A STUDY OF THE RELATIONSHIP BETWEEN VISUAL PERCEPTION AND READING IN THE AUDITORIALLY HANDICAPPED CHILD

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TABLE OF CONTENTS

LIST OF TABLES

Table

CHAPTER I

INTRODUCTION

Learning to read is often a difficult experience for auditorially handicapped children. Hart discusses the nature of the difficulties encountered by these children and provides the following explanation:

> Before he can learn to read, the child must have an understanding of language. Reading, or written language, is a derivative of spoken language. The written forms are symbols for spoken symbols. In order to derive meaning from the written symbols, one should have previous knowledge of the language patterns these written symbols represent. Deaf children, lacking this knowledge of auditory symbols, are at an extreme disadvantage in learning to read.[1]

Auxter reports that many auditorially handicapped children with average intelligence compensate for their disability and learn to read at rates comparable to hearing children. However, there are some hearing impaired children with above average intelligence who have difficulty with reading. Auxter explains that this may be a result of deficient visual perceptual skill which is thought to differentiate children with a learning disability from those with no learning disa-

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[1] Beatrice O. Hart, Teaching Reading to Deaf Children, The Lexington School for the Deaf Education Series, Book IV (Washington, D.C.: The Alexander Graham Bell Association for the Deaf, Inc., 1963), p. 1.

bility.[1]

According to DiCarlo, research suggests "that the number of purely deaf children is decreasing; instead, many more children are discovered in whom deafness is part of a multiple problem, such as the deaf-blind child, the cerebral palsy-deaf child, and the neurologically impaired-deaf child."[2] Thompson concurs by saying that he has rarely found a deaf child who has only one handicap.[3] Frostig and Maslow state that "as a rule, a developmental defect in one area will influence other psychological functions."[4] Myklebust and Johnson explain that to some extent each group of handicapped children overlaps with each of the other groups; thus, a child may have a learning disability superimposed on deafness.[5]

According to Myklebust and Johnson, learning disa-

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[1]David Auxter, "Learning Disabilities Among Deaf Populations," Exceptional Children, XXXVII (April, 1971), 573.

[2]Louis M. DiCarlo, The Deaf, Foundations of Speech Pathology Series (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1964), p. 45.

[3]Richard E. Thompson, "Who Are The Multiple Handicapped Deaf Children?" The Volta Review, LXX, No. 7 (October, 1968), 769.

[4]Marianne Frostig and Phyllis Maslow, "Visual Perception and Early Education" in Learning Disabilities, Introduction to Educational and Medical Management, ed. by Lester Tarnopol (Springfield, Illinois: Charles C. Thomas · Publisher, 1969), p. 217.

[5]Doris J. Johnson and Helmer R. Myklebust, Learning Disabilities, Educational Principles and Practices (New York: Grune & Stratton, 1967), p. 9.

bilities result from a dysfunction in the brain.[1] Frostig reports that one of the most frequent expressions of brain dysfunction is a deficit in visual perception and that deficits in visual perception are common in children with reading difficulties.[2]

Miller states that the relationship between visual perception and primary reading achievement is firmly established.[3] She reports that visual perceptual ability is necessary for reading success, especially at the first-grade level.[4] Frostig concurs by saying that deficits in visual perception seem to be one of the most important contributing factors to reading failure.[5] In the auditorially handicapped child, retarded language development is a major factor in reading inadequacies; however, a deficiency in a skill fundamental to the reading process, such as visual perception, may also contribute to his difficulties.[6]

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[1] Ibid.

[2] Marianne Frostig, "Visual Modality and Reading," Perception and Reading, XII, Part 4, Proceedings of 12th Annual Convention of the International Reading Association (Newark, Delaware, 1968), p. 25.

[3] Wilma H. Miller, "Some Aspects of Visual Perception and Reading," Education, XC (November, 1969), 115.

[4] Ibid.

[5] Frostig, "Visual Modality and Reading," p. 26.

[6] Joseph E. Hartung, "Visual Perceptual Skill, Reading Ability and the Young Deaf Child," Exceptional Children, XXXVI (April, 1970), 603.

Little has been provided educationally for the multiply-handicapped hearing impaired child. Suchman reports that "the learning required by this culture is largely visual and auditory."[1] She states that "while some information is gained through tactual, kinesthetic, and olfactory senses, hearing and sight are primary in teaching the learner in school."[2] If the auditory sense is nonfunctional for practical purposes, the visual sense must function optimally.[3]

Karlsen concurs with Suchman by stating that because of deficient audition, auditorially handicapped children are impaired in basic learning abilities.[4] He reports that auditorially handicapped children "learn to learn visually; that when they are exposed to information through the senses of hearing and vision simultaneously, they learn to ignore the auditory input."[5] He states that hearing impaired children "have extreme difficulty learning to read" and that the method of instruction used with handicapped children "should capitalize upon the unimpaired senses and not depend on the

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[1]Rosslyn Gaines Suchman, "Visual Impairment Among Deaf Children--Frequency and Educational Consequences," The Volta Review, LXX, No. 1 (1968), 31.

[2]Ibid. [3]Ibid.

[4]Bjorn Karlsen, "A research Basis for Reading Instruction of Deaf Children," American Annals of the Deaf, CX, No. 4 (1965), 536.

[5]Ibid.

impaired sense as a major learning modality."[1] However, when both a hearing impairment and a deficit in visual perception are present, it is especially important to ascertain the extent to which each handicap is contributing to the total learning profile and to apply remediation accordingly.

The visual perceptual ability of the auditorially handicapped child needs to be investigated for two reasons. First, very little information regarding the visual perceptual ability of the hearing impaired child can be found in the literature. Secondly, as the relationship between visual perception and reading achievement has been established for the hearing child, it is necessary to explore the implications of this relationship for the auditorially handicapped child. The specific hypothesis is that the visual perceptual ability of auditorially handicapped children is not significantly related to their ability to read.

Definitions.--The following definitions are given so that the reader may be familiar with the terms as used in this paper.

1. Learning disability--behavior that has been disturbed as a result of a dysfunction in the brain and the problem is one of altered processes, not of a generalized incapacity to learn.[2]

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[1] Ibid.

[2] Johnson and Myklebust, Learning Disabilities, p. 9.

2. Perception--the discrimination and recognition of stimuli impinging on the senses.[1]

3. Visual perception--the process by which phenomena are apprehended by the mind through the medium of the eye.[2]

4. Auditorially handicapped--"(Deaf and Severely Hard of Hearing) Children who are auditorially handicapped are those whose hearing is nonfunctional (after all necessary medical treatment, surgery, and/or use of hearing aids) for the purpose of understanding normal conversation and results in a delay in language or speech development or otherwise creates an educational handicap."[3]

5. Hearing impairment--a term used to encompass the spectrum of hearing loss from hard of hearing to deaf. Berg defines the hard of hearing child as "a hearing impaired individual who can identify through hearing and without visual receptive communication enough of the distinguishing features of speech to permit at least partial recognition of the spoken language."[4] He defines the deaf child as "a

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[1]Frostig, "Visual Modality and Reading," p. 26.

[2]Jean Turner Goins, Visual Perceptual Abilities and Early Reading Progress, Supplementary Educational Monographs, No. 87 (Chicago: The University of Chicago Press, 1958), p. 1.

[3]Texas Education Agency, State Plan for Special Education (Austin, Texas: Texas Education Agency, 1970), p. 3.

[4]Frederick S. Berg, "Definition and Incidence," in The Hard of Hearing Child, ed. by Frederick S. Berg and Samuel G. Fletcher (New York: Grune & Stratton, 1970), p. 7.

hearing impaired person who can identify through hearing at best only a few of the prosodic and phonetic features of speech and then not enough to permit auditory recognition of sound or word combinations."[1] Auditorially handicapped and hearing impaired are used interchangeably in this study.

In summary, it has been reported that auditorially handicapped children often have difficulty learning to read despite adequate intelligence. In addition, it has been reported that many hearing impaired children have overlapping handicaps such as learning disabilities and that deficient visual perceptual skills are often associated with learning disabilities. Authorities have established that deficits in visual perception are common in normally hearing children who have difficulty learning to read. Consequently, the purpose of this study is to investigate the relationship between visual perception and reading in auditorially handicapped children.

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[1] Ibid.

CHAPTER II

REVIEW OF THE LITERATURE

A number of studies have been conducted investigating the relationship between visual perceptual abilities and reading in normally hearing children. These studies have been concerned with various aspects of visual perception and are reviewed in the first section of this chapter. A smaller number of studies have investigated the visual perceptual abilities of the hearing impaired child and have related these abilities to reading achievement. These studies are reviewed in the second section of this chapter.

Visual Perception and Reading in the Hearing Child

Development of Visual Perception

The development of visual perceptual abilities must be considered first as an index to a child's readiness for complex visual tasks such as reading. Bower studied the visual perceptual abilities of infants and found that infants were able to recognize three-dimensional shapes. However, the infants were not able to recognize shapes in two-dimensional space which is a much more difficult task.[1] Frostig and

[1] T. B. R. Bower, "The Visual World of Infants," Scientific American, CCXV (1966), 93.

Maslow reported that maximum development of perceptual abilities occurs between three and one-half or four and six and one-half to seven years of age.[1] Miller also stated that the development of visual perceptual abilities begins when a child is about three and one-half years old and concludes when he is about seven and one-half years old.[2] Thus, Miller reported that approximately twenty to twenty-five per cent of the children entering first grade do not have the necessary visual perceptual skills to succeed in beginning reading without exerting extreme effort.[3]

Tarnopol reported that children with learning disabilities exhibit distortions of visual perception, auditory perception, motor function, or any combination of these.[4] He stated that learning problems may also be related to a lack of integration among these functions, and gave, as an example, the inability to translate a visual stimulus into a correct motor activity as in copying letters. Tarnopol stated

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[1]Frostig and Maslow, "Visual Perception and Early Education," p. 219.

[2]Miller, "Visual Perception and Reading," p. 115.

[3]Ibid.

[4]Lester Tarnopol, "Introduction to Children with Learning Disabilities," in Learning Disabilities, Introduction to Educational and Medical Management, ed. by Lester Tarnopol (Springfield, Illinois: Charles C. Thomas · Publisher, 1969), p. 15.

that visual perceptual ability is "clearly a learned process."[1] In the course of learning b from d and was from saw, many apparently normal children of age six get confused, indicating that the process of object constancy is still maturing for these children. Thus, the process of developing object constancy necessary for reading is maturational. In the case of the child with minimal brain dysfunction who has a visual perceptual problem, often part of his problem stems from the fact that he has failed to develop object constancy.[2]

Frostig and Maslow reported that perceptual difficulties frequently involve lack of perception of forms, or of direction, or of relationships in two-dimensional space. They stated that "visual perceptual disabilities usually affect reading and writing because these are activities which are done on a plane surface."[3]

Several aspects of visual perception have been mentioned by the above authors. Gates explained this by reporting that perceptive ability is not always constant.[4] He stated that visual perception is "not a single, unitary capacity or power

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[1]Ibid., p. 16. [2]Ibid.

[3]Frostig and Maslow, "Visual Perception and Early Education," p. 219.

[4]Arthur I. Gates, "A Study of the Role of Visual Perception, Intelligence, and Certain Associative Processes in Reading and Spelling," The Journal of Educational Psychology, XVII (October, 1926), 436.

which operates uniformly upon all sorts of data and under all conditions; perception, on the contrary, is specialized."[1]

Delacato reported that "Neurological Organization, which ends in cortical hemispheric dominance, is critical to reading problems."[2] He stated that even though the eye can take in the stimuli, if the brain cannot organize them into perception, they have no effect on the living organism. As a result of his tests of pupils at the Institute of Reading Disability, Delacato concluded that individuals who have severe reading problems present a very different picture of cortical hemispheric dominance from those who read normally.[3] He felt that this places the problem in the area of early childhood development and that procedures aimed at enhancing Neurological Organization should enable us to create an earlier or more advanced readiness for reading.[4]

Visual Perception Tests as Predictors of Reading Success

Much of the literature relating to visual perception and reading in the hearing child has been concerned with the use of visual perception tests instead of the traditional

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[1] Ibid.

[2] Carl H. Delacato, Neurological Organization and Reading (Springfield, Illinois: Charles C. Thomas · Publisher, 1966), p. 50.

[3] Ibid., p. 49.

[4] Ibid., p. 50.

reading readiness tests to predict reading success. Koppitz reported that "the Bender Test can be used as effectively as the Lee-Clark Reading Readiness Test or the Metropolitan Readiness Test for screening school beginners."[1] DeHirsch also presented data which supported the use of the Bender Gestalt Test as a predictor of success with first-grade reading.[2] Bryan reported that in a study of kindergarten children visual perceptual ability correlated more highly with reading readiness than did intelligence.[3] Barrett found that pattern copying was a very significant predictor of subsequent first-grade reading achievement.[4] Goins reported that six relatively simple tests of visual perception may ascertain early and easily the type of pupil who is able to take advantage of modern methods of learning to read. Conversely, the tests may identify those pupils requiring other types of instruction.[5]

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[1]Elizabeth M. Koppitz, The Bender Gestalt Test for Young Children (New York: Grune & Stratton, 1964), p. 54.

[2]Katrina DeHirsch, Predicting Reading Failure (New York: Harper and Rowe, 1966), p. 82.

[3]Quintin R. Bryan, "Relative Importance of Intelligence and Visual Perception in Predicting Reading Achievement," California Journal of Educational Research, XV (January, 1964), 47.

[4]Thomas C. Barrett, "Visual Discrimination Tasks as Predictors of First-Grade Reading Achievement," The Reading Teacher, XVII (January, 1965), 279.

[5]Goins, Visual Perceptual Abilities, p. 104.

Relationship of Visual Perception to Reading Achievement

Another large body of the literature is concerned with the relationship between visual perceptual ability and beginning reading and first-grade reading achievement. Frostig stated that "visual perceptual disabilities affect beginning reading."[1] She tested twenty-five children between four and one-half and six and one-half years old. Eight of those had a perceptual quotient in the lowest quartile, a score of ninety or below. Later, it was found that none of the children who scored below ninety had begun to read. Of the two children who scored ninety, one read and one did not. Only one child with a perceptual quotient above ninety had difficulty reading. Thus, Frostig stated that in the usual classroom the "coefficient of correlation between visual perceptual skills and beginning reading ability has been found to be between .4 and .5."[2]

Goins was concerned with the existence of a general visual perceptual ability.[3] She surveyed the visual perceptual abilities possessed by a group of first-grade children and the relationship of these abilities to first-grade reading achievement. Her results indicated several types of

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[1]Frostig, "Visual Modality and Reading," p. 26.

[2]Ibid.

[3]Goins, Visual Perceptual Abilities, p. 104.

visual perceptual abilities and that there is a wide individual variation among first-grade pupils in competency of performance. This concurred with Gates's findings; however, Goins's study also indicated the existence of a general power of visual perception as related to reading.[1]

> Based on the evidence of the present study, a theory of the nature of visual perception in reading is postulated thus: Efficient reading involves ability not only to hold in mind the "wholeness" of a word, phrase, or sentence (that is, to perceive its larger relationships both mechanically and ideationally) but also to attend to individual words and, at times, to parts of words. Perceiving in a general way the whole but not discriminating clearly among its component elements (letters, words, phrases) may cause as much difficulty in reading as does concentrated attention on word-analysis and word-calling. The good reader either develops or possesses inherently strength of closure, thus performing both acts in harmony or simultaneously.[2]

Early studies indicated that visual perception for words is more highly correlated with reading than is visual perception for numbers or shapes.[3] However, Stroud questioned this on the basis of a practice effect. Most of the early tests were done with children in grades three through six.[4] Stroud explained that these children had years of experience and practice with letters and words which would result in their perception for these two areas being more highly cor-

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[1] Ibid.

[2] Ibid.

[3] Gates, "The Role of Visual Perception," p. 441.

[4] J. B. Stroud, "Rate of Visual Perception as a Factor in Rate of Reading," The Journal of Educational Psychology, XXXVI (November, 1945), 496.

related with their reading level.[1] Consequently, Goins employed strictly non-verbal perception tests and found a high correlation.[2]

The high correlation of non-verbal perception tests with reading achievement may be explained by Chaney's and Kephart's theory of a "perceptual-motor match."[3] Chaney and Kephart reported that a child first manipulates objects in his environment and, although the child receives neural impulses that reflect what exists in the environment, these neural patterns are meaningless. Chaney and Kephart stated that it is "necessary to relate these meaningless patterns to more meaningful activities within the organism so that they can be translated and become useful in determining responses."[4]

> A correlation between incoming perceptual information and outgoing responses is achieved through the perceptual-motor match. The child pays attention to the perceptual data during his active exploration and notes the correspondences between the perceptual data and the exploratory activity. Thus, as he manipulates an object, he watches his hand and relates what he sees to what he feels. Since a body of information has already been started based on exploration, this information becomes the control for the comparison and he learns to see what he has felt.[5]

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[1] Ibid.

[2] Goins, Visual Perceptual Abilities, p. 100.

[3] Clara M. Chaney and Newell C. Kephart, Motoric Aids to Perceptual Training, The Slow Learner Series (Columbus, Ohio: Charles E. Merrill Publishing Company, 1968), p. 17.

[4] Ibid.

[5] Ibid.

Kephart stated that when the child has established a perceptual-motor match, he can then deal with perceptual data independently. However, in a significant number of children, accidents occur during the developmental period. For these children there is limited stability in the perceptual world. Kephart reported that these children have difficulty with the relationships of right-left and up-down, and thus, cannot distinguish between a b and a d or a b and a p. The mechanics of the reading task become extremely difficult and a perception test which requires the motor response of reproducing figures might more clearly illustrate the difficulties these children might have with reading.[1]

Another area of concern was the rate of visual perception. Spring hypothesized that poor readers process visually presented letters slower than normal readers.[2] The results of his study indicated that the reaction time was longer for dyslexic children than for normal children. Spring also found that the poor readers fell behind as the testing time continued.[3]

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[1]Newell C. Kephart, "Perceptual-Motor Aspects of Learning Disabilities," in Educating Children with Learning Disabilities, Selected Readings, ed. by Edward C. Frierson and Walter B. Barbe (New York: Appleton-Century-Crofts, 1967), p. 411.

[2]Carl Spring, "Perceptual Speed in Poor Readers," The Journal of Educational Psychology, LXII, No. 6 (1971), 492.

[3]Ibid., p. 499.

Stroud investigated the relationship of the rate of visual perception to the rate of reading in a group of pupils in grades four, five and six. He found evidence of a significant relationship between rate of reading and rate of visual perception as measured by tests of word selection, letter selection and number selection.[1]

Bateman theorized that reading instruction should be geared to the individual child's learning style. She reported that there are auditory perceptual subjects and visual perceptual subjects and that the method of instruction should capitalize on their strengths. She developed a study to compare an auditory approach to first-grade reading to a visual approach when children were homogeneously grouped by preferred learning modality and when they were not so grouped.[2] Her results indicated that the auditory approach was significantly superior to the visual method and that the auditory subjects were significantly superior to the visual subjects. Bateman concluded that "reading is basically a sound-symbol association process and should perhaps be taught to all children as such."[3]

Erickson used the classifications of visual, haptic or

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[1]Stroud, "Rate of Visual Perception," p. 497.

[2]Barbara Bateman, "Reading: A Controversial View," in Learning Disabilities, Introduction to Educational and Medical Management, ed. by Lester Tarnopol (Springfield, Illinois: Charles C. Thomas · Publisher, 1969), p. 295.

[3]Ibid., p. 303.

non-visual, and indefinite in a study to determine the relationship of reading achievement to visual-haptic aptitude.[1] In contrast to Bateman's finding, Erickson found that the mean reading level of the visual group was significantly higher than the indefinite group and that both of these groups had a higher reading level than that of the non-visual or haptic group. Thus, he concluded that visual-haptic aptitude is a significant factor in the development of reading skills. Erickson hypothesized that this phenomena is "related to some 'failure' in the early development of perceptual skills."[2] Failure to develop perceptual skills beyond the manipulative stage would manifest itself in the degree to which an individual would take on non-visual characteristics. Erickson stated that the individual can accommodate for this predisposition in some areas, but that it is not feasible to accommodate for it in reading. He felt that, for reading, it is necessary to investigate methods of developing visual perceptual skills that appear to be related to reading achievement.[3]

In contrast to the previously cited authors, Mann questioned the entire realm of perception in relation to

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[1]Richard C. Erickson, "Visual-Haptic Aptitude: Effect on Student Achievement in Reading," Journal of Learning Disabilities, II (May, 1969), 257.

[2]Ibid., p. 259. [3]Ibid.

education. He stated that perception is "an abstraction used to understand how organisms receive, comprehend, organize, and utilize information received through their sense modalities."[1] Since perception is a term used to describe behavior, Mann stated that it "doesn't exist as a 'thing' requiring or permitting training."[2] He also questioned the validity of perception tests in that there is "confusion as to what the tests measure" and "incorrect identification of test results with what causes the test results."[3] Mann felt that too much time is being spent on perceptual training in an attempt to remediate or train one isolated area of behavior. He urged educators to devote more time to teaching the child practical academic and recreational activities that could be generalized to traditional school activities.[4]

Summary

In the review of the literature relating to visual perception and reading in the normally hearing child, it was reported that the development of visual perceptual abilities in children has normally been completed by age seven. Further-

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[1]Lester Mann, "Perceptual Training: Misdirections and Redirections," American Journal of Orthopsychiatry, XL, No. 1 (1970), 31.

[2]Ibid.

[3]Lester Mann, "Perceptual Training Revisited," Rehabilitation Literature, XXXII, No. 11 (1971), 324.

[4]Ibid., p. 327.

more, it was reported that tests of visual perception can be used effectively to predict reading success and to determine which pupils may need special types of reading instruction. Authors concerned with the relationship of visual perceptual skills and reading achievement found a significant correlation and identified various perceptual skills that appeared important to reading such as object constancy, perception of forms, perception of words, perception of direction, and relationships in two-dimensional space. Authors investigating the relationship of rate of visual perception to reading achievement found that the rate of visual perception seemed to be a significant factor in the development of reading skills. The problem of whether a visual approach or an auditory approach is the most successful technique for teaching reading was studied by authorities who reported contradictory results. Although there has been disagreement as to whether visual perceptual abilities should be assessed as a separate entity or as a part of a developmental whole, there is general agreement that these skills are necessary for reading achievement in the normally hearing child.

Visual Perception and Reading in the Hearing Impaired Child

In recent years the assessment of the perceptual abilities of hearing impaired children has received greater attention. However, no clear picture emerges of the per-

formance of the auditorially handicapped child in the perceptive domain. The cause of much of the confusion is implicit in the following questions asked by Keogh, Vernon and Smith: "(1) whether etiological conditions causing deafness also cause brain damage resulting in impaired visuo-motor performance; (2) whether the impaired visuo-motor performance is an effect of auditory deprivation on neurological structure and organization; or (3) whether there is an interaction effect of both factors."[1]

Relationship of Hearing Impairment to Visual Perception

Myklebust and Brutten attempted to answer the questions raised by Keogh, Vernon and Smith. They studied the visual perceptual abilities of hearing and hearing impaired children with a test of marble-board reproduction, and tachistoscopically presented tests of figure-ground relationships, perseveration and pattern reproduction.[2] The results of the performance of the hearing impaired subjects indicated that deafness causes an alteration in the normal response modes of the organism, and that the hearing impaired subjects demon-

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[1]Barbara K. Keogh, McCay Vernon, and Carole E. Smith, "Deafness and Visuo-Motor Function," The Journal of Special Education, IV, No. 1 (1970), 41.

[2]Helmer R. Myklebust and M. Brutten, "A Study of the Visual Perception of Deaf Children," Acta Otolaryngology, Monograph Supplement 105 (1953), 79.

strated a disturbed and inferior visual perceptual functioning. Myklebust and Brutten also concluded that the early processes of concept formation are antecedent to perceptual organization and that this disruption of the normal growth of the faculties of abstraction hampers or precludes the organism's capacity for coping perceptually with certain classes of stimuli.[1]

Bartley agreed with Myklebust and Brutten that disturbances in vision may result from a lack of normal auditory stimulation. Bartley emphasized the importance of synthesis in the total development of the organism. He reported that certain neural mechanisms mainly responsible for vision are partially dependent on auditory stimulation for maximum development and efficiency. Therefore, deprivation of hearing deters and impedes visual perceptual functioning in some respects.[2]

Sterritt, Camp and Lipman also adhere to this theory.[3] They found that children with hearing losses were inferior to normally hearing children in visual temporal pattern reproduction only when inferential processes were involved. They

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[1] Ibid.

[2] S. H. Bartley, Principles of Perception (New York: Harper, 1958), p. 136.

[3] Graham M. Sterritt, Bonnie W. Camp, and Beverly S. Lipman, "Effects of Early Auditory Deprivation upon Auditory and Visual Information Processing," Perceptual and Motor Skills, XXIII (1966), 129.

suggested that the effects of sensory deprivation are not limited to the deprived modality.[1]

Doehring and Rosenstein stated that "the development of visual perceptual abilities in deaf children could be affected by such factors as lack of a normal auditory context or retardation of language development."[2] They suggested that previous studies have not been conclusive due to the possibility that hearing impaired children may be deficient in only a few of the many skills classified as visual perception. Doehring and Rosenstein were concerned with those visual perceptual skills related to reading in auditorially handicapped children.[3]

In 1960, Doehring and Rosenstein studied the comparative abilities of hearing and hearing impaired children to recognize visually presented letters, trigrams and words.[4] The single letters and trigrams were included to determine whether any difficulty in recognition of words by hearing impaired children might be related to deficiencies in visual perception.

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[1] Ibid.

[2] Donald G. Doehring and Joseph Rosenstein, "Speed of Visual Perception in Deaf Children," Journal of Speech and Hearing Research, XII (March, 1969), 118.

[3] Ibid.

[4] Donald G. Doehring and Joseph Rosenstein, "Visual Word Recognition by Deaf and Hearing Children," Journal of Speech and Hearing Research, III (December, 1960), 320.

A vocabulary test was also administered to both the hearing and hearing impaired children. The size of the reading vocabulary of the hearing impaired children was much lower than that of the hearing children. The level of performance of the young auditorially handicapped children on the reading vocabulary test and the three tests of visual recognition was clearly below that of the young hearing children. The older hearing impaired children, despite an extreme retardation in reading vocabulary, were able to recognize briefly exposed words at essentially the same level of accuracy as their hearing peers. Doehring and Rosenstein concluded that the recognition of visually presented words is dependent upon a subject's estimate of the probability of occurrence of a word rather than upon the sheer frequency of the subject's previous experience of hearing and pronouncing the word. However, they suggested that sheer frequency of responses to words might have a more important influence on accuracy of recognition at an earlier stage in language development.[1]

In a later study, Doehring and Rosenstein assessed another aspect of visual perception. They compared the number of stimuli that could be identified within a fixed period of time by hearing and hearing impaired children.[2] The hear-

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[1] Ibid., p. 325.

[2] Doehring and Rosenstein, "Speed of Visual Perception," p. 118.

ing children scored significantly higher on nine of thirteen subtests. The older children, both hearing and hearing impaired, scored significantly higher than the younger children on all thirteen subtests. The hearing impaired children differed least from the hearing children in rapid visual-motor response to a simple non-verbal figure.[1] The hearing children scored significantly higher in identifying single symbols, sets of symbols, and a sequence of forms. This suggested that symbolic cues were more helpful to the hearing children probably because of their higher level of reading achievement. Doehring and Rosenstein concluded that hearing impaired children may be relatively slow in identifying symbolic and sequential printed material, as a direct or indirect result of language retardation. They also suggested that hearing impaired children at certain age and education levels might be found deficient in a variety of visual perceptual skills.[2]

In contrast to the above studies, Hartung stated that "the results of tests on visual perceptual skills of the deaf have shown that the deaf are similar to the hearing on general perceptual tasks."[3] Hartung developed a test to compare the visual perceptual skills of young hearing and hearing im-

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[1] Ibid., p. 124.

[2] Doehring and Rosenstein, "Visual Word Recognition," p. 325.

[3] Hartung, "Visual Perceptual Skill," p. 603.

paired children on different types of materials and to correlate these findings with reading achievement. The tests consisted of visually presented English trigrams and Greek trigrams, plus a reading test which measured vocabulary and comprehension. The results indicated no difference between hearing and hearing impaired children in the visual perceptual skill itself. The correlation between the reading scores and the scores obtained on reproducing trigrams was significant at the .01 level for both the hearing and hearing impaired children.[1] Since identification of both English and Greek cue letters by the hearing impaired children correlated significantly with reading comprehension, it appeared that raw visual speed correlated with the reading skill of the hearing impaired children. Hartung concluded that many auditorially handicapped children are not inferior to hearing children on the visual perceptual skills tested, but they have less knowledge of, or facility with, the alphabetic code.[2]

Furth also studied the perceptual abilities of hearing impaired children "with respect to some quite fundamental modes of visual perception."[3] He tested two groups of hearing and hearing impaired subjects with a mean age of sixteen

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[1] Ibid., p. 607. [2] Ibid.

[3] Hans G. Furth, Thinking Without Language (New York: The Free Press, 1966), p. 105.

years and nine years. The hearing impaired subjects were also subdivided according to reading ability. A letter of the alphabet and a geometrical form were presented in order to observe the closure principle.[1] Parallel lines, gradually separated in pairs, were used to investigate the principle of proximity.[2] Comparison of good and poor readers yielded no significant results. The older subjects responded to the principle of proximity sooner by reproducing the lines as pairs on an earlier step than did the younger subjects. Furth found that the hearing impaired children differed from the hearing children in three out of seven tasks. On a closure task, they recognized an incomplete letter earlier than did the hearing control group. One task tested persistence, and the younger hearing impaired children held to a set more strongly than did the hearing children. Furth suggested that this may result because hearing impaired persons "cannot be as certain as can the hearing about the meaning and instructions of any given problem situation."[3] Finally, on the figure-ground similarity problem, the younger hearing impaired children were less successful than the comparable hearing group. However, Furth suggested that this might be explained by the difficulty the younger hearing impaired children had in understanding the instructions for this problem. The older

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[1] Ibid., p. 106.

[2] Ibid.

[3] Ibid., p. 110.

hearing impaired group appeared to grasp the instructions as well as the hearing group and subsequently performed as well as did the hearing group. The most significant differences found were not by comparison of subjects with varying degrees of language experience, but rather by comparison of different ages or maturational levels. Furth concluded that the visual perceptual ability of hearing impaired children is similar to hearing children.[1]

Mandes, Allen and Swisher utilized a tachistoscope to compare the visual perceptual ability of hearing and hearing impaired children.[2] Two groups, one consisting of ten normally hearing children and the other consisting of ten hearing impaired children, were presented with a visual perception task. The results for both the control group and the experimental group were similar. Mandes, Allen and Swisher stated that "the most interesting aspect of this study is the failure to confirm prior notions concerning the perceptual limitations for the visual modality among deaf children."[3] Their data suggested that "similar perceptual organizations characterize normal and deaf children."[4] Mandes, Allen and Swisher

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[1] Ibid., p. 113.

[2] Evans Mandes, Patricia R. Allen and Charles W. Swisher, "Comparative Study of Tachistoscopic Perception of Binary Figures in Deaf Children and Normally Hearing Children," Perceptual and Motor Skills, XXXIII (1971), 195.

[3] Ibid., p. 199.

[4] Ibid.

concluded that, while hearing loss may deter and impede visual functioning in some cases, it may also have no effect in others, and that the complexity level of the visual perceptual task may play a critical role.[1]

Relationship of Hearing Impairment to Reading

Clarke and Leslie studied a group of auditorially handicapped children in order to determine the relationship of visual-motor skills to their reading ability.[2] Twenty-seven hearing impaired children were selected and divided into three equal groups. Two of the groups consisted of children who were retarded in reading by more than two years, while the third group consisted of children retarded in reading by less than two years. The results of the tests indicated that the hearing impaired children had generally poorer visual-motor skills than the populations used for the standardization of the testing instruments.[3] The tests selected did not differentiate between retarded and non-retarded deaf readers, possibly due to the generally lower reading achievement of all the children tested. Clarke and Leslie stated that

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[1] Ibid.

[2] Bryan R. Clarke and Perry T. Leslie, "Visual-Motor Skills and Reading Ability of Deaf Children," Perceptual and Motor Skills, XXXIII (August, 1971), 263.

[3] Ibid., p. 266.

"although it cannot be concluded that visual-motor skills are a predictor of reading performance of deaf children, results not only for the sample but also for the total population clearly show that these skills of the deaf children are generally well below those of their hearing peers."[1]

Streng reported that the reading process is extremely complicated for hearing impaired children and that a majority of auditorially handicapped children fall considerably below the age-grade norms for hearing children in reading achievement.[2] Streng, in listing the interrelated factors that influence learning to read, put "visual efficiency and ability to discriminate visually"[3] as the first factor. The second factor in Streng's list was "hearing and ability to discriminate auditorily."[4]

Gibson discussed four separate skills that are mastered by normal children in learning to read. He described these skills as (1) learning to discriminate the auditory-vocal symbols used in spoken communication; (2) learning to discriminate the visual symbols used in written communication; (3) learning the correspondence between specific visual

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[1] Ibid., p. 267.

[2] Alice Streng, Reading for Deaf Children, The Pennsylvania School for the Deaf Education Workshop, Book III (Washington, D.C.: Alexander Graham Bell Association for the Deaf, Inc., 1965), p. 1.

[3] Ibid., p. 2.

[4] Ibid.

symbols and specific auditory-vocal symbols; and (4) learning the higher order relationship between certain visual symbols.[1]

McIntyre, Odom and Byassee reported that the failure to isolate the specific causes of the difficulty that hearing impaired children have with reading may be due to lack of knowledge about the skills involved in learning to read.[2] They stated that, although the auditorially handicapped child never masters the first of the skills described by Gibson, he does learn to read, even if at a much lower level of achievement than that attained by normal children.[3] McIntyre, Odom and Byassee suggested that possibly hearing impaired children are able to substitute some equivalent skill for the discrimination of auditory-vocal symbols. This equivalent skill might be the discrimination of visual symbols derived from speechreading, the language of signs, and fingerspelling.[4] McIntyre, Odom and Byassee concluded that the specific set of visual symbols learned by hearing impaired children influences the latter three reading skills discussed by Gibson, and thus, reading performance.[5]

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[1]E. J. Gibson, Principles of Perceptual Learning and Development (New York: Appleton-Century-Crofts, 1969), p. 433.

[2]Curtis W. McIntyre, Richard D. Odom, and Mary Byassee, "The Influence of Congenital Deafness of Processes Concerned with Reading: An Initial Investigation," Journal of Reading Behavior, III, No. 1 (Winter, 1970-71), 36.

[3]Ibid.

[4]Ibid.

[5]Ibid., p. 41.

Summary

Much of the literature has been concerned with whether hearing impaired children are deficient in visual perceptual skills and whether such a deficiency is a result of lack of normal auditory stimulation. Authors investigating this theory have reported that hearing impaired children are deficient in visual perception and have concluded that "deprivation of hearing deters and impedes visual perceptual functioning in some respects."[1] In contrast, other studies have indicated that hearing impaired children function similarly to hearing children in reference to visual perceptual abilities. Authors concerned with the speed of visual perception in auditorially handicapped children have reported that they are relatively slow in processing visual stimuli; however, others reported that "raw visual speed correlated with reading skill of the hearing impaired children."[2]

The results of the preceding studies have demonstrated the confusion surrounding the visual perceptual abilities of the auditorially handicapped child. Studies of visual perceptual abilities in hearing, reviewed in the first section of this chapter, provided little helpful information as their concerns were whether visual perception tests were valid

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[1] Bartley, Principles of Perception, p. 136.

[2] Hartung, "Visual Perceptual Skill," p. 607.

predictors of reading success, and which aspect of visual perception was most highly correlated with reading achievement. Studies involving auditorially handicapped children were mainly concerned with the question of whether hearing impaired children, as a whole, are deficient in visual perceptual skills. The results of these studies were so contradictory that no conclusions can be drawn. However, authorities do agree that visual perceptual skills are necessary for reading achievement and that, in general, auditorially handicapped children have extreme difficulty in learning to read.

CHAPTER III

DESIGN OF THE STUDY

This study was designed in an attempt to identify the relationship between visual perception and reading in auditorially handicapped children. To investigate this relationship, two tests, the Stanford Achievement Test and the Beery-Buktenica Developmental Test of Visual-Motor Integration, were selected. The selection of the hearing impaired children who were the subjects of this study is described in the first section of this chapter, followed by a discussion of the test selected. A detailed description of the testing procedure is presented in the third section.

Selection of Subjects

This study was conducted in the elementary level of the Dallas County-Wide Day School for the Deaf which is located in Dallas, Texas. Eligibility for the program was determined by the State Plan for Special Education established by the Texas Education Agency.[1] The students were identified as auditorially handicapped as defined in the State Plan.[2]

The total enrollment of the elementary program was 121,

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[1] Texas Education Agency, State Plan for Special Education (Austin, Texas: Texas Education Agency, 1970), p. 12.

[2] Ibid., p. 3.

and this entire population was given the Screening Test of the Stanford Achievement Test. The purpose of the Screening Test was to determine which level of the full Stanford Achievement Test would be appropriate for each child. The directions accompanying the Screening Test stated that a score of nine or below determined those students who should complete the Primary I Battery of the Stanford Achievement Test. This test battery is the lowest level, and the reading grade-level score from this battery is based on a reading vocabulary test rather than on a reading comprehension test. Thirty students scored nine or below on the Screening Test, and the writer selected these students as subjects for this study.

The subjects ranged in age from nine years, five months to fifteen years, three months. The mean age of the subjects was twelve years, five months. The subjects had hearing losses ranging from forty-nine decibels to 110 decibels. These figures were obtained by averaging the losses in the three frequencies 500, 1000 and 2000 Hertz in each ear.[1] In order to obtain a single measure of hearing loss for each subject, the average loss in the better ear was selected for use. The mean hearing loss of the subjects was 89.9 decibels. The decibel values given above relate to the 1964 ISO standard.

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[1]Hallowell Davis and S. Richard Silverman, Hearing and Deafness (2nd ed.; New York: Holt, Rinehart and Winston, 1971), p. 181.

Selection of Test

The Beery-Buktenica Developmental Test of Visual-Motor Integration was selected for use in this study because it may be presented individually or in groups and it can be administered and scored by a classroom teacher. The Beery-Buktenica Developmental Test of Visual-Motor Integration is a test of pattern copying and pattern copying is considered to be a valid measure of perceptual-motor development in children.[1]

Barrett reported that the Pattern Copying Test most adequately measured a type of visual ability which is useful in predicting first-grade reading achievement.[2] Rosner also reported that copying tests are commonly used to assess visual perceptual skills.[3] He stated that "this type of task provides the tester with graphic indications of the child's ability to discriminate and reproduce an arrangement of lines."[4] Finally, Goins reported that Pattern Copying correlated more significantly with reading than any of the other five tests

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[1]David B. Ryckman and Robert K. Rentfrow, "The Beery-Buktenica Developmental Test of Visual-Motor Integration: An Investigation of Reliability," Journal of Learning Disabilities, IV, No. 6 (1971), 333.

[2]Thomas C. Barrett, "Visual Discrimination Tasks as Predictors of First Grade Reading Achievement," The Reading Teacher, XVIII (January, 1965), 281.

[3]Jerome Rosner, "Perceptual skills--a concern of the classroom teacher?" The Reading Teacher, XXIV, No. 6 (1971), 544.

[4]Ibid., p. 545.

of visual perception used in her study which was reviewed in Chapter II of this paper.[1] She stated that this test appeared most highly to "measure a type of strength of closure that can best be described as requiring the subject to hold in mind a whole, a perceptual Gestalt, while at the same time he manipulates in some way the 'parts' of the whole."[2]

Ryckman and Rentfrow investigated the reliability of the Beery-Buktenica Developmental Test of Visual-Motor Integration.[3] They reported that the "test-retest correlations indicate that the test possesses sufficient reliability to be useful with children in the elementary grades."[4] The interscorer reliability coefficients indicated that the scoring criteria are explicit and yield high consistency across scorers. Split-half reliability coefficients indicated a high degree of internal consistency in the placement of the items. Consequently, Ryckman and Rentfrow concluded that the Beery-Buktenica Developmental Test of Visual-Motor Integration possesses a sufficient degree of both test-retest and split-half reliability to merit its use with elementary school children.[5]

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[1] Goins, Visual Perceptual Abilities, p. 105.

[2] Ibid., p. 104.

[3] Ryckman and Rentfrow, "Beery-Buktenica Developmental Test of Visual-Motor Integration," p. 334.

[4] Ibid.

[5] Ibid.

Testing Procedure

A special edition of the Primary I Battery of the Stanford Achievement Test was administered to the subjects by their classroom teacher. This edition of the Stanford Achievement Test was modified to the extent that sentences, normally dictated to the hearing child, were printed in the test booklet.[1] The modifications were a result of efforts of the Concerence of Executives of American Schools for the Deaf to standardize the Stanford Achievement Test for auditorially handicapped children.[2] The content of the test was unchanged and it was administered according to the manual accompanying the special edition. The Primary I Battery includes Test 1, entitled Word Reading. This test requires the subject to read and identify single words and scores from this test establish each subject's reading grade level. The scores ranged from 1.7 to 3.2 with a mean score of 2.1.

The Beery-Buktenica Developmental Test of Visual-Motor Integration was administered to the subjects by the writer. Permission was obtained from the Follett Educational Corporation to modify the administration of the test in the follow-

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[1] Truman L. Kelley, et al., Stanford Achievement Test, Form W-HI, Primary I Battery, Special Edition, Adapted for the Annual Survey of Hearing Impaired Children and Youth (New York: Harcourt Brace Jovanovich, Inc., 1970).

[2] Conference of Executives of American Schools for the Deaf, Inc., Proceedings of the Forty-Fourth Meeting (Toronto, Ontario, Canada, 1971), p. 394.

ing manner. An ectograph was used to make slides of the twenty-four form cards which portray geometric designs. The slides were utilized in order to provide a better visual image for a group situation and to enable the writer to fingerspell and sign instructions and answers to questions. A stencil was used to prepare response sheets that replaced the published student test booklet. The instructions were presented to the subjects in accordance with the Administration and Scoring Manual accompanying the test.

Upon completion of the instructions, a slide was projected on a screen while a group of three to five subjects copied the design on the response sheets. The size of the group varied as a result of the students' class schedule. The subjects were monitored and a new slide was projected after all the subjects had completed the previous one. Approximately twenty minutes was required to complete the testing of each group. At the conclusion of the testing, the results were scored according to the manual accompanying the test. Norms, provided in the manual, were used to convert the raw scores into age-equivalent scores. The age-equivalent scores ranged from six years to eleven years, two months with a mean age-equivalent score of eight years. These scores, plus other scores and information previously mentioned, can be found in Table 1.

TABLE 1

SCORES AND INFORMATION ON THIRTY SUBJECTS DISCUSSED IN THIS STUDY

Subject	Reading Grade-level Score	Beery-Buktenica Age-equivalent Score	Chronological Age	Hearing Loss in Better Ear
1	2.3	6.83	12.6	49
2	2.0	7.33	13.4	99
3	1.9	10.25	12.0	104
4	2.5	6.42	13.5	82
5	2.2	6.58	12.3	87
6	1.8	8.58	11.6	102
7	1.7	7.92	9.5	63
8	1.9	8.58	12.5	65
9	1.8	8.67	11.7	76
10	2.1	6.17	10.7	97
11	1.8	9.50	10.9	59
12	2.1	5.50	12.4	108
13	2.4	6.17	12.9	105
14	2.5	8.58	13.7	108
15	1.9	11.08	13.1	110
16	2.2	11.08	12.6	106
17	2.0	7.17	11.8	108
18	1.9	6.83	13.9	87
19	2.0	10.17	10.6	98
20	2.3	7.33	13.1	110
21	2.3	7.92	13.9	66
22	1.8	7.92	13.8	99
23	3.2	6.83	13.6	66
24	2.6	7.17	13.8	102
25	2.4	9.33	12.0	95
26	2.2	9.33	15.3	98
27	1.9	6.00	13.6	99
28	2.0	7.83	13.6	92
29	1.7	8.58	13.7	52
30	2.0	8.67	10.7	103

Summary

This study was designed to investigate the relationship between visual perception and reading in auditorially handi-

capped children. The subjects were thirty hearing impaired children from the Dallas County-Wide Day School for the Deaf, and measures of hearing loss and reading grade-level scores were obtained from their files. These thirty subjects were tested with the Beery-Buktenica Developmental Test of Visual-Motor Integration in a manner previously described. The results were scored by the writer and the raw scores were converted into age-equivalent norms provided in the Scoring Manual. The Beery-Buktenica Developmental Test of Visual-Motor Integration is a pattern copying test and has been reported to be a reliable testing instrument. Tests of pattern copying have been reported to be highly correlated with reading achievement and, thus, are of importance to this study.

CHAPTER IV

TREATMENT AND ANALYSIS OF THE DATA

In order to determine the relationship between visual perceptual ability and reading achievement in auditorially handicapped children, the Pearson product moment formula was selected for statistical analysis. This formula was selected as it is appropriate for the data involved and is the most commonly used statistic in this type of study.[1]

The coefficient of correlation between the scores obtained by the subjects on the Stanford Achievement Test and the Beery-Buktenica Developmental Test of Visual-Motor Integration was computed to be -.284. In order to test the significance of this correlation coefficient, a t-statistic was calculated, and the resulting value was -1.565.

The negative value of the correlation coefficient indicated the existence of an inverse relationship between the Beery-Buktenica Visual-Motor Integration age-equivalent scores and the Stanford Achievement Test reading scores. This suggests that a higher score on the Visual-Motor Integration test is associated with a lower reading score on the Stanford

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[1] John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences, International Series in Decision Processes (New York: Holt, Rinehart and Winston, Inc., 1969), p. 76.

Achievement Test. However, the correlation coefficient of -.284 indicates, at best, a very low correlation.

In addition, this coefficient was not significant at the .05 level. Therefore, it must be concluded that the correlation between the Visual-Motor Integration scores and the Stanford Achievement Test reading scores is not significant. Consequently, the null hypothesis, that the visual perceptual ability of auditorially handicapped children is not significantly related to their ability to read, is accepted.

Since the statistical analysis of the scores indicated that no significant relationship existed, an attempt was made to study the scores in relationship to amount of hearing loss. The subjects were divided into two groups: the most severely hearing impaired with a hearing loss of ninety decibels or greater and the less severely hearing impaired with a hearing loss of less than ninety decibels. The results of the different comparisons can be found in Table 2.

It can be seen that, although the mean reading grade-level score of both groups was 2.1, seventy-four per cent of the most severely hearing impaired group scored 2.0 or above, while only forty-five per cent of the less severely hearing impaired group scored 2.0 or above. It would be expected that the less severely hearing impaired group would

have more language and, thus, would achieve better in reading. However, the results of this comparison contradict such an expectation.

TABLE 2

COMPARISONS OF SCORES IN RELATIONSHIP TO HEARING LOSS

	Subjects with hearing loss of 90 decibels or greater	Subjects with hearing loss less than 90 decibels
Number of subjects	19	11
Mean reading grade-level score	2.1	2.1
Per cent of subjects with reading score 2.0 or above	.74	.45
Mean visual perceptual age-equivalent score	8.19	7.70
Mean chronological age	12.7	12.5

The mean of the visual perceptual age-equivalent scores was somewhat higher for the most severely hearing group than for the less severely hearing impaired group. However, the most severely hearing impaired group also averaged two months older in actual chronological age. This might account for some of the difference between the two groups, but the most

severely hearing impaired group still appears to have performed slightly better on the visual perceptual test.

No conclusions can be drawn from the information presented above except that, as a whole, the auditorially handicapped subjects scored considerably lower on the Beery-Buktenica Developmental Test of Visual-Motor Integration than did the population used in the standardization of this test. The hearing impaired subjects also performed at a low level on the Stanford Achievement Test considering that the mean age of the subjects was twelve years, five months and the mean reading grade-level score was only 2.1. It would appear that these two observations might be related; however, statistical analysis of the data has shown that no significant relationsihp exists in this study.

CHAPTER V

SUMMARY AND DISCUSSION

Summary

The purpose of this study was to investigate the relationship between visual perceptual abilities and reading in the auditorially handicapped child. The relationship was examined in terms of a correlation between two sets of scores obtained from the subjects being studied.

The subjects were thirty auditorially handicapped children selected from the Dallas County-Wide Day School for the Deaf. Two testing instruments, the Beery-Buktenica Developmental Test of Visual-Motor Integration and the Stanford Achievement Test, Primary I Battery, were administered to the subjects. The Stanford Achievement Test was administered by the subjects' homeroom teachers and was machine scored. The Beery-Buktenica Developmental Test of Visual-Motor Integration was administered and scored by the writer.

The Pearson product moment formula was applied to the data collected from the test results, and the resulting value was tested for significance. The value obtained from this correlation was not significant at the .05 level of significance; consequently, the null hypothesis, that the visual perceptual ability of auditorially handicapped children is not

significantly related to their ability to read, was accepted.

Discussion

As the results of this study are contrary to the results of the majority of the studies reported in the literature, variables that may have influenced the testing and data in this study must be considered. One such variable was the existence of different examiners. The Stanford Achievement Test was administered by different homeroom teachers, while the Beery-Buktenica Developmental Test of Visual-Motor Integration was administered to all the subjects by the writer. The personal characteristics of each examiner, such as ability to communicate with auditorially handicapped children, type of communication used, and examiner objectivity, are factors that may have influenced the data obtained.

No attempt was made to control the variables of environmental history, number of years in school, visual acuity, intelligence, and language retardation resulting from hearing impairment. These factors are assumed to influence achievement and may have more relationship to the reading scores than did visual perceptual ability.

Finally, the administration of the Beery-Buktenica Developmental Test of Visual-Motor Integration was modified by the writer as described in Chapter III of this paper. It was scored according to the manual accompanying the test and

the raw scores were converted into standardized age-equivalent scores provided in the manual. However, no allowance was made for the influence that the modifications may have had on the performance of the subjects. The geometric forms, projected on a screen, were both larger and farther away from the subjects than if they had been presented as they were designed to be. This might have affected the subjects' perception for the forms. In addition, the test was presented in this manner to only one sample and no attempt was made to compare the results of such a presentation with more and larger samples. Although the content of the Beery-Buktenica Developmental Test of Visual-Motor Integration and the mode of response remained unchanged, the modifications of the presentation may have affected the scores and thereby influenced the resulting data.

Although the results of this study are not conclusive, they do suggest such challenging questions as: (1) whether there is, in reality, a significant relationship between visual perceptual ability and reading in the auditorially handicapped child; and (2) whether some other variable, such as language retardation, might be more significantly related to reading achievement in hearing impaired children than is visual perception. These questions strongly indicate a need for further research into all the perceptual abilities of

auditorially handicapped children in order to ascertain which, if any, of the abilities included in the perceptual domain are relevant to the education of hearing impaired children. Only when the confusion surrounding this subject is clarified by research can the educator approach the educational needs of the hearing impaired child with more expertise.

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