic Abilities.

5. Research is limited in the area of determining visual-perceptual abilities of under-achieving kindergarten children.

Problem to be Investigated

The problem area was the effect of visual perceptual dysfunction on learning ability in kindergarten children. The major purpose of this study was to (1) investigate the differences in visual perceptual abilities between a learning disability group and a non-learning disability group of kindergarten children, (2) assess the ability of the visual perceptual measures used in this study to discriminate between the two groups, (3) examine the correlations between the visual perceptual measures and other tests regularly administered at the kindergarten level.

The present study used standardized visual perceptual measures to investigate the relationship between visual perceptual ability and scholastic success in kindergarten children. The following hypotheses were formulated:

1. Learning disability children have poorer visual-motor skills as measured by the Bender Visual Motor Gestalt test than do non-learning disability children.

2. Learning disability children have poorer visual reception skills as measured by the ITPA visual reception subtest than do non-learning disability children.

3. Learning disability children have poorer visual sequential memory as measured by the ITPA visual sequential memory subtest than do non-learning disability children.

4. Learning disability children have poorer visual association skills as measured by the ITPA visual association subtest than do non-learning disability children.

5. Learning disability children have poorer visual closure skills as measured by the ITPA visual closure subtest than do non-learning disability children.

6. The visual perceptual test battery consisting of the Bender and the ITPA visual subtest discriminates between

the learning disability and non-learning disability groups of kindergarten children.

7. The subtest scores of the Vane Kindergarten Test, the Metropolitan Readiness Test, the Readiness Rating Scale and the subtest scores of the Bender and the ITPA visual subtests are significantly related.

CHAPTER II

METHOD

The Oklahoma City Public School system has set up developmental classes for primary grade children who show indications of learning difficulties at the kindergarten level. Each school which offers developmental classes, screens their kindergarten children each spring to aid in determining correct placement for first grade in the following academic year.

Subjects

The subjects (S_s) used in this study were chosen from the kindergarten level of the Oklahoma City Public Schools. These children had gone through the following screening process. The Metropolitan Readiness Test and the Motor Screen test is given to all the children. During the spring semester, children who show indications of learning difficulty by the teacher's rating on the Readiness Rating Scale are administered the Vane Kindergarten Test by school psychometrists. Descriptions of these instruments are given below:

Metropolitan Readiness Test (MRT). This is an achievement test administered to aid in determining readiness for first grade (Hildreth, Griffiths, and McGauvern, 1965). A subtest score in the lower quartile is considered an indicator for developmental classes.

Readiness Rating Scale (RRS). This is a checklist devised by the Oklahoma City Public School System to obtain a systematic assessment of the child as observed by the teacher. The RRS is an instrument that is in the developmental stage and has not been standardized as yet. The child can be rated as above average, average, or below average in the following areas; Language Development, Muscular Development and Manipulative Skill, Visual Discrimination, Auditory Discrimination, Number Concepts, Attention and Concentration, and Social and Emotional Development. From the RRS an overall Degree of Risk score is computed. Refer to Appendix II for an example of the RRS.

Motor Screen Test. This evaluation is done by the school medical staff to assess a child's motor skills. The test uses a 10 point rating system with a higher score indicating more difficulty. A score of 6 or above is considered one of the significant indicators for possible learning difficulty. This instrument was developed and is being refined by Dr. Ellidee Thomas of the University of Oklahoma Medical Center, and Dr. Gloria Rogers and her staff of the Oklahoma City Public School System.

Vane Kindergarten Test (VKT). This test was developed as a measure evaluating intellectual and academic potential and behavior adjustment. The VKT is given to children who have been designated as potential High Risk learners by the Readiness Rating Scale; Metropolitan Readiness Test, Motor Screen score, and teacher recommendation. Vane (1968) reported standardization procedures and two measures of test-retest reliability. The coefficient of correlation was .97 on a one week retest and .88 on the six month retest. The Vane was measured against the Stanford Binet Intelligence Scale, LM, on two separate samples. No significant differences were found between the mean VKT IQ and the mean Binet IQ in either sample. The Vane consists of three subtests, Man IQ, Vocabulary IQ, and Perceptual Motor IQ. A Vane subtest score below 78 is considered as one of the indications for the presence of a learning difficulty.

The Oklahoma City Public schools use the following procedure to identify and place children with potential learning problems. After all the testing is completed the school psychometrists compile the results of the total testing battery and assess the number of significant indicators. Those children who have the highest number of indicators are placed in developmental classes. The school terms these children as high risk learners.

For this study, the total high risk population from four schools was considered as a source of subjects. The schools are located in middle class socio-economic neighborhoods in different geographic locations within Oklahoma City. From this group fourteen children who scored below a Full Scale IQ score of 90 on the VKT were dropped from the group; as the purpose was to examine children with average or greater intellectual abilities. This study had the special aim of examining visual perceptual abilities in children who had a measured average or above IQ score but were not achieving academically. Therefore, children who scored at or above the 65th percentile on the MRT, which is considered High Normal in achievement, were also dropped from the group. Thirteen children were dropped for this reason. Since the ITPA validity and reliability has not been established for Negro children they were excluded from this study. One child was dropped for this reason. The remaining children were designated as Learning Disability (LD) subjects for this study.

After the LD group was defined, matched sample Control (C) group members were chosen, each member being matched with an LD group member from the same school and the same classroom. Information was obtained from school records and S_s were matched on sex and age within one month above or below birthdate of the LD child. The mean age for the LD group was 69.54 months and the mean C age was 69.48 months. The control group had not been given the VKT by the school so trained examiners were used to obtain this information from the control group.

Description of Instruments

Visual perceptual development consists of a variety of skills, and measures for this study were chosen to tap different capacities. The abilities assessed by the Bender and the ITPA visual subtests are given below.

1. The Bender Visual-Motor Gestalt Test is a perceptual motor task consisting of reproducing 9 geometric models through a pencil and paper task. This test is a measure of the expressive process at the representational level.

2. ITPA Visual Subtests.

a. Visual Reception is designated as being at the representational level, tapping the receptive process. The test measures a child's ability to gain meaning from visual symbols.

b. Visual Association is also at the representational level and the process is the ability to relate, organize, and manipulate visual symbols. This test is designed to assess the child's ability to relate visually presented concepts.

Two remaining ITPA visual subtests are described as "whole level" tests which are designed to measure automatic, non-symbolic tasks.

c. Visual Closure measures the child's ability to identify an object from incomplete visual clues.

d. Visual Sequential Memory is designed to measure a child's ability to reproduce sequences of unfamiliar figures from memory.

The Bender consists of nine geometric drawings which are presented one at a time for the subject to copy on a blank sheet of paper. The Bender Gestalt test has been widely used for several years as a measure that reflects maturity in visual-motor perception in children. A Developmental Scoring System (DSS) was developed by Koppitz (1964) to aid in analyzing Bender records so the examiner can evaluate perceptual maturity, neurological impairment, and emotional adjustment.

Koppitz (1963) discussed reliability on the DSS in regards to scorer and test score reliability. Pearson product moment correlations on scorer reliability were statistically highly significant and ranged from r_{tt} .88 to r_{tt} .96. Test score reliability was tested by the test-retest method. One hundred and twelve Bender protocols were administered three months apart to two kindergarten and two first grade classes of children. Reliability coefficients were computed between the first and second administrations of the Bender. They ranged from .549 to .649 for the four groups and were found to be statistically significant at the .001 level.

Research has been reported on reliability of the ITPA (Bateman, 1965; Lamb, in Tarnopol, 1969). Two forms of reliability for the ITPA were studied: (1) internal consistency, and (2) stability. Internal consistency measurements evaluated the homogeneity of items within a subtest. The overall coefficients of correlation for the subtests ranged from .89 to .95. Stability was measured by a test-retest method and the coefficient for the ITPA total score was .70. The split-half method was also used to estimate reliability. Over-all coefficients ranged from .90 to .99.

Lamb (in Tarnopol, 1969) and Bateman (1965) have reviewed studies concerning validity of the ITPA. To determine concurrent and predictive validity, criterion tests for each subtest were administered at the same time as the ITPA and then readministered about three months later. Estimates were made for each ITPA subtest. Lamb (in Tarnopol, 1969, p. 262) summarized a validity study of the ITPA done by McCarthy and Olson which is given in Table 1.

Of interest to the present study were the research results from the visual subtests. The Visual Reception subtest had a significant correlation with the Durrell-Sullivan Paragraph Meaning Section for Pre- and post-selection and with the Raven's Progressive Matrices and the Peabody Picture Vocabulary Test. This was interpreted as supporting the view that the test measures comprehension of visual stimuli. The Visual Association subtest had significant correlations with both the Raven's Progressive Matrices and the Draw-A-Man Test which indicated the test measures the ability to make meaningful associations of visual stimuli. The Visual-Motor Sequencing subtest had a low correlation of .15 with the preselected criterion test, the Knox Cube Test, and a significant correlation of .32 with the Stanford Achievement section on

TABLE 1

SUMMARY OF THE VALIDITY CHARACTERISTICS OF THE ITPA AND ITS INDIVIDUAL SUBTESTS (McCarthy and Olson, 1964)

ITPA	Types of Validity			
	Concurrent & Predictive	Content	Construct	Diagnostic
Whole Test	Yes[a]	Omissions Noted	e,f	Moderate to Significant
Visual Decoding	Yes	c,d	Yes	g
Auditory Decoding	Qualified[b]	c,d	Yes	g
Visual-Motor Ass'n.	Yes	c,d	Yes	g
Auditory-Vocal Ass'n.	Qualified[b]	c,d	Yes	g
Motor Encoding	Doubtful	c,d	Yes	g
Vocal Encoding	Questionable	c,d	Yes	g
Visual-Motor Seq.	Qualified[b]	c	Qualified[b]	g
Auditory-Vocal Seq.	Yes	c	Yes	g
Auditory-Vocal Auto.	Doubtful	c	No	g

[a] Criterion Tests and Retests included the reading and spelling section of the Stanford Achievement Battery, the reading section of the Durrell-Sullivan Capacity Test, the Raven's Progressive Matrices, the Goodenough Draw-A-Man Test, the Peabody Picture Vocabulary Test, and the mean-length-of-response and "sentence complexity" scores derived from a sample of the subject's speech.

[b] A qualified Yes.

[c] Standard Error ranges recommended. Subtests internally consistent but fairly heterogenous with respect to one another.

[d] Basically "single ability" in character.

[e] Inversely related to social class, number of sibs, and position among sibs; positively related to mental age; zero relation to sex of subject.

[f] Stability coefficients vary from .70 to .95.

[g] Classification, by type of child, can be made reasonably well by "experts" on linguistically handicapped children; the test is not sufficiently sensitive to confirm teachers' ranking of ITPA subtests for linguistically "normal" children.

Paragraph Reading and other auditory-vocal ability tests, which suggested that in addition to measuring visual skill, a transfer took place from visually perceived elements to auditory memory elements.

The above reliability and validity reviews were based on the 1961 edition of the ITPA. Lamb (in Tarnopol, 1969, p. 261) commented on the 1968 form which was used in the present study.

> The revised edition of the ITPA is essentially the same as the 1961 edition with some revisions in content, higher reliability for the subtests, greater ease in administration and scoring and an extended age range, up to 11-6. Three tests have been added to the battery--a visual closure test, a sound blending test and an auditory closure test. The basic battery will consist of ten subtests which include the visual closure test.

Design

This study determined the visual perceptual developmental level and its relation to academic achievement in selected groups of kindergarten children. The independent variables were learning disability child and non-learning disability child. The dependent variables were the number of correct responses on the ITPA visual subtests and the number of errors on the Bender.

Task and Procedures

Four examiners, including the investigator, who were trained and experienced in working with children and in the use of the ITPA and Bender instruments administered the tests in the following order: (1) Bender; (2) ITPA Visual

Reception; (3) ITPA Visual Sequential Memory; (4) ITPA Visual Association; (5) ITPA Visual Closure. The testing was administered to each child individually in a testing room. Each battery took from 30 to 45 minutes. All testing was done within a two week period.

The ITPA visual subtests and the Bender were administered and scored according to standard test instructions. The Bender scoring system entails a degree of subjective judgment and the Benders were scored by the original examiner, and rescored by a qualified psychologist and the present investigator. The average of these three scores was used in the study. See Appendix III for Bender scores.

The administration of the Bender followed the procedure developed by Koppitz (1963). The examiner placed a #2 pencil with an eraser and an 8 X 11" piece of unlined paper before the S and other paper was available if needed by the S. Instructions were given to the S as follows:

> I have nine cards here with designs on them for you to copy. Here is the first one. Now go ahead and make one just like it (Koppitz, 1963), p. 15).

The first Bender card was placed at the top of the blank page in front of the S. After S finished the first card, the remaining cards were treated by the same method until all figures were drawn. Any inquiries about how to draw were answered as follows: "Make it look as much like the picture on the card as you can" (Koppitz, 1963, p. 15). There was no time limit.

One of the most important procedures in the administration of the ITPA was instructing the child in the task to be tested. The standardized procedure included demonstration items which were used before each subtest administered in this study. Descriptions of the visual ITPA subtests are as follows:

1. Visual Reception. There were 40 picture items in the test. Each item consisted of a stimulus picture on one page, which was exposed to the child for 3 seconds, and four response pictures on the second page. The child was directed by "See this" on the stimulus page, and "Find one here" on the response page. The correct choice was the object or situation which had a conceptual similarity to the stimulus.

2. Visual Sequential Memory. Each sequence model was exposed for 5 seconds and then the child was asked to place the identical chips in a tray in the same order. If the child failed in the first sequence he was given a second trial.

3. Visual Association. A single stimulus picture surrounded by four optional pictures, one of which was associated with the stimulus picture, was presented with the question "What goes with this?", and then pointing to the optional pictures, "Which one of these?" was asked. At the upper level the test used visual analogies.

4. Visual Closure. There were four sets, each containing 14 or 15 partially hidden items. The child was given 30 seconds to point to the items.

CHAPTER III

RESULTS

Sixty-two kindergarten children from the Oklahoma City Public School system were divided into two groups according to learning disability (N=31) or non-learning disability (N=31). Each group was given the Bender Visual-Motor Gestalt Test, four visual subtests from the ITPA, the Metropolitan Readiness Test, the Vane Kindergarten Test, and a Readiness Rating Scale used by the teacher for ranking students. Additional biographical data were collected on each subject such as age, sex, school and teacher. All of the data collected were used in analyzing the differences between the two groups. However, the primary data used in testing of the hypotheses were the visual subtest scores from the ITPA and the Koppitz developmental score from the Bender test.

Evaluation of Visual Perceptual Ability

The ITPA yields a total of four subtest scores; (1) Visual Reception, (2) Visual Sequential Memory, (3) Visual Association, and (4) Visual Closure. These subscores and the Bender score were used to assess whether there would be a difference between the scores for the Learning Disability (LD) group and the non-learning disability control (C) group in visual perceptual ability. The results of the first five hypotheses are given in the following section. The dependent variables are the number of correct responses on the ITPA and the number of errors on the Bender. It should be noted that on the ITPA subtests a larger raw score indicates a higher level of ability, while on the Bender the reverse is true. A high level of functioning results in a lower error score on the Bender.

Results of Testing Hypotheses

Hypothesis one stated that there is a difference between the VISUAL RECEPTION scores of the learning disability subjects and the VISUAL RECEPTION scores of the control subjects.

The t value obtained indicates that there was a significant difference between the means of the learning disabled and control groups ($t=3.036$, 60 df, $p < .005$), with the learning disability group having the lower score (see Table 2). The experimenter concluded that a significant difference exists between the two comparison groups in the area of visual reception.

A graphic display of the scores is shown in Figure 1. The figure indicates that the two groups of subjects had overlapping distributions of scores with the C group showing a bimodal distribution and the LD group showing a unimodal distribution.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF THE VISUAL RECEPTION SCORES FOR THE LEARNING DISABILITY AND CONTROL GROUPS

Group	Mean	Standard Deviation
LD N=31	15.4838	5.8927
C N=31	20.1612	6.2348

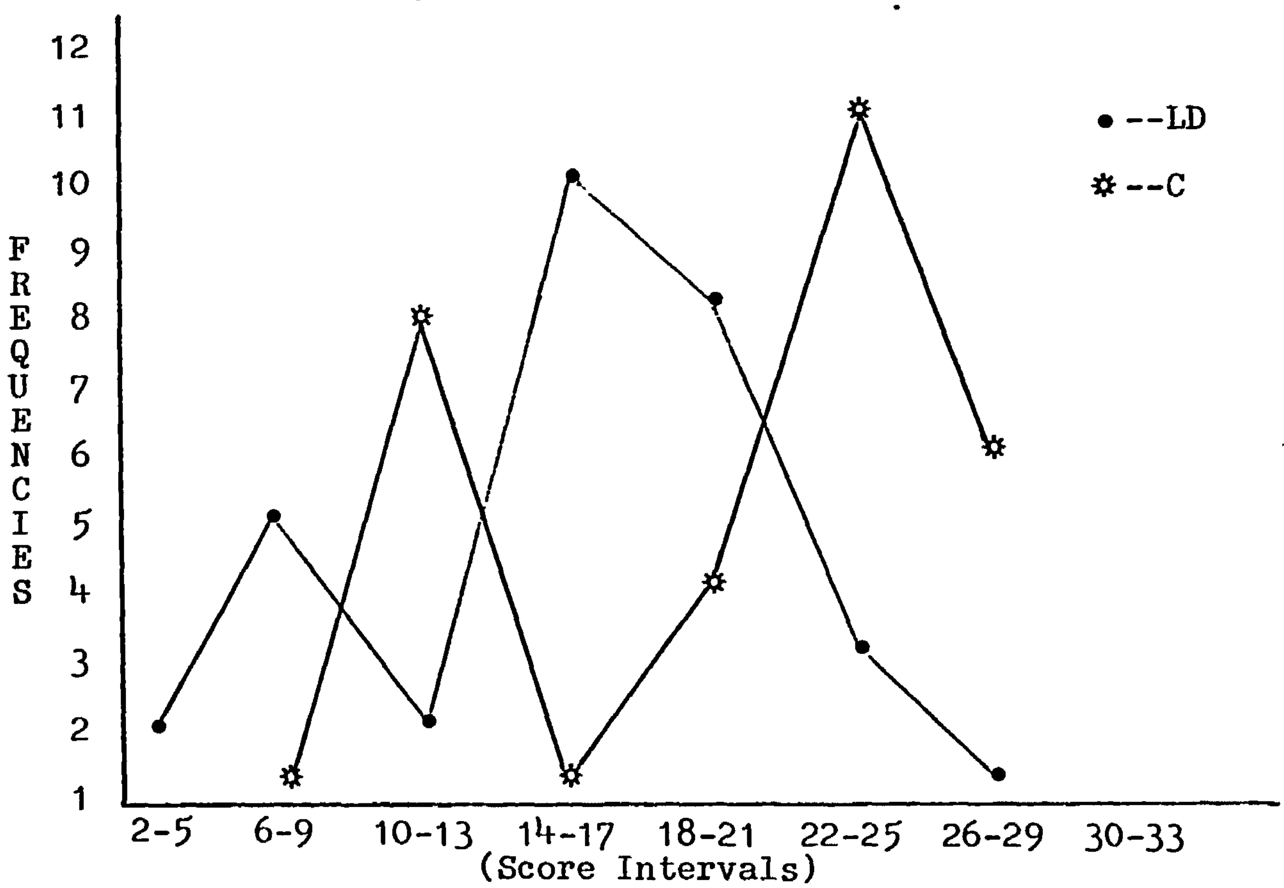

Fig. 1.--ITPA Visual Reception subtest scores

Hypothesis two stated that there is a difference between the VISUAL SEQUENTIAL MEMORY scores of the learning disabled subjects and the VISUAL SEQUENTIAL MEMORY scores of the control subjects.

The t value obtained indicated that there is a significant difference between the learning disability and control groups ($t=4.1076$, $df=60$, $p < .0005$), with the learning disability group having the lower score (see Table 3). The experimenter concluded that a significant difference exists between the two groups in the area of Visual Sequential Memory.

TABLE 3

MEANS AND STANDARD DEVIATIONS OF THE VISUAL SEQUENTIAL MEMORY SCORES FOR THE LEARNING DISABILITY AND CONTROL GROUPS

Group	Mean	Standard Deviation
LD N=31	12.7419	4.6257
C N=31	17.2903	4.0758

A graphic display of the scores is shown in Figure 2. Figure 2 indicates that the two groups of subjects had a unimodal distribution of scores and both modes were the same.

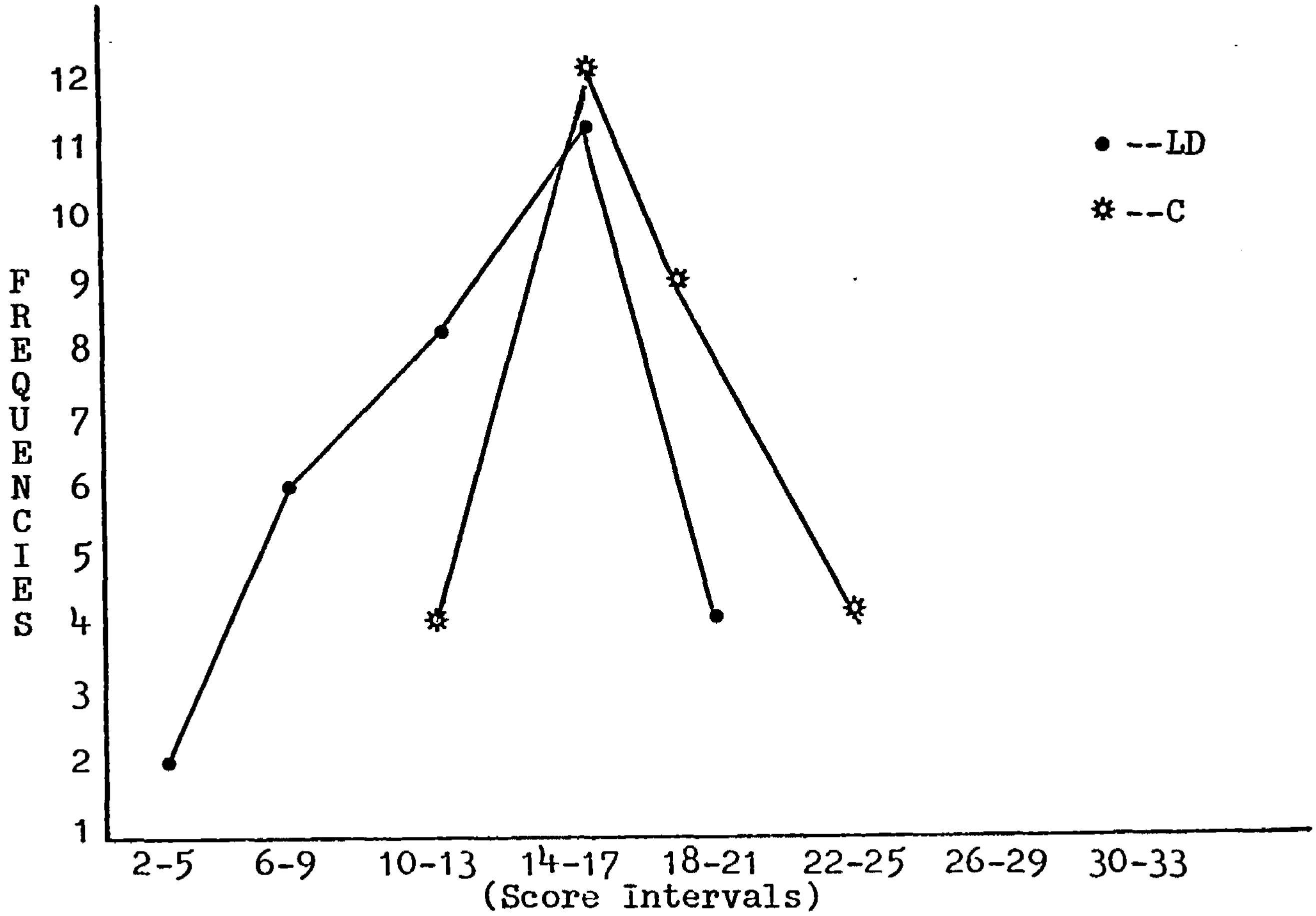

Fig. 2.--ITPA Visual Sequential Memory subtest scores

Hypothesis three stated that there is a difference between the VISUAL ASSOCIATION scores of the learning disabled subjects and the VISUAL ASSOCIATION scores of the control subjects.

The t value obtained indicated that there is a significant difference between the learning disabled and control groups ($t=3.5001$, $df=60$, $p < .0005$), with the learning disability group having lower score (see Table 4). The experimenter concluded that a significant difference exists between the two comparison groups in the area of Visual Association.

A graphic display of the scores is shown in Figure 3.

TABLE 4

MEANS AND STANDARD DEVIATIONS OF THE VISUAL ASSOCIATION SCORES FOR THE LEARNING DISABILITY AND CONTROL GROUPS

Group	Mean	Standard Deviation
LD N=31	17.0967	5.0948
C N=31	21.2580	4.2266

Figure 3 indicates that the LD group of subjects had a unimodal distribution of scores. The C group had a truncated distribution and the LD group had more scores in the lower range.

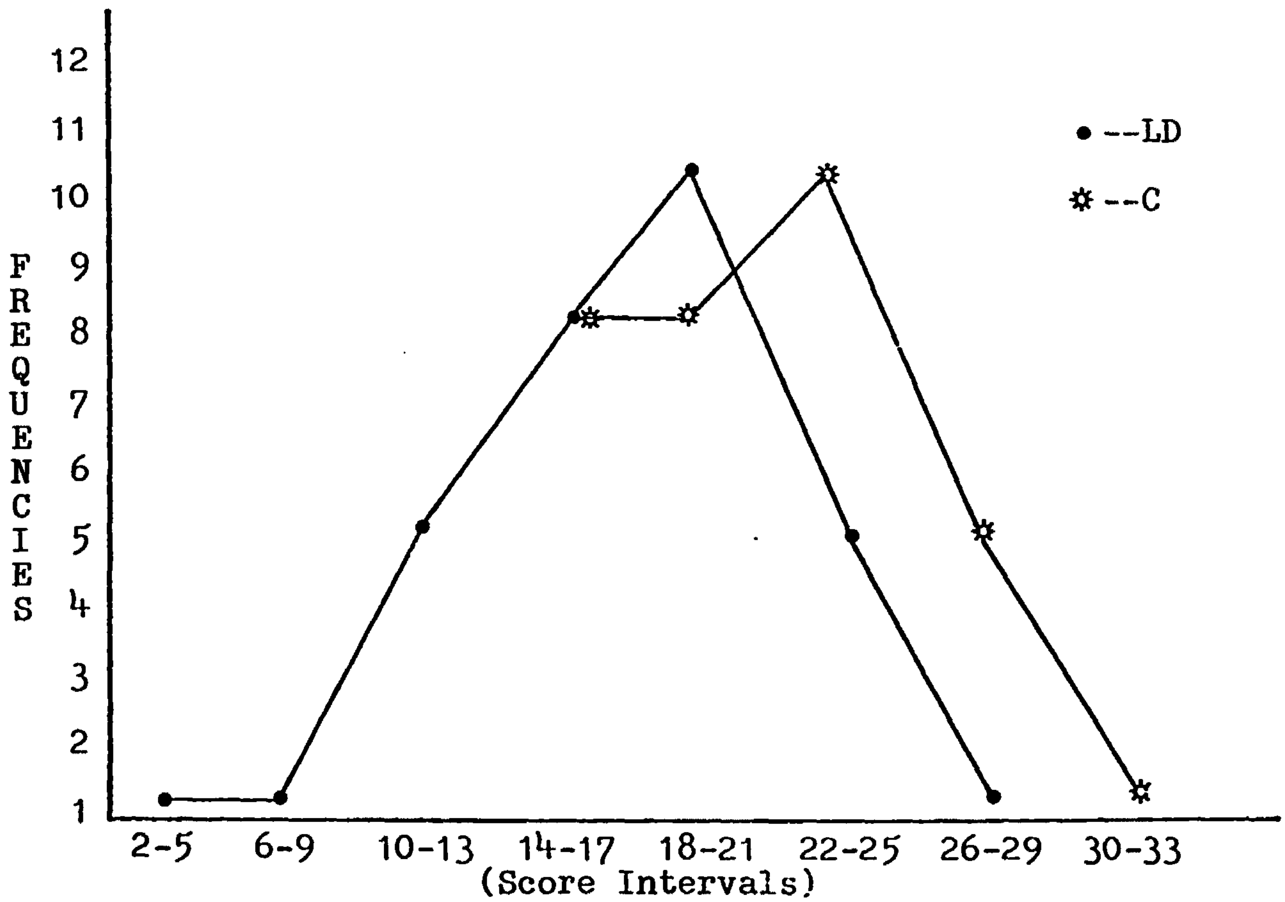

Fig. 3.--ITPA Visual Association subtest scores

Hypothesis four stated that there is a difference between the VISUAL CLOSURE scores of the learning disabled subjects and the VISUAL CLOSURE scores of the control subjects.

The t value obtained indicated that there is a significant difference between the learning disability and control groups ($t=4.0817$, 60 df, $p < .0005$), with the learning disability group having the lower score (see Table 5). The experimenter concluded that a significant difference exists between the two comparison groups in the area of Visual Closure.

TABLE 5

MEANS AND STANDARD DEVIATIONS OF THE VISUAL CLOSURE SCORES OF LEARNING DISABILITY AND CONTROL GROUPS

Group	Mean	Standard Deviation
LD N=31	13.3225	4.7335
C N=31	18.1612	4.5978

A graphic display of the scores is shown in Figure 4. The figure indicates that the two groups of subjects had overlapping distributions with the LD group showing a higher frequency of errors.

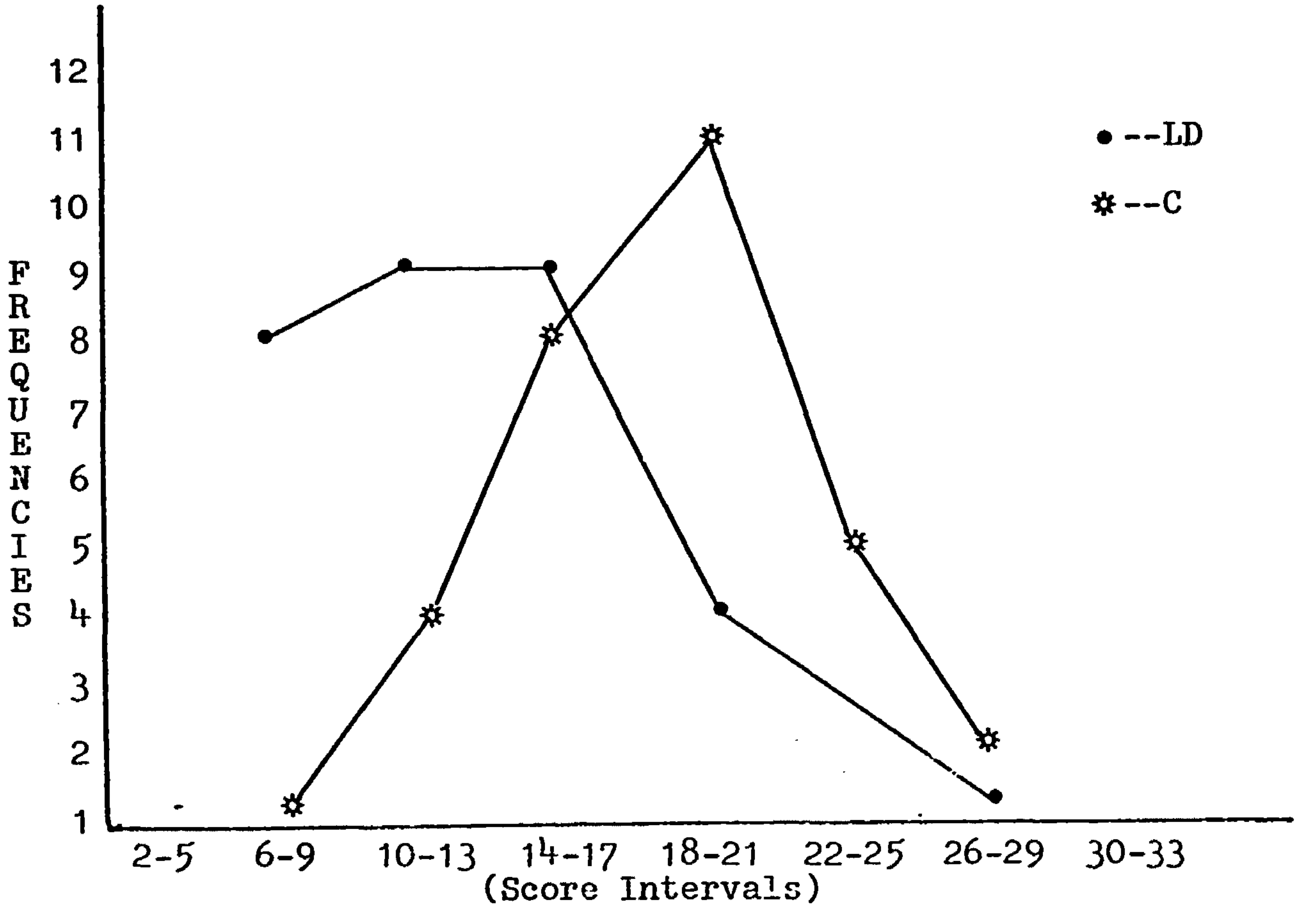

Fig. 4.--ITPA Visual Closure subtest scores

Hypothesis five stated that there is a significant difference between the Bender scores of the learning disability subjects and the Bender scores of the control subjects.

The t value obtained indicated that there is a significant difference between the learning disability and control groups ($t=5.3705$, $df=60$, $p<.0005$), with the learning disability group showing a higher error score (see Table 6). The experimenter concluded that a significant difference exists between the two comparison groups in the area of visual-motor ability as indicated by the Koppitz developmental score on the Bender.

TABLE 6

MEANS AND STANDARD DEVIATIONS OF THE BENDER SCORES FOR THE LEARNING DISABILITY AND CONTROL GROUPS

Group	Mean	Standard Deviation
LD N=31	14.4193	3.2534
C N=31	9.5161	3.5671

A graphic display of the scores is shown in Figure 5. Figure 5 indicates that the two groups had similar distributions of scores with the C group obtaining fewer errors.

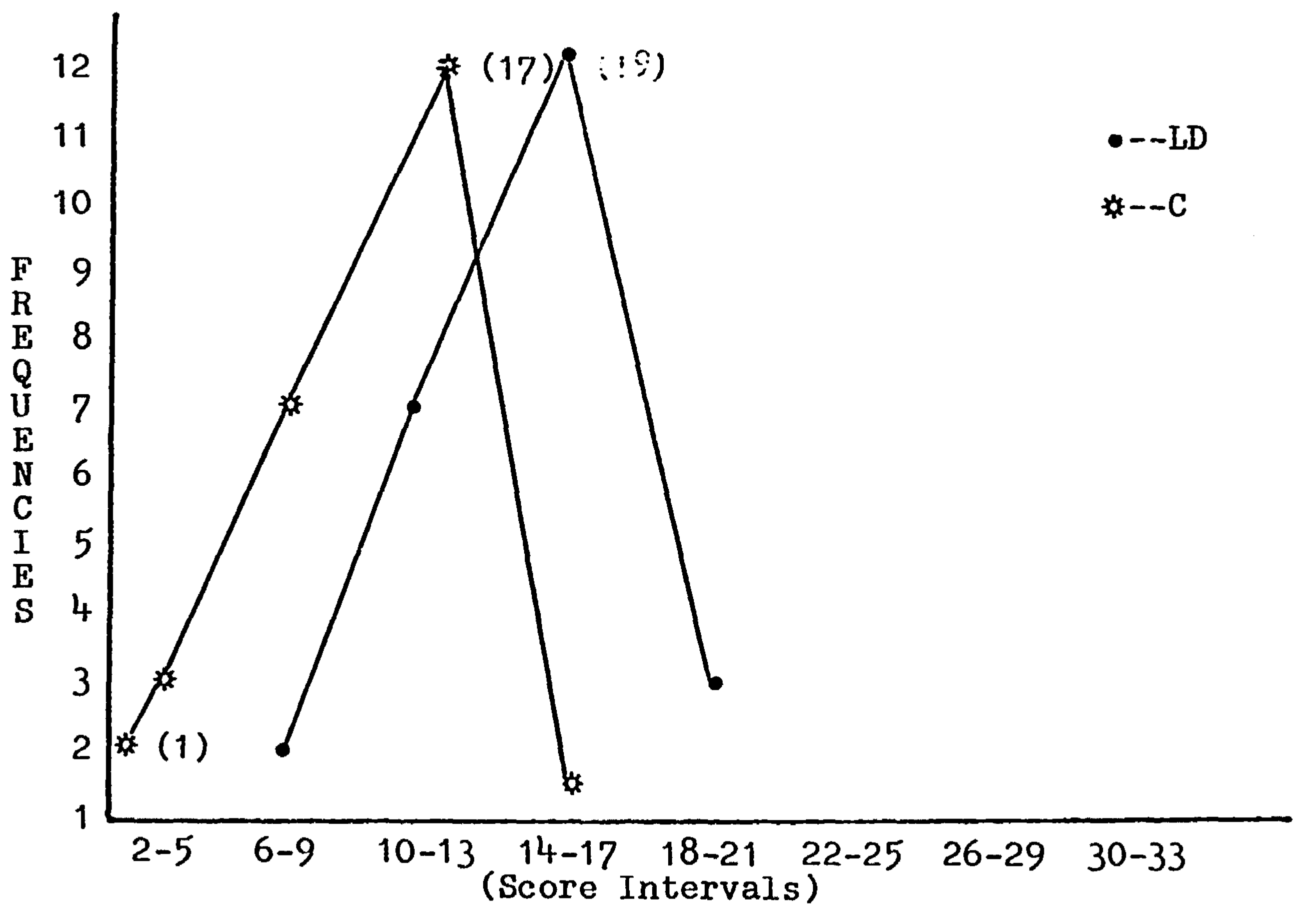

Fig. 5.--Bender scores.

Testing the Appropriateness of Subject Classification

The assignment of subjects to the appropriate group in any study is a difficult problem. This is especially so in academic settings since it is important to place children in the classroom that is best suited to their specific needs. A Discriminant Function Analysis (McNemar, 1959, p. 211) was performed on the scores in order to classify both groups used in this study. This was performed as an attempt to determine how well the subjects had been assigned to the appropriate group using the four ITPA visual subscores and the Bender score as the assignment criteria. The results pertaining to hypothesis six using the Discriminant Function Analysis (DFA) are given in Table 7.

The cutoff score for determining the probability of the subject being placed in the same group again was .50. The DFA performed can be interpreted as showing that 27 of the 31 subjects of the learning disability group scored .50 or above and would be placed in the same group again. In group two (Control) 26 of the 31 subjects scored .50 or above and would be assigned to the same group again if the same five test scores were used for the assignment criteria.

From these results the researcher accepted hypothesis six that stated the visual perceptual battery was an effective discriminator. The conclusion was that the subjects had been assigned to the appropriate groups.

TABLE 7

APPROPRIATENESS OF GROUP ASSIGNMENT OF SUBJECTS

Learning Disability		Normals	
Subject Number	Probability of re-assignment of this group of subjects	Subject Number	Probability of re-assignment to this group of subjects
1	.99	1	.99
2	.98	2	.99
3	.98	3	.98
4	.67	4	.95
5	.97	5	.99
6	.89	6	.84
7	.99	7	.65
8	.97	8	.60
9	.46	9	.73
10	.86	10	.90
11	.99	11	.97
12	.08	12	.99
13	.94	13	.56
14	.63	14	.98
15	.95	15	.76
16	.74	16	.47
17	.12	17	.99
18	.72	18	.88
19	.99	19	.99
20	.96	20	.99
21	.55	21	.99
22	.91	22	.91
23	.70	23	.93
24	.98	24	.47
25	.98	25	.49
26	.36	26	.97
27	.72	27	.26
28	.91	28	.32
29	.94	29	.93
30	.96	30	.91
31	.97	31	.74

Evaluation of Intercorrelation of Subtest Scores

Hypothesis seven stated that there will be significant relationships among the subscores of the MRT, the Vane, the Bender, the ITPA visual subtests, and the RRS, for either of the two groups of subjects.

Hypothesis seven was tested by correlating the subscores of each of the instruments of each of these groups in a 25 X 25 correlation matrix. The measures included in the matrix from the Readiness Rating Scale were the overall Degree of Risk score that is the teacher's estimate of the child's degree of learning risk and the four subscores from the rating of the child in the Visual Discrimination category. The results of these correlations are given in Tables 8 and 9. Many of the correlations were subtests of a particular instrument relating to the total score and were therefore meaningless. After subtracting these part-whole correlations from the group, 296 possible correlations remain. At the $p < .05$ level, if chance alone were operating, 15 of these 296 correlations would be expected to attain "significance."

Table 8 shows the results of the intercorrelation matrix for the learning disability group. A total of 46 of the subcorrelations other than part-whole correlations were significant beyond the .05 level. Some of the correlations were quite meaningful and can be used with learning disability children in future research. Of particular interest are the intercorrelations of the subscales of; (1) ITPA Visual

Reception with Vane Vocabulary IQ, Vane Full-Scale IQ and Metropolitan Readiness Test Numerical ability; (2) ITPA Visual Memory with the Bender Neurogenic score, and Teacher Rating Forms; (3) ITPA Visual Association with the Bender Neurogenic score, the Vane Vocabulary score, and the MRT Listening score; (4) ITPA Visual Closure with Vane Vocabulary IQ, MRT Matching, MRT Numerical Ability, MRT Total score, and MRT Percentile Rank; (5) the Neurogenic Bender score with the Vane Vocabulary IQ, and the MRT Word Meaning score.

Table 9 shows the results of the intercorrelation matrix for the normal subjects. A total of 81 of the sub-correlations other than part-whole correlations were significant beyond the .05 level of significance. Of particular importance is the fact that thirty-five more of the intercorrelations were significant for the control group as the learning disability group.

Of particular interest were the following intercorrelations: (1) Age with Visual Reception, Visual Closure, Vane Vocabulary IQ, Full Scale IQ, MRT Alphabet, MRT Matching, MRT Numerical Ability, MRT total score and MRT percentile rank; (2) ITPA Visual Reception with MRT total score, MRT percentile rank, Likenesses, Forms, Colors, and Categories; (3) ITPA Visual Association with Word Meaning and Alphabet; (4) ITPA Visual Closure with Full Scale IQ score, MRT total score, and Degree of Risk; (5) Bender score with Man IQ, and Copying.

Tables 8 and 9 show that hypothesis seven was supported in that statistically significant relationships were found among the measures used in this study.

Besides consideration of the total matrix this study was especially interested in the correlations that occurred between the visual perceptual battery and the measures used by the Oklahoma City Public Schools. There were 85 correlators in this block and 4.25 would be expected at the $p < .05$ level by chance alone. Ten occurred in the learning disability group and fourteen occurred in the control group in this particular area. It appears that the visual perceptual skills assessed by the ITPA visual subtests and the Bender contribute to learning in the areas measured by the Vane, MRT, and RRS but no clear cut pattern emerged that would allow these tests to be used as diagnostic indicators.

Summary of Results

Seven hypotheses were tested in this study. The first five were tested using Student's t. The sixth hypothesis was tested by performing a Discriminant Function Analysis on the ITPA and Bender scores for both groups. The seventh hypothesis was tested by using a Pearson Product-Moment Correlation matrix of the subscores of the various tests used in the study, plus age and sex. The results of testing these seven hypotheses are given in the following statements:

TABLE 8

LEARNING DISABILITY INTERCORRELATION MATRIX

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sex	1	1.00																								
Age	2	.19	1.00																							
Vis. Rec.	3	.08	-.23	1.00																						
Vis. S. Mem.	4	.07	-.01	.17	1.00																					
Vis. Assoc.	5	.25	.06	.08	.39	1.00																				
Vis. Clos.	6	.04	.13	.29	.14	.32	1.00																			
Bender--K	7	-.16	-.10	.13	-.23	-.03	-.10	1.00																		
Bender--N	8	-.13	.12	-.19	-.43	.38	-.16	.64	1.00																	
PM IQ	9	.00	.07	.29	-.06	-.01	-.04	.20	.08	1.00																
Voc. IQ	10	.17	-.39	.44	.22	.42	.40	-.07	-.42	.04	1.00															
Man IQ	11	-.13	-.02	.11	.10	.07	.04	.15	-.06	.54	.13	1.00														
FS IQ	12	.04	-.22	.42	.15	.27	.23	.10	-.26	.67	.67	.73	1.00													
Word Mng.	13	.11	-.01	.34	.07	.30	.21	-.16	-.36	.18	.40	-.15	.24	1.00												
Listening	14	.01	-.04	.27	.10	.37	.28	.14	-.07	-.08	.40	-.03	.17	.38	1.00											
Matching	15	.11	.23	.25	.22	.13	.41	-.34	-.09	.00	.11	-.20	-.04	.20	.33	1.00										
Alph.	16	.01	-.02	-.01	.02	-.14	.21	-.05	-.10	-.04	.14	-.09	.03	.02	.06	.29	1.00									
Number	17	.02	.14	.42	.35	.19	.54	.05	.02	.24	.24	-.17	.15	.30	.38	.59	.30	1.00								
Copying	18	.02	.23	-.01	.10	.09	-.03	.20	.19	.36	-.14	.15	.11	.10	.39	.15	.11	.28	1.00							
Total Sc.	19	.04	.12	.33	.27	.16	.40	.07	-.18	.22	.26	-.13	.17	.52	.62	.68	.56	.79	.51	1.00						
% Rank	20	.07	.13	.30	.20	.13	.38	-.05	-.07	.16	.21	-.22	.08	.45	.57	.67	.58	.78	.56	.97	1.00					
Deg. Risk	21	.03	.33	.11	.15	.09	.32	.10	.21	-.15	.09	-.28	-.15	.20	.44	.15	-.08	.43	.39	.35	.40	1.00				
Likenesses	22	-.08	.28	.12	.25	-.03	.07	-.04	.04	-.16	.06	-.34	-.19	.33	.51	.28	-.05	.49	.39	.46	.50	.78	1.00			
Forms	23	-.28	.25	-.10	.40	-.07	.01	-.02	.04	-.17	-.30	-.07	-.29	.07	.15	.02	-.10	.12	.26	.12	.15	.47	.51	1.00		
Colors	24	.43	.01	-.07	.27	.32	-.04	-.05	-.12	-.19	.09	-.35	-.17	-.02	.25	.01	.06	.18	.17	.11	.17	.35	.35	.12	1.00	
Categ.	25	.40	.38	.05	.18	.28	.03	.15	.12	.05	.06	-.20	-.03	-.06	.30	.21	.03	.38	.29	.25	.31	.55	.52	.10	.68	1.00

Note: Value of r--.01 level = .456

Value of r--.05 level = .355

TABLE 9

CONTROL GROUP INTERCORRELATION MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sex 1	1.00																								
Age 2	.03	1.00																							
Vis. Rec. 3	-.07	.37	1.00																						
Vis. S. Mem. 4	.14	.14	.32	1.00																					
Vis. Assoc. 5	[illegible]	.21	.13	.01	1.00																				
Vis. Clos. 6	-.04	.36	.00	.00	.33	1.00																			
Bender--K 7	.21	-.21	.13	.23	.05	-.17	1.00																		
Bender--N 8	.13	-.24	-.19	.15	.05	-.22	.69	1.00																	
PM IQ 9	.12	.11	.21	.30	.10	.23	-.24	-.09	1.00																
Voc. IQ 10	-.04	.40	.13	.18	.00	.33	-.13	.00	.39	1.00															
Man IQ 11	-.28	.28	.19	.00	.21	.21	-.42	-.43	.11	.43	1.00														
FS IQ 12	-.08	.41	.24	.19	.14	[illegible]	[illegible]	-.24	[illegible]	.86	.70	1.00													
Word Mng. 13	.08	.26	.23	.03	.36	.34	-.09	.00	.56	.16	.07	.34	1.00												
Listening 14	.01	.27	.18	[illegible]	.01	[illegible]	-.05	.10	.47	.54	.14	.52	.43	1.00											
Matching 15	-.25	.54	.47	.17	.09	[illegible]	-.29	-.16	.43	.59	.45	.67	.28	.36	1.00										
Alph. 16	-.04	.41	.28	.24	[illegible]	.08	-.05	.10	.22	.29	.23	.33	.23	.01	.54	1.00									
Number 17	.26	.49	.12	.25	.23	.33	.05	.12	.23	.49	.09	.39	.25	.55	.43	.35	1.00								
Copying 18	-.10	.28	.29	.03	-.20	.18	-.36	-.28	.34	.14	.05	.21	.29	.30	.37	.00	.17	1.00							
Total Sc. 19	.03	.59	.37	.26	.22	.38	-.19	.00	.55	.58	.24	.62	.59	.66	.75	.58	.77	.51	1.00						
% Rank 20	.06	.53	.46	.26	.20	.29	-.17	-.02	.52	.51	.26	.57	.58	.57	.78	.59	.68	.53	.96	1.00					
Deg. Risk 21	-.12	.27	.31	.13	.08	.38	-.15	-.16	.40	.25	.25	.39	.41	.48	.46	.10	.50	.34	.55	.53	1.00				
Likenesses 22	-.16	.20	.39	.19	.03	.30	.05	-.03	.40	.18	.12	.30	.45	.36	.35	.22	.41	.24	.48	.47	.90	1.00			
Forms 23	.20	.03	.38	.14	.12	.10	.14	.10	.31	.06	.18	.20	.32	.21	.28	.19	.32	.18	.35	.39	.74	.83	1.00		
Colors 24	.08	.02	.37	.23	-.05	.15	.22	.03	.38	.11	.04	.20	.25	.40	.15	.01	.36	.12	.30	.28	.78	.89	.78	1.00	
Categ. 25	.00	.12	.36	.17	-.02	.10	.22	.08	.40	.17	.06	.26	.23	.45	.19	.06	.43	.17	.38	.35	.78	.84	.74	.95	1.00

Note: Value of r--.01 level = .456

Value of r--.05 level = .355

1. There is a significant difference between the Visual Reception scores of learning disabled students and normal students ($p < .005$).

2. There is a significant difference between the Visual Memory scores of learning disabled students and normal students ($p < .0005$).

3. There is a significant difference between the Visual Association scores of learning disabled students and normal students ($p < .0005$).

4. There is a significant difference between the Visual Closure scores of learning disabled students and normal students ($p < .0005$).

5. There is a significant difference between the Bender scores of learning disabled students and normal students ($p < .0005$).

6. The five subscores used to distinguish between the two groups of subjects, ITPA Visual Reception, ITPA Visual Memory, ITPA Visual Association, ITPA Visual Closure, and Bender, appear to be useful discriminators for determining whether a student has a learning disability.

7. There are significant correlations among the subscores of the ITPA, the Bender, the MRT, the Vane, and the RRS. While this is true for both learning disabled students and normal students, there were a higher number of correlations for the normals than the learning disabled subjects.

The investigator was able to accept the seven hypotheses and conclude that the ITPA and the Bender are useful instruments in determining the differences among learning disabled students and normal students at the kindergarten level.

CHAPTER IV

DISCUSSION

The present study had three aims,

(1) to study visual perceptual ability in learning disability and non-learning disability kindergarten children;

(2) to analyze the ability of the visual perceptual measures used in this study to discriminate between the two groups; and

(3) to examine the correlations between the ITPA visual subtests, the Bender test, and the measuring instruments already in use in the Oklahoma City Public School system.

The visual perceptual measures used in this study were chosen in an attempt to tap a variety of visual perceptual processing tasks. The basic formulation behind the stated hypotheses was that visual perceptual ability is a necessary component in the capacity to achieve academically. The results of the various analyses were encouraging.

The first five hypotheses investigated visual perceptual ability in the two groups of kindergarten children. In each of the five areas that were measured, significant differences were found to exist between the two groups, with the non-learning disability children showing a higher level of visual perceptual skill in each area. These findings are in accordance with previous studies relating visual perceptual ability to efficiency of intellectual processes. Flavell (1963), Greenberg (1969) and Piaget (1969) formulated some of the basic concepts stressing the integral function of perceptual development to intellectual functioning. Several authors (e.g. Strauss and Kephart, 1955; Frostig, 1963; Birch and Lefford, 1964; Wunderlich, 1967; Maslow, 1968; Chalfant and Scheffelin, 1969; Deutsch and Schumer, 1970) have concluded that a disruption in visual perceptual ability will result in a lowered ability to cope with a wide range of intellectual tasks. Other studies have aimed at examining visual perceptual ability and its relation to specific academic areas. Birch and Belmont (1960) related inability to read to inadequate visual perceptual skill, especially in the areas of analysis and synthesis. Birch and Bortner (1966) examined problem solving techniques of normal and brain-injured children and found normal children were more abstract and less concrete in their approach. Coleman (1968) and Silver and Hagin (1970) found deficiencies in visual perceptual development were related to a lower level of language development and reading skill.

A basic conclusion derived from the reviewed studies in perception was that utilization of intersensory capacities were hindered more than unimodal ability in a child who had perceptual dysfunction and this limited the ability to learn.

In some areas of visual perception, motor development is considered an essential part of the functioning. Strauss and Lehtinen (1947) based some of their early findings on tests utilizing solution by visual perception and the expression of the solution by a motor act. Chalfant and Scheffelin (1969) in their extensive review of the literature stated that motor development is considered an integral part in development of vision. Deutsch and Schumer (1970) found significant differences between brain-damaged and normal children on perceptual motor tasks.

The tasks used for this study were chosen as valid and reliable measures of what they purported to examine in the visual perceptual area. However, inherent in the level of the tasks is some utilization of intersensory skills. This is the most marked in the Bender Visual-Motor Gestalt test used to investigate hypothesis number five. This test requires a motor act in response to verbal instructions and a visual stimulus. The largest difference between the means of the two groups occurred on this subtest.

Figures 1 through 5 displayed the distribution of the scores for both groups on the four ITPA visual subtests and the Bender test. The distributions overlapped in each display but showed consistently that the C group attained a higher level of performance in each area. The C group in Figure 1 showed the only bimodal distributions. All other distributions were unimodal.

The sixth hypothesis examined the ability of the visual perceptual battery used in this study to predict into which of two groups a child is likely to fall. Some techniques have been developed to make predictions based on specified data obtained about a child. In this study the data used for prediction were the ITPA visual subtest scores and the score from the Bender test. The probabilities associated with the ability of these scores to predict are given in Table 6. These figures indicate this battery has a high degree of effectiveness as a predictor as 27 of the 31 learning disability subjects and 26 of the 31 control subjects scored .50 or above, indicating the probability that they would be placed in the same groups again. Early recognition of learning disability children has been emphasized as an important factor by many workers in this area (Frostig, 1963; Wunderlich, 1967; Coleman, 1968; Frostig and Maslow, 1968; Chalfant and Scheffelin, 1969; Tyson, 1969). The Discriminant Function Analysis used on this battery indicated a testing battery can be utilized that can improve the accuracy of placement of a child in the learning disability category.

Hypothesis seven examined the correlations that occurred between the ITPA visual subtests, the Bender test, and the measures used by the Oklahoma City Public School system at the kindergarten level. Significant correlations occurred but in different areas in each group. There were more significant correlations than could have been expected by chance alone but no presently used measure in use for testing Oklahoma City kindergarten children appears to consistently measure a specific visual perceptual skill area in all types of children. Also, the highest correlation that occurred in either group was .47 for Visual Reception and MRT Matching. The shared variance existing between these two measures is 22.09 percent. The magnitude of the variances existing between the significant correlations indicates that the visual perceptual skills measured in this study appear to contribute to the achievement of the task but are not reflected to a large degree in any of the measures presently in use.

The differences in significant correlations between the two groups and the larger number of significant correlations within the control group lend support to the idea that learning disability children learn on a different basis than non-learning disability children. Although hypothesis seven was supported in that significant correlations did occur, the usefulness of present testing measures as diagnostic indicators of visual perceptual ability appear to be negligible.

Further research needs to be done by cross-validating the measures used in this study to gain knowledge about the applicability of these findings to other groups.

Overall the hypotheses proposed in this study were supported in that the two groups used in this study differed significantly in their measured visual perceptual abilities. The two groups were chosen in order to examine the differences between children with average or better intelligence who achieve at an expected academic rate and those who do not. Prior research has stated that visual perceptual skill may be a major component in this ability to achieve and results from this study support that view.

An interesting aspect has emerged from the results. The Discriminant Function Analysis used to test hypothesis six shows that measures can be utilized to predict placement within a group. Future research needs to explore this area. Emphasis is repeatedly placed upon early detection and subsequent training of learning disability children and this study shows such predictors can be used. The next step could be to use a predicting instrument during the first few weeks of kindergarten and follow this with visual perceptual training to see if children can be aided in achieving closer to the academic rate expected from their ability level.

A limitation of this study was the narrowness of the population group that was used. Since the subjects used in the study were not drawn randomly from a larger population the results can only be generalized to the subjects used. Further studies should be done on much wider populations in order to expand the generalizability of results.

Further research should explore differences in visual perceptual ability that exist in other socio-economic and

and racial groups. Willis (1970) found that lower socio-economic class subjects functioned less efficiently on visual motor perceptual tasks. Determination of the early learning experiences that aid in visual perceptual development could assist in formulating effective remediation procedures.

This study indicated that the areas of deficit can be diagnosed at the kindergarten level. However, this should only be the first step in devising curriculum procedures to provide each child the opportunity to develop his or her inherent abilities. Many authors (Frostig, 1963; Zaporozhets, 1965; Birch and Lefford, 1967; Frostig and Maslow, 1968; Chalfant and Scheffelin, 1969; Deutsch and Schumer, 1970) have reported research and suggested possibilities to be utilized in developing further work in this area.

CHAPTER V

SUMMARY

Children who apparently do not achieve academically, despite indications of the potential to do so, concern those interested in the processes of learning. In recent years, children who have exhibited this behavioral pattern have been termed as having a learning disability or minimal cerebral dysfunction.

A review of the literature revealed that perceptual dysfunction is considered to be an inhibitor of effective learning, and disturbances in visual perceptual abilities are considered to be especially disruptive to the learning process. It has also been stated that it is important to diagnose and remediate learning difficulties as early as possible in a child's career.

This study was devised to examine the visual perceptual abilities in thirty-one learning disability kindergarten children in the Oklahoma City Public School System. This group was compared with a matched sample of non-learning disability kindergarten children. Significant visual perceptual differences, as measured by the Bender Visual-Motor

Gestalt test and four of the Illinois Test of Psycholinguistic Abilities visual subtests, were found to exist between the two groups. The learning disability group had a poorer performance level in all measured areas. A Discriminant Function Analysis also showed that these instruments were effective predictors of placement in a learning disability or non-learning disability group. In addition, results showed that significant correlations existed between the Bender and ITPA visual subtests and the Metropolitan Readiness Test, Vane Kindergarten Test and Readiness Rating Scale, which are presently in use as screening devices by the Oklahoma City Public Schools. These correlations indicated visual perceptual abilities are an integral function in performance on the measured tasks, but no clear-cut patterns developed that would enable the presently used tests to be used as diagnostic indicators.

In conclusion, this investigation indicated that learning disability kindergarten children have a lower level of visual perceptual abilities than do non-learning disability kindergarten children. If further investigations substantiate this finding, it suggests that curriculum changes at the kindergarten level might be implemented to remediate visual perceptual dysfunction.

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APPENDICES

APPENDIX I

DEFINITIONS OF LEARNING DISABILITY AND MINIMAL CEREBRAL DISFUNCTION

Definition of Terms

There were specific ways in which terms were used in this study. These terms are defined as follows:

Learning Disability: The definition presented by the National Advisory Committee on Handicapped Children in January, 1968 will be the one used for the present study. It is as follows:

> Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance or to environmental disadvantages (Chalfant and Schefflin, 1969, p. 47).

Minimal Brain Dysfunction Syndrome: The definition used is the one given in Task Force 1: Minimal Brain Dysfunction in Children (Clements, 1966, pp. 9-10).

> The term 'minimal brain dysfunction syndrome' refers in this paper to children of near average, average, or

above average general intelligence with certain learning or behavioral disabilities ranging from mild to severe, which are associated with deviations of function of the central nervous system. These deviations may manifest themselves by various combinations of impairment in perception, conceptualization, language, memory, and control of attention, impulse, or motor function.

These aberrations may arise from genetic variations, biochemical irregularities, perinatal brain insults or other illness or injuries sustained during the years which are critical for the development and maturation of the central nervous system, or from unknown causes.

APPENDIX II

READINESS RATING SCALE (1970-71 Revision)

NAME:

TEACHER:

SCHOOL:

CLASS:

INSTRUCTIONS: In case of multiple skills, underline problem areas. The child should be rated twice yearly, at the beginning and end of the second semester.

AA=Above Average
A=Average
BA=Below Average

			AA		A	BA	
			5	4	3	2	1
LANGUAGE DEVELOPMENT	1	Is able to express ideas clearly					
	2	Speaks distinctly					
	3	Able to relate ideas in sequence					
	4	Proper use of pronouns, e.g., I-me, him-her					
MUSCULAR DEVELOPMENT AND MANIPULATIVE SKILLS	1	Is able to jump, skip, hop, balance					
	2	Is able to participate in rhythms					
	3	Is able to dress self; is able to tie shoes					
	4	Is able to work with scissors, crayons, paint & paste					
	5	Is able to work with patterns					
VISUAL DISCRIMINATION	1	Recognizes likenesses & differences, e.g., gross-fine, directions					
	2	Able to perceive and reproduce forms					
	3	Recognizes colors - eight basic					
	4	Able to classify into categories, e.g., toys, animals, etc.					
AUDITORY DISCRIMINATION	1	Discriminates loud-soft, high-low, near-far, direction					
	2	Hears & repeats patterns, e.g., clapping, numbers, drum					
	3	Discriminates rhyming sounds					
NUMBER CONCEPTS	1	Recognizes shapes					
	2	Understands & expresses comparison of quantity, size & space relationship					
	3	Understands number concepts 0-10					
ATTENTION AND CONCENTRATION	1	Listens to and follows directions					
	2	Focuses attention for reasonable length of time					
	3	Able & willing to relate personal experience & listen to others					
	4	Able to sit for reasonable length of time					
	5	Able to give back information					
SOCIAL AND EMOTIONAL DEVELOPMENT	1	Works and plays well with others					
	2	Works and plays independently					
	3	Understands and accepts routines					
	4	Takes good care of work materials					
	5	Completes task in a reasonable period of time					
	6	Able to accept correction					
	7	Seems relaxed and happy in class					
	8	Accepts new experiences with minimum of fear or upset					

COMMENTS:

APPENDIX III

BENDER SCORES FROM EACH EXAMINER (E)
FOR THE LD GROUP

Subject	E_1	E_2	E_3
1	17	16	18
2	11	12	10
3	17	17	18
4	13	15	11
5	16	14	12
6	15	14	13
7	18	17	16
8	12	11	12
9	6	5	6
10	15	14	16
11	18	16	14
12	10	11	9
13	17	18	16
14	15	12	14
15	16	15	13
16	13	10	12
17	7	8	6
18	14	14	13
19	20	18	21
20	13	14	14
21	15	16	13
22	18	19	18
23	14	15	12
24	15	14	15
25	15	14	16
26	14	12	14
27	12	11	12
28	15	16	14
29	18	19	17
30	16	16	15
31	14	17	16

BENDER SCORES FROM EACH EXAMINER (E)
FOR THE C GROUP

Subject	E_1	E_2	E_3
1	6	5	6
2	1	1	1
3	1	1	1
4	11	10	12
5	5	4	5
6	11	11	10
7	8	7	8
8	10	9	11
9	12	12	13
10	9	10	10
11	7	6	8
12	8	9	9
13	18	19	16
14	9	10	7
15	13	13	14
16	12	11	9
17	5	5	5
18	11	11	10
19	9	10	12
20	5	4	5
21	8	7	8
22	8	8	9
23	12	11	12
24	11	11	10
25	11	12	12
26	10	10	9
27	11	13	14
28	10	10	11
29	9	10	12
30	13	15	13
31	12	10	12