A STUDY OF AUDITORY PERCEPTION, VISUAL PERCEPTION, AND PHONICS ABILITIES OF FOURTH AND SIXTH GRADERS

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We hereby recommend that the dissertation prepared under our supervision by Anna Beth Forrester Fouse

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CHAPTER I

INTRODUCTION

The teaching of reading has always been a primary concern of educators. Reading is almost universally considered to be the most important single learning task of all children throughout their school experience. Learning to read is a prerequisite to almost all other school learning.

The history of reading has been a history of controversy concerning different approaches to the teaching of reading. Aukerman (1971) declared that historically children have learned to read by methods which seem incredible to the modern educator, but nevertheless, children did learn to read.

The inclusion of phonics in beginning reading instruction has been a controversial issue in education for many years. The phonics method came into use in the middle 1800's (Ashlock, 1969). At the present time, almost all total approaches to reading include phonics instruction, and therefore most teachers teach at least some phonics as part of their beginning reading procedures (Ashlock, 1969; Barton and Wilder, 1962). The current focus of the issue is not if phonics should be taught, but the amount of phonics instruction that is needed and at what time the child should begin his phonics instruction.

Although children with high intelligence can usually learn to read through the phonemic approach without much difficulty, children of low intelligence often are unable to remember phonemes from one day to the next (Aukerman, 1971). Therefore, the use of a phonics program with all children in a particular school district is of questionable value.

There are many studies which relate auditory and visual perceptual functioning to reading in general. However, in a very extensive review of the literature in this area, no studies were located in which auditory and visual perceptual functioning were related specifically to ability in phonics. As phonics is currently an integral part of most school reading programs, it was felt that a study of this type was needed. This need was emphasized in a statement by Hammill and Larsen (1974):

> Teaching children to associate letter sounds with their graphic representations has long been recognized by teachers as essential, or at least very desirable, to reading, though this seemingly valid procedure should probably be carefully studied in future research (p. 434).

Problem

The problem of this study was to determine whether students who are unable to learn phonics also have a disability in auditory perception and/or visual perception. In other

words, is auditory and visual perceptual functioning related to a student's ability to learn phonics?

Purpose

The purpose of this study was to conduct an investigation with fourth graders and sixth graders enrolled in the Grand Prairie Independent School District during the spring term of the 1974-75 academic year to determine if there was a relationship between auditory perception, visual perception, and ability or disability in phonics which is a major area of concern in the teaching of reading.

The study also investigated whether there was a significant difference in the relationship between auditory perception and phonics abilities and the relationship between visual perception and phonics abilities. It also sought to determine whether there was a significant difference in the performance of girls and boys in the areas of phonics, auditory perception, and visual perception. The significance of grade level as a variable was investigated in relation to phonics, auditory perception, and visual perception. Finally, a subgrouping of subjects functioning one year or more below grade level in the area of phonics was compared to the random sample of subjects in the areas of auditory and visual perception.

Definition of Terms

In order to clarify the meaning of certain terms which were used in the study, specific definitions were necessary. A retarded reader is defined as an individual of normal intelligence (90 to 110 I.Q.) in the regular classroom who is functioning one year or more below grade level in reading as determined by a standardized achievement test score. Phonics is the system of reading instruction which stresses the translation of parts of visible words or alphabetic symbols into sounds and using the sounds to work out the recognition and pronunciation of a word. For this study, a phonics disability refers to individuals scoring one year or more below grade level on Word Identification and Word Attack, two subtests of the Woodcock Reading Mastery Tests which were used in the research. Auditory perception is the ability to receive and interpret sensations through the auditory modality. It implies not only an ability to hear the sounds, but also an ability to perceive and understand what is heard. Visual perception refers to the ability to receive and interpret incoming stimuli through the visual modality. This implies an ability to understand and perceive what is seen.

Statement of Hypotheses

1. There are no significant relationships between the variables, phonics, auditory perception, and visual

perception.

2. The relationship between auditory perception and phonics is the same as the relationship between visual perception and phonics.
3. There is no significant difference in auditory perception, visual perception, and phonics with respect to sex.
4. There is no significant difference in auditory perception, visual perception, and phonics with respect to grade level.
5. There is no significant difference in the means of the subgrouping of retarded readers and the means of the random sample in auditory and visual perception.

Limitations

1. The study was limited to one geographic area, Grand Prairie Independent School District.
2. Subjects were currently enrolled in regular classes in the fourth and sixth grades in the Grand Prairie Independent School District.
3. Subjects were Caucasian.

CHAPTER II

REVIEW OF THE LITERATURE

Reading involves a learning process, therefore, the review of the literature concentrated on the auditory and visual modalities and their relationship to learning processes. Special consideration was given to research studies dealing specifically with the relationship of the auditory and visual modalities to reading. It was extremely difficult, however, to draw any broad conclusions about the effect of mode because of the lack of comparability of subjects, methods, and materials in the research studies which were investigated. An attempt has been made to organize this research into a convenient and usable form. A table listing related research in chronological order is included in Appendix A.

Studies comparing the auditory modality with the visual modality

Early research in the area of visual and auditory modality systems attempted to identify one system as being consistently more efficient for learning. In one of the first studies in this area, Munsterberg (1894) concluded that the visual modality is superior to the auditory modality for learning and that when the two modalities act together they hinder each other. Whitehead (1896) also found the visual method

of presenting nonsense syllables for memorization superior to the auditory method. In contrasts, Henmon (1912) found the auditory method of presentation superior when the lists were presented one, two, or three times. Erickson (1917) and Russell (1928) found the auditory modality superior in the lower elementary grades. However, at the upper grade levels, Erickson's group of ninth grade subjects favored the oral presentation while Russell's ninth grade subjects favored the visual method. This lack of agreement may be a result of a lack of control of subject variables and an inability to provide pure treatment procedures.

More recent studies have also resulted in disputes as to the more efficient modality. In a summary of the literature comparing the rates of learning by auditory and visual modalities, McGeoch (1952) concluded that the auditory presentation seemed to be more effective for young children, but that it becomes less effective as the subject increases in age.

Budoff and Quinlan (1964) investigated McGeoch's statement in a study comprised of 56 second grade public school children between seven and eight years of age, of average intelligence, and from nonprofessional homes. Children with known uncorrected aural or visual deficiencies were excluded. Three and four letter nouns and verbs were used in a paired associate task. Words were selected from vocabulary lists of

preprimers. The visual task utilized the Hunter Card Master, Model 340. The word pairs were presented on plastic cards before a window. Two rates were considered: the anticipation interval, and the joint-presentation interval. They found that word pairs presented aurally were more quickly learned than the visual pairs. Therefore, the results suggest that aural learning among primary grade children appears more rapid and efficient than learning with a visual presentation which is in agreement with the statement by McGeoch. However, as the investigators have concluded, replication by other researchers seems appropriate.

Murray and Roberts (1968) found that for short-term memory, more auditory material was recalled than visual. The channel reported first was recalled better than the channel reported second. Recall was worst at the fastest rate and best at the slowest rate although this increase was reflected mainly in the visual recall, as auditory recall remained relatively constant across rates.

In an evaluation of comparative recall strengths of auditory, visual, and simultaneous auditory-visual prereaders, Linder and Fillmer (1970) presented material for sequential recall, a necessary task in learning to read well. One hundred eight southern Negro second grade boys, all born in 1961, with an I.Q. test score between 75 and 95 were selected. They were tested with three instruments designed

for the study. The tasks required sequential recall of 1) eight familiar objects, 2) eight digits, and 3) eight colors.

The researchers concluded that the total auditory performance was significantly poorer than the total visual and the total auditory-visual for the three tasks combined. There were no significant differences between the total visual and the auditory-visual results.

These findings agree with research evidence which found that auditory presentation words were easier to remember in meaningful context than out of context for poor readers (Jenkin, 1935). Material with meaningful associations can be remembered longer and more easily than material which provides no meaningful associations, regardless of the modality used.

In view of their findings, Linder and Fillmer (1970) supported the contention that the auditory channel may be a better predictor of reading achievement than the visual, although most reading readiness tests are a function of the child's visual perceptual ability. Coinciding with this view are the findings of Durrell and Murphy (1963) who reported that those students performing better on an auditory diagnosis seem to have a better chance of succeeding in remedial reading classes.

One limitation of their study was that only slow readers were tested. Therefore, the design did not allow for a

direct comparison of the results of tasks for good and slow readers. The sample was also restricted in terms of race, sex, and geographic locale.

In a five year follow-up study of 177 pupils with language disorders enrolled in special public school classes for the educationally handicapped, Koppitz (1971) also found auditory functioning significantly related to achievement. The children studied were in a learning disability program and were from six to 12 years old. The children lived in a Northeastern state in rural, semirural, suburban, and small town communities, and were transported to classes with an average of eight students by bus. There were no mentally retarded children included in the study. Each child was given the Bender-Gestalt Test and the Wide Range Achievement Test shortly after the child's admission to the special class, and again at the end of the school year.

According to Koppitz, it became apparent during the course of the study that the children's auditory perception and their auditory memory had a profound effect on their progress and achievement in the learning disability program. The study revealed that most of the children with poor auditory perception as measured by the Wepman Test of Auditory Discrimination required long-term special education. It was noted that the three children with poor auditory perception who returned to regular classes did not do well. Koppitz

also indicated that most of the learning disabled children who did poorly on the Wepman Auditory Discrimination Test also did poorly on the Bender-Gestalt Test.

In a study by Myklebust and Johnson (1965), 60 six to 18 year old children were given the Wechsler Intelligence Scale for Children (WISC) or the Wechsler Adult Intelligence Scale (WAIS). The mean scaled score on Digit Span was 8.58. Some of the most severe and educationally retarded children were those in which Digit Span and Coding were below average. This same population was given the Detroit Tests of Learning Aptitude. The mental age scores of the subtests were converted into quotients and the group measures were given. The group measures were lowest for the subtest, Auditory Attention Span for Unrelated Words. The next lowest score was on the subtest, Auditory Attention Span for Related Syllables. In this particular population, it was found that auditory memory impairment predominated over visual memory impairment. This study, like the study by Koppitz (1971), emphasized the fact that auditory involvement is prominent in learning disabled children.

The original population in a research study by Smith (1971), had more than three times as many visual subjects as auditory subjects. In this study, subjects with a difference of twelve months or more between their average auditory and visual scores were designated auditory or visual

learners according to superior modality. Because of the small number of auditory types available, five subjects who had ten or eleven month difference scores were included in the auditory group.

Studies relating to preferred modalties

There are relatively early studies which showed significant interaction between the more efficient modality system and the instructional method (Reynolds, 1963; Englemann, 1967; Bateman, 1968). Wolpert (1970) asserted that no one sensory modality based method is best for all children or for any subgroup dichotomized on the basis of sex, readiness test scores, or I.Q. because most children exhibit differences in sensory modality functioning. Duane (1973) concurred with Wolpert in his assertion that all individuals do exhibit either an auditory or a visual preference. Data from a study conducted by Level (1971) also suggested the existence of individual mode preferences.

Summary of literature related to the auditory and visual modalities and to preferred modalities

A number of studies have been conducted concerning the amount of learning which accurred with visual and auditory presentations without regard to the more efficient modality system of the individual. The majority of these studies have found that the visual presentation is significantly

more effective than the auditory presentation (Webb, 1956; Lockard, 1961; Bruinicks, 1970; Berry, 1973; and Williams, 1973). However, other studies have found that younger children perform better in the auditory modality than the visual modality (McGeoch and Irion, 1952 and Budoff and Quinlan, 1964).

The relationship between prereaders' abilities to integrate sensory information and reading achievement was investigated by Muehl and Kremenak (1966). The subjects were required to match information within and between the auditory and visual senses. The four sequential-type matching tasks were designated V-V (visual-visual), A-A (auditory-auditory), A-V (auditory-visual), and V-A (visual-auditory).

Results indicated that V-V was easiest, A-A the most difficult, and V-A and A-V intermediate in difficulty in that order. No reliable differences associated with sex or age existed. In analyzing the data for evidence of a relationship between the four sensory matching skills and reading readiness and subsequent achievement, the analysis showed that ability to match visual-to-auditory (V-A) and auditory-to-visual (A-V) pairs at the beginning of the year made significant contributions to predicting reading. For the population in this study, the general ability to relate information from the auditory sense to the visual sense was markedly associated with later reading achievement.

Daniel (1974) concluded that neither the auditory mode of presentation nor the visual mode is superior to the other but that individuals have a differential modality preference through which learning occurs more efficiently. Similar findings of modality preference as an important variable in learning are reported by Bursuk (1971), Waugh (1971), and Waters (1973).

A number of studies have concluded that there is no interaction between modality preference and instructional procedures (Robinson, 1968; Nelson, 1970; Tyler, 1971; Smith, 1971; Scott, 1973; Gilberg, 1973; Warren, 1973; Waugh, 1973; Sabatino, 1974). Each of these studies recommended further investigation in this area utilizing children at different grade levels and a variety of learning tasks.

As previously stated, there are numerous reasons why contradictory results are found regarding the same or similar hypotheses. First, it is difficult to provide pure treatment procedures which are meaningful and related to school learning tasks. Studies that appear to be comparable often do not use the same type of tasks, evaluation procedures, or consider the exact same variables. Therefore, conflicting results occur.

Studies relating auditory and/or visual perceptual ability to reading ability

Studies attempting to correlate auditory and/or visual

perceptual ability to ability in reading can be divided into two main categories. In the first category, researchers sought to predict future reading performance in terms of the child's present functioning on measures of auditory and/or visual memory. The second category of studies compared the functioning of good readers and retarded readers in relation to auditory and visual variables.

Gray (1922) was one of the first investigators to note that it was possibly failures such as auditory memory rather than failures in auditory acuity or discrimination that inhibited the reading process. Though little has been conclusively resolved regarding the relationship between memory and reading achievement, discussion continues to the present.

Durrell and Harrington (1955) found that visual discrimination of word elements had high importance in acquiring a primary grade reading vocabulary.

The relation of certain aspects of auditory discrimination to silent reading ability was investigated by Wheeler and Wheeler (1954) by testing 629 children in the fourth, fifth, and sixth grades. Ability to judge pitch of musical tones was tested by the Seashore's Tests of Musical Talent, and ability to discriminate sounds in auditory language situations was tested by the Auditory Discrimination (A-D) Test, which was designed by the author's to meet the special needs of the investigation.

Sight vocabulary and silent reading comprehension skills were determined from results of the Metropolitan Achievement Tests administered and processed under the direction of the school's remedial reading teachers. Intelligence data were available on the permanent school records of the pupils. The conclusions were that pitch discrimination probably has little to do with ability to read, and that a substantial relationship does not exist at the intermediate grade level between silent reading ability and the ability to discriminate sounds in the spoken language situation as measured by this study.

Groups of disabled and normal readers aged eight to 14 years were compared on the Bender-Gestalt, Auditory Discrimination Test, and a visual-motor matching task. No significant differences between the disabled and normal readers were found on the Bender-Gestalt and the visual-motor matching task. The normal readers were superior to disabled readers on the Auditory Discrimination Test (Lingren, 1969).

Tompkins (1971) investigated the relationship between reading achievement and auditory and/or visual perception, discrimination, and memory for third grade boys. The review of the literature revealed that an investigation of both boys and girls, in terms of predicting reading achievement with the variables, would represent a double study because the combination of variables predicting for each had

already been found to be significantly different (de Hirsch, Jansky, & Langford, 1966; Kerfoot, 1967). Moreover, Dykstra (1966) and Hirst, Crane, and Pagel (1969) found girls to be superior to boys in reading achievement. It has also been reported that approximately 87 per cent of reading disability cases are boys (Gold, 1970).

Schulz (1972) investigated the relationship of first grade reading and arithmetic achievement to auditory memory, visual memory, and haptic memory. The sample was comprised of 101 English speaking, Anglo boys from several first grades in Hidalgo and Cameron Counties in Texas. She found that haptic memory and visual memory were related to reading and arithmetic achievement. Reading achievement and arithmetic achievement were also found to be correlated. Contrary to most of the current literature, auditory memory did not have a significant relationship to reading and arithmetic achievement. However, Schulz (1972) concluded that this may be a result of the choice of the subtest used to measure auditory memory rather than any other factor.

The relationship between memory span and associative learning test findings of 50 Caucasian boys whose average reading scores were at least two years beyond expectancy for their mental age was investigated by Raymond (1955). He used five memory span tests from the Detroit Tests of Learning Aptitude (Detroit). Results of the investigation suggested

that there was a highly significant difference in favor of the visual presentation over the auditory presentation. There was a highly significant difference in favor of the visual-auditory presentation over the visual-visual presentation. A comparison of Raymond's reading achievers to retarded readers of the same chronological age from a previous study by Stauffer (1947) suggests that the auditory and visual memory span tests from the Detroit did appear to discriminate between retarded and achieving readers.

Neville (1966) reported that retarded readers as a group perform better in those measures which might be labeled as visual perceptive and poorer in auditory memory tasks. The population studied by Neville performed poorly on the more formally learned verbal tasks (Information and Arithmetic) and on Digit Span. Neville hypothesized that the poor performance on the Arithmetic subtest of the WISC was in part due to the auditory memory deficit as it was observed that poor readers tended to request that the arithmetic problems be repeated often.

Rizzo (1939) and Morency (1968) found that auditory memory span did discriminate between good and poor readers or predicted first grade achievement to a significant degree within normal populations. In studies of clinic populations, Sandstedt (1964) and Ellehammer (1966) suggested that auditory memory span does divide normal from retarded readers.

A study by Golden and Steiner (1969) investigated the relationship between specific auditory and visual functions and reading performance. Pairs of second graders, matched according to mental age, chronological age, and I.Q., were tested with several subtests from the Revised ITPA (Auditory Sequential Memory, Visual Closure, Auditory Closure, and Sound Blending), and the Monroe Visualization Test. The findings indicated that poor readers are lacking primarily in auditory functions rather than visual.

Cabrini (1963), McLeod (1965), and Shepard (1967) have also found that poor readers do not perform as well as good readers on tests of auditory memory.

Dornbush and Basow (1970) studied the relation between reading achievement and functioning in the auditory and visual modality using short term memory as an investigative tool. Memory spans in which rate of presentation, modality of presentation, and order of report were varied were presented to subjects in the first, third, fifth, and ninth grades. Intelligence was held constant. Subjects in each grade were subdivided according to good and poor reading ability. It was found that performance on memory tasks was not affected by reading level. It was reported that young subjects do not operate in terms of storage; they ignore what they cannot immediately handle.

Flynn and Byrne (1970) designed a study to test auditory

abilities in a selected group of advanced and retarded third-grade readers from both high and low socioeconomic schools. Auditory discrimination, auditory memory, and blending were the auditory abilities that were evaluated. Children in the advanced reader group had scored 4.2 or higher on the reading subtest of the Iowa Test of Basic Skills. The group of retarded readers had scored 2.2 or lower on the reading subtest of the Iowa Test of Basic Skills. Two groups of advanced readers from high and low socioeconomic schools and two groups of retarded readers from high and low socioeconomic schools were given a battery of nine subtests designed to assess the auditory modality. The advanced readers from the high economic group and from the low economic group scored significantly higher than their counterparts in the retarded readers. The advanced readers in the two economic levels could not be differentiated. The advanced readers scored high on tests of auditory discrimination, auditory memory, and blending regardless of socioeconomic level. The retarded readers, regardless of socioeconomic level, scored low on the same tests indicating a weakness in the auditory modality in retarded readers. Therefore, it seems that a strong auditory channel is conducive to producing strong readers whereas children with poor auditory modalities usually are poor readers.

The tests which yielded highly significant differences

between the advanced and retarded readers required blending of phonemes and syllables (The Monroe Sound Blending Test), and discriminating between pairs of words, nonsense syllables, and musical pitches (Wepman Auditory Discrimination Test, Schiefelbusch-Lindsey Test of Auditory Discrimination, and the Pitch subtest from the Seashore Test of Musical Talents, respectively).

Studies relating specific standardized tests of auditory and/or visual memory and perception to reading

Raymond (1955) investigated the relationships between memory span and associative learning test findings of 50 selected reading achievers whose average reading grade scores were at least two years in advance of mental age expectancy.

The visual and auditory memory span tests from the Detroit Tests of Learning Aptitude, Auditory Attention Span for Unrelated Words, Visual Attention Span for Objects, Auditory Attention Span for Related Syllables, Visual Attention Span for Letters, and Oral Directions were among the memory span tests used in the study.

In comparing the reading achievers to retarded readers of the same chronological age from a previous study conducted by Stauffer (1947), memory span tests of visual and auditory material from the Detroit Tests of Learning Aptitude appeared to differentiate between retarded and achieving readers. However, further research is needed because

Raymond's and Stauffer's groups were not equated or matched.

A difference was found between good and poor readers' ability to discriminate between auditorily presented word-pairs as being the same or different (Bond, 1935; Wheeler and Wheeler, 1954). The Wepman Auditory Discrimination Test was used to investigate the relationship between reading achievement and inadequate articulation and inadequate auditory discrimination. As a group, children whose auditory discrimination was not adequate for their age scored significantly lower in reading grade equivalent than children whose auditory discrimination was adequate for their age. The Wepman Auditory Discrimination Test was found to be positively related to reading achievement in first, second, and third grade pupils (Wepman, 1960). The data supported the statement that an important relationship exists between poor reading achievement and the auditory discrimination ability of the children studied.

Morency (1967) conducted a longitudinal predictive study of 177 students. The students were initially tested upon entering first grade, then at the end of the second and third grades. The tests used were 1) the Wepman Auditory Discrimination Test, 2) an experimental test for auditory memory using consonants-vowels nonsense syllables, 3) an experimental test for visual memory and discrimination that incorporated the use of geometric forms, 4) the Lorge-

Thorndike Intelligence Tests, and 5) the Metropolitan Readiness, and Metropolitan Achievement Tests.

Findings indicated that the Wepman Auditory Discrimination Test and auditory memory for nonsense syllables at the beginning of first grade correlated significantly with every subtest of the achievement battery given at the end of third grade. Visual discrimination and memory abilities for geometric forms were found to correlate significantly to most of the subtests of the achievement battery.

An attempt was made to predict reading achievement through third grade and to develop screening devices to assess perceptual abilities and identify potential learning disabilities in a three-year study (Buktenica, 1969). One hundred forty Negro and white children of lower and middle class backgrounds who had the same reading program were tested in the first, second, and third grades. Tests used were 1) the Primary Mental Abilities Test, 2) the Test of Non-verbal Auditory Discrimination, 3) the visual-motor integration test, 4) the Wepman Auditory Discrimination Test, and 5) the Metropolitan Reading Achievement Tests given at the first grade and the end of the third grade.

Correlations between tests of non-verbal auditory and visual perception and reading achievement remained significantly high and rather constant over the three year period. The best predictor of reading was the Non-verbal Auditory

Discrimination Test, but all perceptual tests were more effective than I.Q. measures.

A study by Sabatino (1969) used the Bender Visual Motor Gestalt Test and an Experimental Test of Auditory Perception constructed by the investigator as testing instruments. Thirty subjects with known minimal brain damage and 30 subjects with no known cerebral damage were used as experimental and control groups respectively. Their ages ranged from 6-1 to 12-7 years. The two groups were matched for age, sex, and verbal I.Q. Both groups were given the Bender Visual Motor Gestalt Test and the Experimental Test of Auditory Perception.

The study sought to determine if the commonly used Bender Visual Motor Gestalt Test could identify children having neurological impairment resulting in learning disabilities and if some neurologically impaired children have learning problems related to specific behavioral impairment in areas such as auditory perception.

It was concluded that the functions assessed by the Bender Visual Motor Gestalt Test were not the same as the functions assessed by the Experimental Test of Auditory Perception in either normal or neurologically impaired children and the routine assessment of visual perception may contribute to overlooking a large group of children with serious auditory perceptual problems.

de Hirsch, Jansky, and Langford (1966) attempted to develop diagnostic criteria in order to identify potential reading failures at the kindergarten level. This study was limited to the perceptuomotor and linguistic functioning of 53 preschool children. Among the 37 kindergarten tests, 19 were significantly related to overall reading performance 2½ years later; however, these coefficients were low, ranging from .23 to .50.

The Bender-Gestalt Test, all reading readiness tests (except Letter Copying), which were primarily visual perception, and the Wepman Auditory Discrimination Test were among the tests positively associated with later performance in reading. It was suggested that it was not the specific skills involved in the Bender-Gestalt that accounted for the predictive efficiency of the test, but on the degree to which it measured integrative ability. Family history of language and handedness, environmental stimulation, gross motor skills such as hopping, throwing, and balancing, and ill-defined lateralization did not predict performance in reading.

Separate coefficients of correlation were computed for boys and girls for those 19 tests that were potential predictors. Three tests predicted about equally well for boys and girls. Two of the tests predicted better for boys although the overwhelming majority of the tests were much

better predictors for girls.

The relationship of first and second grade reading achievement to selected auditory and visual readiness tests was investigated by Kerfoot (1967). The findings suggested that multiple regression equations predicting reading achievement from the above measures of auditory and/or visual discrimination must be derived separately for boys and girls, since the combination of variables which predict are clearly different for each. Measures of visual discrimination proved to be better predictors of reading achievement than measures of auditory discrimination and intelligence in this particular study.

Egeland, Di Nello, and Carr (1970) attempted to determine the best combination of test scores in predicting achievement of first and third grade boys from a battery of tests given in first grade. The instruments used were the Wechsler Intelligence Scale for Children, the Illinois Test of Psycholinguistic Abilities, the Bender Visual Motor Gestalt Test, and the Harrison Stroud Reading Readiness Profiles. Results suggested that valid predictions can be made by evaluating intelligence, psycholinguistic abilities, reading-readiness skills, and visual-motor skills in first grade. The subtests that were extremely important for predicting early academic success were those that measured the child's ability to retain, manipulate, and attach meaning

to visual symbols.

Studies relating phonics to reading ability

Wheeler and Wheeler (1954) found significant correlations between reading ability and auditory tasks of discrimination as to same or different between paired-sound elements, selecting one word from four which did not rhyme, and selecting from a list of three sounds, the one sound which had been heard in a stimulus word previously pronounced by the examiner.

Durrell and Harrington (1955) compared the reading ability of 500 first grade and 1000 second grade pupils with high and low auditory discrimination. Auditory discrimination skills considered in the study were noticing initial consonants, rhyming at the end of words, final consonants, and a combination of initial and final consonants in spoken words by the examiner.

Highly significant differences were found, indicating that pupils with superior auditory discrimination were also superior in reading ability. It was concluded that phonics instruction had a higher relation to reading achievement than any of the other factors studied.

The relationship between prereading measures of auditory discrimination and reading achievement at the end of the first grade were investigated by Dykstra (1966). The

Lorge-Thorndike Intelligence Tests (1957), the Gates Primary Word Recognition and Paragraph Reading Tests (1958), and seven tests of auditory discrimination selected from published reading readiness tests were administered to 632 first graders.

Multiple regression analysis showed that the Lorge-Thorndike I.Q. was consistently the best predictor of reading achievement. Ability to discriminate between spoken words which do or do not begin with identical sounds from the Harrison-Stroud Profiles, and identifying correct pronunciation of words from Reading Aptitude were, also, good predictors of reading. An additional finding in this study was that girls were significantly superior to boys in the auditory discrimination skills measured and in reading achievement after a year of instruction.

Major trends found in the literature

When sex, age, and preferred modality were not considered, it appears that visual presentations are usually superior to auditory presentations. When age was considered, however, as a variable, auditory presentations appear to be more effective for younger children. Comparisons of groups of different age levels on the auditory and visual variables generally found the older groups to be visually superior to the younger groups.

The majority of the research studies agreed modality preferences do exist. However, it appeared that the auditory modality may be more important than the visual modality in reading although adequate visual perception is necessary and most reading readiness tests are a function of visual perception. Studies of retarded, normal, and advanced readers found the retarded readers to have impaired auditory perception whereas normal and advanced readers were generally superior in the auditory channel. Meaningfulness of material also appeared to have an effect in auditory presentations. Sex appeared to be a variable as the majority of the disabled readers were boys and the majority of the advanced readers were girls. However, as Wheeler and Wheeler (1954) found girls to be superior auditorily, this may be due to the superiority of the auditory channel rather than the sex variable.

CHAPTER III

PROCEDURES

Permission to select a random sample of fourth and sixth grade students and a sample of fourth and sixth grade slow readers was obtained from the Grand Prairie Independent School District in Grand Prairie, Texas.

Selection of Sample

Sixty students, randomly selected from 480 fourth and sixth graders in the Grand Prairie Independent School District, were tested in the area of phonics, auditory perception, and visual perception. The sample consisted of 30 fourth graders (15 males and 15 females) and 30 sixth graders (15 males and 15 females).

In addition, a subgrouping of the retarded readers from a pool of 158 students were tested in the area of phonics. Sixty students who performed one year or more below grade level on the two phonics subtests were then tested in the area of auditory and visual perception. The subgrouping of students selected for the auditory and visual perceptual testing also consisted of 30 fourth graders (15 males and 15 females) and 30 sixth graders (15 males and 15 females).

Criteria for the Parent Population

1. Subjects were currently enrolled in grades four and six of the regular classes in the Grand Prairie Independent School District.
2. Subjects were Caucasian in an attempt to control the variance which might have resulted from using students from different racial groups.
3. The subject's level of functioning in phonics was determined by two subtests of the Woodcock Reading Mastery Tests (Woodcock) which are Word Identification and Word Attack.
4. In the area of visual perception, the subjects were given the Bender Visual-Motor Gestalt Test (Bender) and two subtests of the Detroit Tests of Learning Aptitude (DTLA), Visual Attention Span for Objects and Visual Attention Span for Letters. A subject was identified as having a visual perceptual problem if he performed two years below his age level expectancy on the two subtests of the DTLA. The scores from the Bender were used in a post-hoc correlational study to determine if subjects' scores on the visual subtests of the DTLA were valid measures of subjects' functioning in visual perception.
5. In the area of auditory perception, the subjects were administered the Wepman Auditory Discrimination Test (Wepman) and two subtests of the DTLA, Auditory

Attention Span for Related Syllables and Auditory Attention Span for Unrelated Words. A subject was identified as having an auditory perceptual problem if he performed two years below his age level expectancy on the two auditory subtests of the DTLA. The scores from the Wepman were used in a post-hoc correlational study to determine if subjects' scores on the auditory subtests of the DTLA were valid measures of subjects' functioning in the area of auditory perception.

Information concerning the subjects' age, sex, and level of functioning on standardized achievement tests in reading was obtained from the records on file in the Grand Prairie Independent School District. Only records less than one year old were utilized.

Criteria for the Subgrouping of Retarded Readers

1. The subgrouping of retarded readers consisted of students who met all the criteria of the parent population and the random sample.
2. Scores on the Iowa Tests of Basic Skills were used to screen fourth grade students and identify students who were functioning one year or more below grade level in reading.
3. Total Reading Scores on the California Achievement Tests were used to screen sixth graders and identify students

who were functioning one year or more below grade level in reading.

4. Subjects' scores on Word Identification and Word Attack, two subtests from the Woodcock, were used to select subjects functioning one year or more below grade level in phonics from the group of fourth and sixth grade students who were functioning one year or more below grade level in reading. Therefore, all subjects in the subgrouping of retarded readers also had a phonics disability.

Instrumentation

The Iowa Tests of Basic Skills at the fourth grade level and the California Achievement Tests at the sixth grade level were used in the study to screen for level of functioning in reading because the subjects had been administered these tests by the Grand Prairie Independent School District. The test results which were on file in the school district offices were utilized. Both of these tests are standardized achievement tests and are used in school districts throughout the United States to determine achievement levels of students.

A reading diagnostic test, the Woodcock, was selected to determine the subject's level of functioning in the area of phonics. Two subtests, Word Identification and Word Attack, were used.

Subtests of the DTLA were used to test individual's

functioning in the areas of auditory and visual perception. The DTLA is frequently used in test batteries to assess children's strengths and weaknesses in auditory, visual, and motor channels. Subtests which assess the auditory modality and were used in the study are Auditory Attention Span for Unrelated Words and Auditory Attention Span for Related Syllables. Subtests which assess the visual modality and were utilized in the present study are Visual Attention Span for Letters and Visual Attention Span for Objects. As Oral Commissions and Oral Directions are combined measures of the auditory, visual, and motor channels, they were not used in this study.

The Wepman Test of Auditory Discrimination and the Watkins Bender-Gestalt Scoring System were administered for use in a post-hoc correlational study to determine the validity of the subtests of the DTLA for measuring auditory and visual perception.

All tests were administered and scored according to the instructions given by the authors. A combined measure of phonics ability was obtained for each subject by averaging the mental age scores on the Word Identification subtest and the Word Attack subtest of the Woodcock. A combined measure of auditory perceptual functioning was obtained for each subtest by averaging the mental age scores from the two auditory subtests of the DTLA. A combined measure of visual

perceptual functioning was obtained for each subject by averaging the mental age scores from the two visual subtests of the DTLA.

Description of the Measuring Instruments

The Woodcock Reading Mastery Tests, a battery of five individually administered reading tests for use from kindergarten to grade twelve, was authored by Richard W. Woodcock, and published by American Guidance Service, Inc., in 1973. The five tests are Letter Identification, Word Identification, Word Attack, Word Comprehension, and Passage Comprehension. Two alternate forms of the battery are available, Form A and Form B. The two forms may be used interchangeably at any level as they are essentially equivalent in range and distribution of item difficulties. Form A was used in this study. Raw scores for the five subtests can be converted to traditional normative scores including grade scores, age scores, percentile ranks, and standard scores.

For this research study, only Word Identification and Word Attack were administered.

The Word Identification test, which consists of a set of 150 words ranging in difficulty from first grade to grade twelve, requires the subject to name the word presented to him. There is no assumption that the subject knows the

meaning of the word nor that he has even seen the word before.

The Word Attack subtest which contains 50 items measures the subject's ability to identify nonsense words through the application of phonetic and structural analysis skills. Grade level norms are provided for each subtest. In addition, separate norms for boys and girls are provided for this test.

Subtests of the revised Detroit Tests of Learning Aptitude (1967) by Harry J. Baker and Bernice Leland were used in this study. The DTLA consists of 19 subtests designed to measure learning abilities such as reasoning and comprehension, practical judgment, verbal ability, number ability, time and space relationships, auditory attentive ability, visual attentive ability, and motor ability. The tests yield a mental age for each subtest. Auditory Attention Span for Unrelated Words and Auditory Attention Span for Related Syllables require the subject to listen to a series of words or phrases and repeat the series in the same order if possible. Visual Attention Span for Objects and Visual Attention Span for Letters require the subject to look at a picture of objects or letters for a specified length of time and then verbally recall what was seen.

The Wepman Auditory Discrimination Test by Joseph Wepman was also used to assess the strength of the auditory modality. Forty stimulus pairs were presented to the subject. The subject answered "same" or "different" in response to each

stimulus pair. The Wepman test manual suggests that assessment of auditory discrimination be based only upon scores obtained on the "different" items, and that those in the "same" category be employed only as a check on the validity of individual test results. Scores for individual subjects were computed and reported in a post-hoc correlational study.

The Watkins Bender-Gestalt Scoring System by Ernest O. Watkins was used to assess visual perception. This particular scoring system was chosen because it is an objective type of scoring system and norms have been set up for different age levels which identify the child as having no visual perceptual problem or as having a mild, moderate, or severe visual perceptual problem. The results from this test were utilized in a post-hoc correlational study which is included in the dissertation.

Statistical Analysis

The data obtained for this study was analyzed using the following statistical procedures:

1. A one-sample t test was used for testing the significance of each one of the correlation coefficients of null hypothesis one.
2. A z test for testing the significance of the differences between the two correlation coefficients in null hypothesis two was computed.

3. A 2x2 multivariate analysis of variance was conducted to evaluate the relationships of sex and grade level to auditory perception, visual perception, and phonics ability (null hypotheses three and four). A Biomedical Computer Program from the University of California, Los Angeles, BMD12V, which is available at the North Texas State University Computer Center was utilized. This was preferred to a series of one-way analyses of variances because it reduces the Type I Error Rate.
4. A multivariate analog of the two-sample t test was utilized to evaluate whether the means of the subgrouping equal the means of the random sample (null hypothesis five).
5. A post-hoc correlational study to determine the validity of the DTLA as a measuring instrument for auditory and visual perception was conducted. A Biomedical Computer Program from the University of Los Angeles, BMD02D, which is available at the North Texas State University Computer Center was utilized.

CHAPTER IV

RESULTS

An analysis of the data obtained in the study is presented in Chapter IV.

The primary concern of this study was to determine the relationships between auditory perception, visual perception, and phonics. The following null hypothesis was tested at the .05 level of significance:

> H_o1: The correlation coefficients for the variables, phonics ability, auditory perception, and visual perception are not significantly different from zero.

Pearson product-moment correlations were obtained for the relationships which existed between the three dependent variables considered in the study. The correlations were obtained through the utilization of the computer program, BMD02D. Correlations were computed using only the data from the random sample.

Table 1

Correlation Matrix

	Auditory	Visual	Phonics
Auditory	1.000	0.4988	0.3540
Visual	0.4988	1.000	0.5897
Phonics	0.3540	0.5897	1.000

These correlation coefficients were compared to a table of critical values of r_{xy} to determine if the correlation coefficients were significantly different from zero. This table was constructed by using the following test statistic (Glass, G. V. & Stanley, J. C., 1970):

When ρ_{xy} is 0,

$$t = \frac{r_{xy}}{\sqrt{(1 - r^2_{xy})/(n - 2)}} .$$

The correlations between auditory and visual, auditory and phonics ability, and visual and phonics ability were all significantly different from zero. At the .01 level of significance with 58 degrees of freedom, the critical value of r_{xy} is .331. The correlation coefficient for the auditory and visual variables was 0.4988. The correlation coefficient for the auditory and phonics variables was

0.3540. The highest correlation coefficient, 0.5897, was for the relationship between the visual and phonics variables.

Another concern of the study was to determine if the correlation between auditory perception and phonics was significantly different from the correlation between visual perception and phonics. A z test for testing the significance of the differences between the two correlation coefficients in null hypothesis two was computed and tested at the .05 level of significance.

H_o2: The relationship between auditory perception and phonics is the same as the relationship between visual perception and phonics.

The formula used for the computation was:

$$z = \frac{\sqrt{n}(r_{xy} - r_{xz})}{\sqrt{(1 - r^2_{xy})^2 \quad (1 - r^2_{xz})^2 - 2r^3_{yz} - (2r_{yz} - r_{xy}r_{xz})(1-r^2_{xy} - r^2_{xz} - r^2_{yz})}}$$

where n is the sample size,

r_{xy} is the sample correlation of auditory perception and phonics ability,

r_{xz} is the sample correlation of visual perception phonics ability,

r_{yz} is the sample correlation of auditory perception and visual perception (Glass, G. V. & Stanley, J. C., 1970).

The critical values for z at the .05 level of significance are ±1.96. As the computed z was -2.148, the correlation between auditory perception and phonics ability was significantly different from the correlation between

visual perception and phonics ability.

The dependent variables, auditory perception, visual perception, and phonics ability were further analyzed to determine if sex and grade level were significantly related to the dependent variables. A 2x2 multivariate analysis of variance was conducted. BMD12V, a Biomedical Computer Program from the University of California, Los Angeles, was utilized.

The following discussions and tables present the results of this 2x2 multivariate analysis of variance. The null hypotheses tested and accepted at the .05 level of significance were:

H_o3: There is no significant difference in auditory perception, visual perception, and phonics ability with respect to sex.

H_o4: There is no significant difference in auditory perception, visual perception, and phonics ability with respect to grade level.

Table 2

Cell Means for Auditory Perception

		Grade		
		Fourth	Sixth	
Sex	Boys	96.133	114.067	$\bar{X}_B$ = 105.100
	Girls	95.067	121.067	$\bar{X}_G$ = 108.067
		$\bar{X}_4$ = 95.600	$\bar{X}_6$ = 117.567	$\bar{X}_{..}$ = 106.583

Table 3

Cell Means for Visual Perception

		Grade		
		Fourth	Sixth	
Sex	Boys	117.600	136.533	$\bar{X}_B$ = 127.067
	Girls	117.867	142.067	$\bar{X}_G$ = 129.967
		$\bar{X}_4$ = 117.733	$\bar{X}_6$ = 139.300	$\bar{X}_{..}$ = 128.517

Table 4

Cell Means for Phonics Ability

		Grade		
		Fourth	Sixth	
Sex	Boys	123.200	170.733	$\bar{X}_B = 146.967$
	Girls	124.667	162.267	$\bar{X}_G = 143.467$
		$\bar{X}_4 = 123.933$	$\bar{X}_6 = 166.500$	$\bar{X}_{..} = 145.217$

Table 5

Multivariate Analysis of Variance

Source	F
J (sex)	0.2815
K (grade level)	0.8808
JK (Interaction of sex and grade level)	1.1869
I(JK)	

With $\alpha = .05$, the critical value of $F_{3,54}$ is approximately 2.76. As the F values presented in the above table are all lower than the F value of 2.76, the main effects of

sex and grade level and the interaction effect were found to be non-significant.

A subgrouping of 60 slow readers was compared to the 60 subjects in the random sample. The data analysis consisted of comparing the mean scores obtained for auditory perception, visual perception, and phonics ability. Hotelling's T^2 statistic was utilized (Harris, R. J., 1975).

$$T^2 = \frac{N_1 N_2}{N_1 + N_2}(\underline{\bar{X}}_1 - \underline{\bar{X}}_2)' \; \underline{S}_c^{-1}(\underline{\bar{X}}_1 - \underline{\bar{X}}_2)$$

The T^2 computed was 8.32059. The critical value of $T^2_{(.95,2,120)}$ is 6.196. The T^2 statistic was then converted into an F value of 4.1250. The critical $F_{(.95,2,117)}$ is approximately 3.07. On the basis of the T^2 statistic and the F value, the following null hypothesis was rejected at the .05 level of significance:

H_o5: There is no significant difference in the means of the subgrouping of retarded readers and the means of the random sample in auditory and visual perception.

Table 6

Cell Means for the Two Samples

	Auditory	Visual
Random Sample	106.583	128.517
Slow Readers	96.167	118.450
Differences	10.416	10.067

Comparisons were then conducted to determine whether the auditory, the visual, or both variables were significantly different in the two samples. The critical t for the two univariate t tests at the .05 level of significance is 2.488. The computed t for the auditory variable was 2.054 and the computed t for the visual variable was 2.789. Although it appeared that the differences in the means for the auditory and visual variables would both be significant, only the difference in the means of the two samples on the visual variable was significant because the auditory variable contained greater variability in scores.

Results of a post-hoc correlational study on subtests of the DTLA, the Bender-Gestalt, and the Wepman are reported in Appendix E.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

Chapter V presents a discussion and the conclusions of the major findings of the study, and recommendations for further research.

The primary purpose of this study was to investigate the relationships between auditory perception, visual perception, and phonics ability. Another area of emphasis was the comparison of a subgrouping of slow readers to the random sample of fourth and sixth grade subjects. Both groups consisted of 30 fourth graders (15 boys and 15 girls) and 30 sixth graders (15 boys and 15 girls).

Five major research hypotheses were stated as follows:

Hypothesis 1. There are no significant relationships between the variables, phonics, auditory perception, and visual perception.

Hypothesis 2. The relationship between auditory perception and phonics is the same as the relationship between visual perception and phonics.

Hypothesis 3. There is no significant difference in auditory perception, visual perception, and phonics with respect to sex.

Hypothesis 4. There is no significant difference in auditory perception, visual perception, and phonics with respect to grade level.

Hypothesis 5. There is no significant difference in the means of the subgrouping of retarded readers and the means of the random sample in auditory and visual perception.

Null hypothesis one was rejected at the .05 level of significance because the correlation coefficients were significantly different from zero. However, it should be noted that the correlations between auditory perception and visual perception and between auditory perception and phonics ability were very low.

Null hypothesis two was rejected at the .05 level of significance. There was a significant difference between the correlation for auditory perception and phonics and the correlation for visual perception and phonics. It was assumed, however, before the research began that the highest correlation would be between auditory perception and phonics ability. Instead, the highest correlation was between visual perception and phonics ability. As this correlation was only 0.5897, it appears that other factors such as motivation, socioeconomics status, race, and teacher variables might also influence ability in phonics.

Null hypotheses three and four were accepted at the .05 level of significance. In this study, sex and grade level were non-significant in relation to auditory perception, visual perception, and phonics ability. This conflicts with results found by several researchers. Erickson and King (1917), Russell (1928), McGeoch and Irion (1952), Otto (1961), Carterette and Jones (1966), Cooper and Gaeth (1967), and Kuhlman and Wolking (1972) found grade level to have a significant effect on auditory and visual perception. They did not agree, however, upon the effect that grade level produced. These results are inconclusive and cannot be adequately compared to other studies as the variable of phonics ability was included in the present research and was absent from other research studies. Other research studies also considered different grade levels. Future research in this area should probably select at least one grade level from the primary, intermediate, middle school, and high school levels. In the present study, both grades selected were from the intermediate level.

The first four null hypotheses applied to data collected from the random sample. Null hypothesis five applied to data collected from the random sample and from a subgrouping of retarded readers. A comparison was made of the means

obtained for auditory and visual perception in each sample.

Null hypothesis five was rejected at the .05 level of significance because there was a significant difference in the means of the subgrouping of retarded readers and the means of the random sample in auditory and visual perception. Comparisons revealed that the significant difference occurred in the means for visual perception. The retarded readers were significantly lower in the area of visual perception than were the subjects in the random sample.

The results of this study cannot be generalized to include any other conditions other than those which were included in the present research. The results applicable to auditory perception, visual perception, and phonics ability cannot be generalized to other research in which different instruments are used to measure these variables. Providing the results remain the same when larger samples are studied, they would still apply only to Caucasian students in the regular fourth and sixth grade classes in the Grand Prairie, Texas geographic region.

Recommendations for Further Research

The following recommendations for further research are made:

1. Continue research into the relationship between visual perception and phonics ability.

2. A similar study be conducted utilizing subjects of different grade levels.
3. Continue research in the three variables, auditory perception, visual perception, and phonics ability utilizing different measuring instruments.
4. Investigate the same variables utilizing children of different ethnic and racial backgrounds such as Black, Mexican-American, and American Indian.

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APPENDIX A

TABLE OF RELATED RESEARCH STUDIES

KEY TO TABLE OF RELATED RESEARCH STUDIES

Sex

M - male

F - female

Race

C - Caucasian

B - Black

L-A - Latin-American

O - Other

Classification

Nor - Normal intelligence

MR - Mentally Retarded

LD - Language and/or learning disabled

BI - Brain-injured

Modality

A - Auditory

V - Visual

A-V - Auditory and visual combined

T-K - Tactile-kinesthetic

RELATED RESEARCH STUDIES

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1893	Kirkpatrick, A		M & F		Primary, Grammar, High S., College	Nor	A & V	Memory for words & concrete objects	Visual modality superior to auditory; when together, they hinder each other.
1894	Munsterberg, H., & Bigham, J.						A, V, & A-V		Visual modality was superior to the auditory modality.
1896	Whitehead, Louis Grant	13	7 M 6 F		Adults	Nor	A & V	Memory for non-sense syllables	Visual was superior to auditory for learning, but retention favored auditory.
1898	Calkins, M. W.	50	F		College	Nor		Repeated Kirkpatrick's design using all women college students	
1907	Kublmann, F.							Memory tasks	Study of factors influencing visual memory: color & motion.
1912	Hemmon, V. A. G.							Testing for immediate recall	Auditory was superior whether lists were presented 1, 2, or 3 times.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1917	Erickson, C. I., & King, I. A.				3,4,5, 6,7,8, & 9th grades	Nor	A & V	Visual task was administered by having the Ss read the material.	Oral presentation gave stronger results at grades 3,4, 7, 8,9; Inconclusive at grades 5 & 6, but slightly better for retention.
1925	Worcester, D. A.						A & V		Neither better for learning but auditory was better for retention.
1928	Russell, R. D.	690			5th, 7th, & 9th grades		A & V		Grade 5 was better for auditory. Equal for 7th; Reading (visual) was slightly better in 9th.
1931	Emerson				Young child			Memory for bodily position of objects.	The greater the amount of bodily movement, the fewer the # of correct placements.
1932	Carmichael						A-V		Strong distortion of visual memory by auditory suggestion.
1935	Jenkin, Annie	16			9 adults 7 children (8-14 yrs.)		A-V	Memory of sense & nonsense items	Memory of sense & nonsense items was more strongly influenced by verbal cues than visual(colors).

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1938	Carlson, H. B., & Carr, H. A.	202	M & F				A-V, V-vocal, & vocal	Visual recognition tasks	Ss differed in their use of visual, vis.-vocal, & vocal presentation. Supports modality learning theory. A # of Ss were consistently superior in one series.
1939	Rizzo, N. D.	310			Grades 2-12	IQ was not controlled.		Memory and reading comprehension	
1946	Krawiec, T. S.	60			College		A & V	Short- & long-term memory. Nonsense syllables & words	Visual was better for learning; Neither was superior for retention.
1946	Woodrow, H. A.								Summary-review: "discouraging history of research in the area."
1947	Strauss, A. A., & Lehtinen, L. E.								"Landmark publication." Advocated matching perceptual mode to teaching materials
1950	Day, W. P., & Beach, B. K.						A, V, & A-V		Review of literature: "discouraging."

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1950	Ewers, D. W. F.	140			Grades 9 - 12		A & V	Tested blending, memory, discrimination, word recognition, and reading comprehension	
1952	McGeoch, J. A., Irion, A. L.				Young children		A & V	Summarizes previous literature	Auditory better for young children; less effective as age increases
1953	Edson, W. H., Bond, G. H., & Cook, W. W.	188			4th		V	10 measures of silent reading skills & 13 tests of visual characteristics	No evidence that silent reading is limited by vision.
1953	Reynolds, M.	188				IQ was controlled		Tested word recognition and obtained a composite reading score.	
1954	Prentice, W. D. H.						V & A-V	Memory (Visual recognition test)	Differs with Carmichael; Suggests verbal labels influence reproduction rather than memory of a visual image.
1954	Wheeler, L. R., & Wheeler, V. D.	629			4th-6th		A	Tested discrimination and reading comprehension	

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1955	Harrington, M. J., & Durrell, D.	500			2nd			Tested discrimination and reading comprehension	
1955	Wallach, H. E., & Averbach, F.								Suggests internal cross-modality influences (e.g.: reauditorizing)
1956	Webb, W. B., & Wallon, E. J.		M		18 - 25 yrs. (College)	Nor	A & A-V	Reading and hearing material	Single reading thru & hearing material once, both were equally effective. With equal study time, visual is better. Reading & hearing simultaneously is more effective than either alone.
1958	Goins, J. T.		M & F		1st		V	14 visual perceptual tasks	Non-verbal visual perceptual tests are valuable additions to reading readiness tests as predictors of reading achievement.
1959	Friedman, R. J.		M & F		5th		A & V	Verbal material presented visually and orally.	

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1959	Rey, A.					Nor & BI			Memory of objects was stronger than words.
1960	Daly, W. C., & Lee, R. H.					MR			Match method & specific disability & reduce expectancy-performance gap.
1960	Goetzinger, C. P., Dirks, D. P., & Baer, C. J.	30	F		4th - 6th	Nor(15) & retarded readers	A	Experimental and control groups were matched on age, intelligence, & visual acuity. Tested phonemic sound discrimination & composite reading.	Normal group was higher on auditory presentation tests than retarded readers.
1960	Spiker, Charles				5th & 6th	Nor		Verbal paired-associate learning	Investigated practice effects.
1961	Gates, Arthur	1269	M & F		3rd, 4th, & 5th	Nor		Carden System of Phonics	Children taught by the Carden Method are not reading up to their level
1961	Lockard, J., & Sidowski, J. B.	36			4th & 6th		A, V, & A-V	Investigating the influence of 3 modes of stimulus presentation & 2 modes of responding (Covert & overt)	Visual was better in recall but combined was the same.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1961	Otto, W.		M & F		2nd, 4th, & 6th		A & A-V	Memory for CVC trigrams	2nd was better on A-V; 4th & 6th was better on A; no difference on re-learning or recall
1961	Suchman, J. R., & Aschner, M. J. M.							Focuses on how & when perceiving, thinking, & learning develop.	Discrimination of general cognitive level
1961	Zoepfel, M. M.								Not an experimental study; consists of a discussion of assessment & improvement of auditory discrimination in the B-I child.
1962	James, N. E.	503	M		Airmen		A & V	Auditory: lecture Visual: reading	No differences in airmen's learning by expressed preferences as in non-preferred. (Reading versus lecture)
1962	Rosenbaum, M. E.				Elementary		A	Self-verbalization & verbalization by others	Verbalization in chorus may interfere with self-verbalization though all other types of verbalization helped learning.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1963	Chall, J., Roswell, F., & Blumenthall, S. H.	80			2nd-4th			Blending, word recognition, and reading comprehension	
1963	Katz, P. A., & Deutsch, M	48	F	C & B	Lower-class El.		A & V	Meaningful words in a serial learning paradigm.	Black retarded readers learned more rapidly on V than A. Lower class kids were unable to benefit from A. presented information
1963	Katz, P. A., & Deutsch, M					Retarded & good readers	A & V		At all ages, poor & good readers differed significantly in the ease at which attention was shifted from one modality to another.
1963	Love, H. D.	30			4th, 5th	Nor	A	15 monolingual & 15 bilingual Ss were given auditory discrimination, reading, & spelling tasks.	Training in auditory discrimination resulted in gains in that area - not in reading and spelling.
1963	Ranken, H. B.							To learn a series of random shapes under different instructional sets.	Labelling versus imagining.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1963	Reynolds, M. S.								Significant interaction between aptitude and instruction.
1963	Williams, J. M., & Derks, D. L.				College	Nor	A, V, & A-V	Paired-associates	V & A-V was better than aural.
1964	Budolf, M., & Quinlan, D.	56			2nd	Average & retarded readers	A & V	Reading	Retarded readers: more rapid A & slower V. Aural reading was faster for both.
1964	Katz, P. A., & Deutsch, M.	48			3 grade levels	Nor & retarded readers	A, V, & A-V		Retarded readers exhibited a markedly uneven pattern of learning efficiency - especially poor A levels
1964	Noall, M. S., & ceravolo, G. C.							Spelling: presence of many factors in spelling.	Low correlations between spelling gain & visual memory & spelling gain & phonic spelling.
1964	Van Mondfrans, A., & Travers, P.	72	M & F		College	Nor	A, V, & A-V		Slight difference only

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1965	Barrett, R. C.						V	A review of research relating visual discrimination to 1st grade reading	Discrimination & knowledge of letters had the highest predictive relationship with reading.
1965	Birch, H. G., & Belmont, L.	137			2nd-6th		A-V	Auditory-visual integration and composite reading	Perceptual factors may be most important for initial acquisition of reading skill while other factors such as measured I.Q. tests become more important in later stages of reading skills development.
1965	Harris, H. J.		M & F		1st		V & T-K	Pretested for preference; supplemental instruction.	No difference by perceptual preference
1965	Reese, H. W.				36-96 months		A, V, & auditory-verbal	Reading	Both "verbal compounds" and "visual compounds" helped learning
1966	Carterette, E. C., & Jones, M.		M & F		1st-5th		A & V	Recognition task (No assessment of possible sex differences)	A was better for 1st grade; by 5th, V is equal or better.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1966	Dykstra, R.	632			1st			Blending, discrimination, word recognition, reading comprehension	
1966	Hill, S. D., & Hecker, N. E.	32			2nd	Nor	A & V	Paired-associates	No significant differences
1966	Jones, M. J.	84		C (culturally disadvantaged	N, K, & 1st		A, V, A-V, & A-V-K	46 word cards	No significant difference by modality
1966	Muehl, S., & Kremenak, S.	119			1st		A-V	A-V integration & composite reading	
1966	Olson, A. V.				3rd				
1966	Shapiro, S. S.				10-11 & 13-14 yr.		A & V	A & V presented paired-associates lists	Younger Ss did better with A; older Ss were equal.
1966	Shepard, R. N.						V & verbal	Recall	Evidence of a V as well as a verbal memory code.
1967	Berry, J. W.	30	M & F		$\bar{X}$ age was 11.7	Nor & retarded readers	A-V, & V-A	A-V and V-A integration tasks Matched on age, sex, and I.Q.	Normal readers had significantly higher scores on A-V & V-A integration tasks.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1967	Bateman, B.								Match techniques to the child.
1967	Brickner, C. Ann	106	M & F		Head-start				Group I children performed better than Group II children on both verbal discrimination & following directions; both groups performed better than the control group.
1967	Brooks, Lee R.								Visualization and reading compete for the use of stimuli pathways specialized for visual perception.
1967	Cooper, J. C., Jr., & Gaeth, J.	932	M & F		Detroit Public Schools		A & V		Significant interaction between grade level and modality; 10th & 12th graders scored higher with V. presentation. Suggested there is no inherently preferred modality for meaningful materials. Patterns reflect habit.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1967	Ford, M. P.	121			4th	I.Q. was controlled	A-V	Word recognition, reading comprehension	Failed to produce significant correlation between A-V integration and reading skill when I.Q. was held constant.
1967	Keogh, & Smith, C.	73	M & F	C	K, 3rd, & 6th	Nor			The Bender-Gestalt is a useful predictor of educational achievement in the elementary grades. K: Girls higher than boys; 3rd: Boys higher than girsl; 6th: Boys equal girls
1967	McGrady, H. J., & Olson, D. A.				8 & 9 years	Nor & LD,	A, V, & A-V	Compared LD and normals	
1967	Murdock, B. B., Jr.								In short term memory, retrieval can be from a preperceptual store. Modality differences can be very large.
1967	Poulton, E. C., & Brown, G. H.	24	F		Housewives		V	Visual was through reading.	First 30% of pages read: visual was better; for remainder, same example, the last 10% was better aloud.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of task	Summary Statement
1967	Rudnick, M., Sterritt, G., & Flax, M.		M		3rd		A-V		A-V integration skill was significantly correlated with reading comprehension.
1967	Wepman, Joseph								The differences among children in the use of specific modalities for learning and the necessary establishment of perceptual bases for conceptual learning are discerned.
1968	Bagford, J.	150			1st-6th		A	Discrimination and reading comprehension	
1968	Bateman, B. D.				1st		A & V	Reading and Spelling	A best; Auditory Ss also superior in reading and spelling
1968	Brooks, L. R.						A & V	Memory	Information regarding modality influence of stimulus in same modality.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1968	Bruininks, R.	105			3rd		A & A-V	A-V integration, blending, phonemic discrimination, & reading.	Failed to produce significant correlations between A-V integration & reading skill when I.Q. was held constant.
1968	Diley, M. G., & Paivio, A.	120	M & F		N, K, & 1st	Nor	A & V	Recall for pictures and words	Differences between pictures and words as stimuli and as responses: pictures good for stimulus; words for responses. W-P as opposite to P-P & W-W; unlike adult studies
1968	Hagen, J. W., & Kingleg, P.				Nursery-5th		V & A-V	Short-term memory An age related improvement for STM performance was also found.	Overt labelling of visual figures facilitates STM at intermediate age but not at youngest and oldest.
1968	Kahn, D. & Birch, H.	350			2nd-6th	I.Q. was controlled	A-V	A-V integration and composite reading.	
1968	Kaplan, S., Kaplan, R., & Sampson, J. R.	40	M		adult			Words versus pictures	Pictures stronger as the eye can be doubly coded as words and pictures.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1968	Murray, D. J., & Roberts, B.		F		7, 8, 9, & 10 yrs.		A & V	Recall of word lists	Visual lists remembered better by older Ss.
1968	Mira, M. P.	24				Nor & LD	A & V		Confirms need to program by preference. Suggests auditory deficits are more common than visual deficits.
1968	Robinson, H. H.						A & V	High V - High A High V - Low A Low V - High A Low V - Low A	No interaction between instructional process & perceptual test results.
1968	Schultz, Rudolph, & Hopkins, R.						A & V	Noble & Parker dyssyllables compaired in paired associates, free learning & verbal discrimination.	If mode has an effect, it is reflected by the more rapid acquisition of low-m material under V than other A conditions of reception.
1968	Blair, Francis								Not a research study; concern is expressed for the lack of good methods for early identification of auditory disorders as well as serious gaps in educational programming.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1969	Bruinicks, R. H.	Pool of 105		B	3rd		A & V (20 Ss in each group)	Instructional materials along the lines of Mills Learning Methods Test (1964)	Learned to recognize words equally well when matched with strength or weakness.
1969	Chase, W. G., & Calfe, R. C.				2nd	Nor	A & V	Short-term memory; 2 factor repeated measures design.	Rate of learning not affected by mode of stimulation. V. of verbal material appears to produce a base of transfer.
1969	Corsini, D. A.				K, 3½-4½, 4½-5½, 7-8	Nor	A & A-V		A-V instruction aided retention
1969	Doehring, D. G., Rabinovitch, M. Sam	55	M & F			Nor & LD	A		More research is needed before the term "auditory perceptual deficit" can be meaningfully applied to children with learning problems.
1969	Evans, James R.							A review of related research	There seems to be enough evidence to warrant attention to auditory functions in remedial or reading classes.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1969	Hall, V. C.				K, & 2nd	Nor	A & V	Paired-associate task	Initial learning was faster on visual
1969	Horowitz, A. B.				K, & 3rd	Nor	A, V, & A-V		Older Ss did better than younger Ss. V & A-V was more effective than A. There was no age by mode interaction.
1969	Murdock, B. B., & Walker, K. D.						A & V	Single-trial free recall word lists	Results are inconsistent. Reaffirmed that there are separate prelinguistic V & V short-term stores.
1969	Paivio, A., & Csapo, K.						A & V	Sequential memory tasks; Abstract words	Sequential memory: V inferior to A; V superior to A for abstract words.
1969	Sabatino, D. A.	60	M & F		6-1 to 12-7	Nor & LD	A & V		A correlational study of the BVMGT & Test of Auditory Perception. TAP discriminated MBI better than BVMGT.
1969	Schleif, M. E.	90	M & F		post-K (summer program)		A, V, & A-V	ANOVA & orthogonal contrasts	V learners learn more V; K more K V method most effective with A learners.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1969	Simon, J. R., & Small, H. M.	64	M & F		College	Nor	A	Reaction time task: to press 1 of 2 keys as soon as possible after hearing the tone.	The speed of processing the symbolic content of a command was affected by the ear in which the command was heard. Command by ear stimulated interaction. It also occurred when pure tones were used to signal the appropriate response.
1969	Walther, C. J.				13-0 to 15-11	Nor & MR	A & V	14 item paired-associate list	Low IQ's better on V. High IQ's better on A.
1970	Blank, R. B.	206			2nd			Memory, phonemic discrimination, composite reading.	
1970	Bruininks, R. H., & Clarke, C.	36	M & F		1st, 3rd, 5th	Nor	A, V, & A-V	Paired-associates	V. and A-V was better than A.
1970	Butter, E. J., & Zung, B. J.		M & F		K - 3rd		V, Haptic, V-haptic	Form recognition task	Quality of V & bimodal performance is equivalent; haptic performance is less than V. & bimodal.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1970	Flynn, P. T., & Byrne, M. C.	39			3rd	Advanced & retarded readers	A	10 auditory subtests	Significant differences exist between advanced & retarded readers on A tasks. Socioeconomic environment alone did not affect A ability. Total intelligence scores are highly related to reading achievement.
1970	Helms, H. B.	1						Basic addition facts; use of A with child with V. perceptual problems.	A case study
1970	Linder, R. E., & Fillmer, H. T.	108	F	B	2nd	Below national norms in reading.	A, V, & A-V	Sequential recall tasks	A lower than V or A-V; V approximates A-V for total performance, sequential recall, & color.
1970	McGrady, H. J., Jr., & Olson, D. A.	99	M & F		8 & 9 years	Nor & LD	A, V, & A-V	13 psychosensory tests	Ld's found to have verbal deficits; more errors regardless of psychosensory modality.
1970	Nazzaro, J. R., & Nazzaro, J. N.	32	M & F		College	Nor	A & V	Short-term memory	Auditory presentation learned faster than visual.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1970	Nelson, J. B.	36	M & F		1st	Nor	A, V, & A-V	Word recognition tasks	No significant difference between acquisition and recall for V. learners. A learners better on A method. V learners better on A.
1970	Sabatino, D. A., & Hayden, D. L.	472			1st 6th		A & A-V	A-V integration, phonemic discrimination, word recognition, reading comprehension.	
1970	Wolpert, E. M.				1st	Nor		Reading based task	Intra-individual differences; no best sensory based method.
1971	Breger, Ilana	399	M & F		College		A	Rated the pleasantness of 12 sounds. (A cross-cultural sample of student at Hebrew U., Jerusalem, Israel)	Although subjective auditory perception seems to be partly sa function of sex & culture of the perceiver, on an overall basis it seems to transcenc cultural differences.
1971	Buktenica, N. A.	356	M & F	C & B	6, 7, & 8 years	Nor	A	Standardization, reliability, & validity data are presented for TENVAD	

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1971	Bursuk, L.		M & F		10th	Retarded readers	A, V, & A-V	Reading comprehension	A learners & those without preferences improved significantly more than V when A-V method was used. V. better than A for visual approach
1971	Daniel, P. R.	15	M & F		7.5 to 8.5	Nor	A, V, & A-V	CVC trigrams	Neither A or V is superior, but individuals have a differential preference. A preference learned best thru preferred mode.
1971	Farr, B. J.		M & F		College	Nor	A & V	Individuals predicted modality preference	Predicted success matching learning & testing to preferred mode is most desirable condition.
1971	Freer, F.	278			1st		A & V	Word recognition (2 methods of reading instruction) Classroom instruction. Pre-tested modality preference for A. & V.	No aptitude by method differences were found. A strength facilitated acquisition of reading without regard to method.
1971	Ingersoll, G. M.		M & F				A, V, & A-V	Immediate recall. Combined A-V task for A & V attenders	A recalled more A stimuli; V recalled more V stimuli.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1971	Koppitz, E.	197	M & F		6 - 12 yrs.	LD	A & V	5 yr. follow-up study;	Poor auditory perception has considerable influence on a child's progress in the L. D. program. Children who have difficulties in both auditory and visual-motor perception are likely candidates for long-term special education.
1971	Levin, J. R., Rohwer, W. D., Jr., & Cleary, J. A.	288	M & F		K, 1st, & 3rd	Nor	A & V	Paired-associates; did not pretest for preferred modality	Existence of individual mode preference suggests need for further research.
1971	Lowell, R. E.	192	M & F		1st		A & V	Phonemic discrimination and word recognition	
1971	McNinch, G.	111	M & F		1st		A-V	A-V integration, phonemic discrimination, blending, memory, composite reading.	
1971	McNinch, G. & Hafner, L.	117	M & F		1st				Separate perceptual skills can be measured. When cross-cultural comparisons by race are made, significant differences in task performance are not found.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1971	Palkes, H., Stewart, M., & Freedman, J.		M			Hyper-active			Verbal commands are more effective than silent.
1971	Reilly, David H.	225	M & F		1st-4th	Nor	A-V		Females develop A-V integration skills earlier than males. With females, these skills appeared to reach an asymptote by 2nd grade.
1971	Smith, C.	72	M & F		1st & 2nd	Nor	A & V	Pretested for preferred modality with the ITPA	More V learners in the pool. No significant differences between reading treatment & modality type. Reading methods were not entirely A or V.
1971	Tyler, J. L.	44	M & F			Nor & MR	A & V	Pretested for A & V preferred modalities	Failed to support H_0 that EMR's learned best when instruction matched modality. Neither was superior.
1971	Waugh, R. P.	166	M & F		2nd	Nor	A & V	Pretested with ITPA for A & V preferred modality	A & V learners performed equally well on A & V; V preferred at age 5; A preferred at age 7; A was higher than V across tasks.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1972	Dequen, H. C.	184	M & F		10th & 11th		A & V	Reading & listening experiences. Pretested for cognitive style; matched cognitive style with instructional mode.	Individual preferences for reading or listening didn't affect achievement.
1972	Du Bose, R. F.	16	M & F		9.6 years	Nor (Remedial reading)	A & V	Pretested preferred modality with ITPA, TOMAR MLMT	Instruments used to diagnose preferences may not be tapping separate modality systems.
1972	Fullingim, B.	80	M & F		5th	Nor (Remedial reading)		Memory and composite reading.	The number of underachieving girls & boys with normal intelligence was found to be equal.
1972	Cundick, B. P., & Robison, L. R.	48	M & F		6 - 11 years	Nor & BI	V	2 administrations of 50 sets of geometric designs; Matched on sex, age, & verbal ability	BI children can be separated from controls on their ability to match geometric designs.
1972	Jones, J. P.								Critical review: criticizes treatment process and instruction for determining modality preference.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1972	Hartlage, L. C., & Luces, D. G.	44			1st			Memory, word recognition, and composite reading.	
1972	Kirk, S. A.			B, L-A, & Amer. Indian			A & V		Black was better on A; American Indian and Latin American were better on V.
1972	Kirk, W. J., & Johnson, J. T.	72	M & F		11 - 13 years	Nor & MR	A, V, & A-V	Paired associates	Significant differences between modes of presentation. A > V > A-V
1972	Kobs, T.	44	M & F		2nd	Nor	A & V	Spelling; pretested for preferred modality & matched preferred modality & method of instruction	High V was better in preferred modality. Medium V & high A tended to be better in preferred mode. Spelling was easier for V Ss. A Ss were more efficient learners.
1972	Kuhlmann, E. S., & Wolking, W. D.	40	M	C	5.6, 6.6, 7.6, & 8.6 grades		A, V, & A-V	Matching tasks; temporal patterns of dots and dashes	Significant age effect; within & cross-modal matching tasks not significant with both in the same modality.
1972	McNinch, G., & Richmond, M.	55			1st		A, V, & A-V	A-V integration, blending, memory, word recognition, reading comprehension	

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1972	Robinson, H. M.	448	M & F		1st		A & V	Reading	Auditory discrimination had a strong significant effect on reading.
1972	Waters, L. D.	55			3rd	Nor (Remedial reading)	A & V		Use mode to meet child's individual needs. Recommends a multi-modal approach.
1972	Williams, D. V., & Williams, J. P.	96	M & F	C	4th & 6th	Nor (Remedial reading)	A & V	Word pairs, sentences, prose passages. Used Mills Learning Methods Test & ITPA	Prose material best when presented aurally; complex relation between mode, time, & materials.
1972	Schulz, S. A.	101	M		1st	Nor	A, V, & Haptic	Reading and arithmetic tasks.	
1972	Zach, L., & Kaufman, J.	70	M & F		K	Nor	V	Bender-Gestalt and a discrimination task using the same forms	It was possible for a child to discriminate forms well and still obtain a score on the B-G which indicated a perceptual difficulty or vice versa.
1973	Belmont, I., Flegenheimer, H., & Birch, H. G.				1st	Nor		Perceptual training and remedial instruction	Neither perceptual training nor remedial reading was a superior program.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1973	Berry, F. M., Detterman, D. K., & Mulhern, R.		M & F		College		A & V	Pretested for modality preference	Tests were reasonably reliable; A & V tests were significantly related to continuous discourse offered under different presentation modes.
1973	Gilberg, S. F.	517	M & F		1st, 2nd, & 3rd		A, V, & A-V	Recognition/recall task	Presentation mode was more important than preferred mode. A-V was highest; V was 2nd; A was least effective. There was no consistent interaction between mode and method.
1973	Kalash	162	M & F		1st	Nor	A & V	Pretested with N. Y. MOD Test. Correlated modality preference with reading readiness scores.	V preference was greater on reading readiness score than A preference. There was an association between concept tempo and reading.
1973	Levin, J. R.				4th		V & A-V	Paired associates (Pictorial and verbal items)	Classification of Ss by picture learners and word learners.
1973	Lilly, M. S., & Helechen, J.	57	M & F		8-1 to 12-2 years	I.Q. between 80 & 129	A & V	Pretested with Mills Tests of V. Memory & A Memory Stories in print & tape form.	A & V tests were significantly related to continued discourse offered under differing presentation modes.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1973	Pitcher-Baker, G., & Raskin, L. M.					LD	V, T-K, & V-T	Letter learning and recognition	V & V-T were higher than T. V equalled T.
1973	Punn, A. K.	90	M & F		3rd	Nor	V, T-K, V-T, & Math Symbols	Arithmetic	T & V-T were greater in arithmetic achievement than V. Attitudes of T & V-T improved. Attitudes of V declined.
1973	Reed, K. L.	22	M & F				V, T-K, & V-T-K	Matching and discriminating letters	Cross-modal training was not more effective than V intramodal method.
1973	Ringler, L. H., & Smith, I. L.	106	M & F		1st	Nor	A, V, & T-K	Word recognition tasks	There were no significant differences among groups when controlled for modality preference. Like & unlike modality preference groups were equal. Preference can be differentiated.
1973	Scott, Dianna				1st, 2nd	Nor (Poor readers)	A, V, & T-K		Treatment didn't differentially affect reading achievement.

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1973	Williams, J., Williams, D. V., & Blumberg, E. L.	416	M & F	C & B	C: 2nd, 4th, 6th, 8th, & 10th B: 2nd, 4th, & 6th		A & V	Paired associate noun list	Visual was greater than auditory. The middle class performance was superior.
1973	Vande Voort, L. V., & Senf, G. M.	32			4th		A-V	A-V integration, auditory discrimination, & composite reading.	
1974	Daniel, P. N., & Tucker, R. S.	45	M & F		8 years	Nor	A & V	Lists of CVC trigrams; presentation through preferred & nonpreferred modality.	Recall was best when the stimuli was presented through the preferred modality and worst through the nonpreferred modality.
1974	Hammill, D. D., & Larsen, S. C.								Review of 33 studies; Concluded that the measured auditory skills are not usefully related to reading. The findings should not be generalized to other auditory functions (auditory acuity, listening comprehension, or "phonic" skills).

Date	Study	#	Sex	Race	Grade-Age	Classification	Modality	Type of Task	Summary Statement
1974	May, R. B., & Hutt, C.	60	M & F		9 years		A & V	List of nouns, recall and recognition task.	V was higher than the A presentation. Girls performed better than boys. There was a significant sex x mode interaction.
1974	Rose, R. S.					Nor	A, V, A-V, & T-K	6 week program for teaching the concept of shape	All showed improvement in visual-motor abilities.
1974	Sabatino, D. A., & Dorfman, N.	77	M & F			MR	A & V	Aptitude x treatment design. Evaluated Sullivan Programmed Reading and DISTAR	No significant interaction
1974	Black, R. W.	60	M & F		$\bar{X}$ age was 8 years	LD		WISC, Frostig Dev. Test of Visual Perception, and the WRAT	With the effects of I.Q. controlled, the reading test performance of the low perceivers was significantly higher than that of high perceivers.

APPENDIX B

RECORD FORMS

WORD ATTACK TEST

RAW SCORE _____

RESPONSES: (Incorrect responses may be recorded following the printed answers)

1 ___ ift
2 ___ bim
3 ___ ut
4 ___ rayed
5 ___ kak
6 ___ maft
7 ___ nen
8 ___ ab
9 ___ tash
10 ___ wip's

11 ___ ziz
12 ___ ott
13 ___ nudd
14 ___ weet
15 ___ plen
16 ___ twib
17 ___ beb
18 ___ rejune
19 ___ knap
20 ___ ain

21 ___ tob
22 ___ chen
23 ___ hets
24 ___ plon
25 ___ lundy
26 ___ hode
27 ___ expram
28 ___ stabe
29 ___ imbaf
30 ___ eam

31 ___ telequik
32 ___ shenning
33 ___ quib
34 ___ laip
35 ___ fubwit
36 ___ pertome
37 ___ sloy
38 ___ subcrote
39 ___ pipped
40 ___ etbom

41 ___ polybendable
42 ___ dinlan
43 ___ eldop
44 ___ wubfambif
45 ___ wotfob
46 ___ cigbet
47 ___ conration
48 ___ biftel
49 ___ bafmotbem
50 ___ nolhod

DIAGNOSTIC INTERPRETATION OF ERRORS:

IMPLICATIONS FOR INSTRUCTION:

WORD IDENTIFICATION TEST

RAW SCORE*____

RESPONSES: (Incorrect responses may be recorded following the printed answers)

1 ___ is
2 ___ come
3 ___ the
4 ___ look
5 ___ up
6 ___ big
7 ___ down
8 ___ that
9 ___ she
10 ___ on

11 ___ my
12 ___ jump
13 ___ something
14 ___ at
15 ___ book
16 ___ him
17 ___ of
18 ___ work
19 ___ what
20 ___ rabbit

21 ___ out
22 ___ was
23 ___ man
24 ___ be
25 ___ as
26 ___ fly
27 ___ away
28 ___ cake
29 ___ water
30 ___ sheep

31 ___ mitten
32 ___ duck
33 ___ name
34 ___ sit
35 ___ bear
36 ___ farm
37 ___ night
38 ___ could
39 ___ food
40 ___ high

41 ___ walk
42 ___ told
43 ___ street
44 ___ much
45 ___ still
46 ___ pony
47 ___ love
48 ___ morning
49 ___ ship
50 ___ surprise

51 ___ wife
52 ___ most
53 ___ better
54 ___ city
55 ___ always
56 ___ found
57 ___ learn
58 ___ once
59 ___ front
60 ___ meaning

61 ___ listen
62 ___ paper
63 ___ until
64 ___ peace
65 ___ remember
66 ___ strange
67 ___ angry
68 ___ while
69 ___ watch
70 ___ leap

71 ___ quick
72 ___ crash
73 ___ body
74 ___ piece
75 ___ public
76 ___ brought
77 ___ busy
78 ___ surface
79 ___ groan
80 ___ gravy

81 ___ comfort
82 ___ engine
83 ___ soapy
84 ___ human
85 ___ design
86 ___ crime
87 ___ warning
88 ___ zigzag
89 ___ twilight
90 ___ produce

91 ___ smolder
92 ___ professional
93 ___ delayed
94 ___ inventor
95 ___ amazement
96 ___ drawl
97 ___ broadcast
98 ___ departure
99 ___ gruffly
100 ___ giggle

101 ___ vehicle
102 ___ cauliflower
103 ___ lagoon
104 ___ rudely
105 ___ valid
106 ___ relapse
107 ___ jeopardize
108 ___ excusable
109 ___ urgent
110 ___ sociable

111 ___ zenith
112 ___ balmy
113 ___ penetration
114 ___ dignify
115 ___ occasionally
116 ___ frigid
117 ___ clerical
118 ___ radioactivity
119 ___ skeletal
120 ___ recurrence

121 ___ yacht
122 ___ alertly
123 ___ sapphire
124 ___ pathology
125 ___ inaptitude
126 ___ physician
127 ___ memorandum
128 ___ sulphuric
129 ___ aberration
130 ___ embassy

131 ___ alkali
132 ___ cistern
133 ___ instigator
134 ___ ghoulish
135 ___ unsociable
136 ___ abdominal
137 ___ causation
138 ___ judicious
139 ___ carnivorous
140 ___ manganese

141 ___ vigil
142 ___ anarchy
143 ___ vernacular
144 ___ artesian
145 ___ expostulate
146 ___ plagiarism
147 ___ grandiose
148 ___ aria
149 ___ picayune
150 ___ beatitude

DIAGNOSTIC INTERPRETATION OF ERRORS:

IMPLICATIONS FOR INSTRUCTION:

*Assume that all items prior to the lowest administered item are correct. *Add* this number to the number of correct responses to obtain the Raw Score.

DETROIT TESTS OF
LEARNING APTITUDE
For all ages from three
years through adult ages

Detroit Tests of Learning Aptitude
(Individual)

PUPIL'S RECORD BOOKLET

Name..... Sex..... Case No.....

Date..... School..... Grade.....

Birthdate..... C. A..... Med. M. A..... I. Q.....

Time Started..... Finished..... Examiner.....

No.	Test	Score	Age	Rank	Interpretation
1.	Pictorial Absurdities				
2.	Verbal Absurdities				
3.	Pictorial Opposites				
4.	Verbal Opposites				
5.	Motor Speed ..... 2′ ..... 3′ ..... 4′				
6.	Auditory Attention Span for Unrelated Words — Simple Score ..... Weighted Score				
7.	Oral Commissions				
8.	Social Adjustment A				
9.	Visual Attention Span for Objects — Simple Score ..... Weighted Score				
10.	Orientation				
11.	Free Association ..... 1′ ..... 2′ ..... 3′ ..... 4′ ..... 5′				
12.	Designs				
13.	Auditory Attention Span for Related Syllables				
14.	Number Ability				
15.	Social Adjustment B				
16.	Visual Attention Span for Letters				
17.	Disarranged Pictures				
18.	Oral Directions				
19.	Likenesses and Differences				

Summary of Impressions.....

.....

THE TEST DIVISION OF
The Bobbs-Merrill Company, Inc.
4300 W. 62nd St. / Indianapolis, Indiana 46206

Printed in U. S. A.

6. Auditory Attention Span for Unrelated Words

(See pages 33-34 of Handbook)

Score: Simple.....

Weighted.....

2a cat ice
2b dog ship
3a man horse song
3b pen girl cow
4a cart bird desk road
4b chair hen book vest
5a head milk dress oats night
5b pipe west fence coat mule
6a fish clock heart sun box frog
6b stone blot freeze door cut white
7a skirt plant friends east tub barn hair
7b mud vase north ten rain cross shoe
8a ear boat key pig south knob ink rope
8b flour skate fan spend lamp wool axe toad

9. Visual Attention Span for Objects

(See pages 48-49 of Handbook, 37-50 of Pictorial Material)

Score: Simple.....

Weighted.....

2 a cat girl
2 b dog horse
3 a pig hand fork
3 b tree pail star
4 a watch boy fish pen
4 b hat top knife sled
5 a ring door shoe cake lamp
5 b stove cow lock kite wheel
6 a moon saw drum chair bread ear
6 b swing tub ball flag clock bird
7 a bed dress sun house box train king
7 b eye horn bell rake cup pear jug
8 a egg book key leaf church glove spoon fence
8 b soap fan broom hen rat comb goat screw

7. Oral Commissions

Score.....

(See pages 34-35 of Handbook)

1a Show me the window.

b Stand up straight.

2 a Walk to the door; then bring me that book.

b Walk to the window; then put this book on a chair.

3a Put this pencil on the table; then open the door; then fold your hands behind you.

b Bring me that piece of paper; then close the door; then stand on this line.

4a Walk to the window; then tap the floor once with your foot; then put this penny in my hand; then tell me your name.

b Open the door; then put a mark on this paper; then bring me that book; then stand by the window.

8. Social Adjustment A

Score.....

(See pages 35-48 of Handbook)

1. Throw stones.....
2. Radio disturbs.....
3. Break window.....
4. Play near sick.....
5. Stranger ride.....
6. House fire.....
7. Disease.....
8. Bus conductor.....
9. Broken glass.....
10. Worn clothes.....
11. Policeman court.....
12. House blocks.....
13. Banana peeling.....
14. Person sick.....
15. Sit next to.....
16. Find purse.....
17. Tired bed.....
18. Live wire.....
19. Team wins.....
20. R. S. V. P.....

13. Auditory Attention Span for Related Syllables

(See page 69 of Handbook)

Score.....

1. My doll has pretty hair. 2. We will go for a walk. 3. My dog chases the white cat.
4. Our new car has four red wheels. 5. Henry likes to read his new book.
6. Bring the broom and sweep the front room. 7. The bell on the engine rings loudly.
8. On Sundays all of us go to church. 9. In summer we go North where it is cool.
10. Green leaves come on the trees in early spring. 11. The airplane makes a loud noise when it flies fast.
12. We saw a little fire on the way to school. 13. The sun shone brightly today and it hurt my eyes.
14. The men painted our new house white with dark green blinds.
15. They gave me some pretty shoes for my birthday last month.
16. The art teacher comes to our own school three days a week.
17. Ten persons went to a party where there was lots to eat.
18. Three boys spent a happy day last week on a fishing trip.
19. On Tuesday for lunch we had some fresh bread which our mother baked.
20. Father must buy some new license plates for his car once each year.
21. When the train passes the whistle blows for us to keep off the track.
22. In the summer time the nights are very short and the days are long.
23. We had a party for Jean last Monday with cake and ice cream to eat.
24. At eight we go to bed and mother reads to us from our story books.
25. Each year when the big circus comes to town father takes the whole family.
26. Many boys and girls go to the movies on nights at the end of each week.
27. My sister Mary has a pretty new doll which shuts its eyes and goes to sleep.
28. The man who lives next door is a good neighbor and invites us for many rides.
29. Last winter we made a big round snow man and put a little black hat on his head.
30. In my uncle's home there was a soft red carpet on the floor of the living room.
31. The day of the football game the weather was clear but chilly and the wind blew briskly.
32. Because there were few vacant lots the police roped off our street so that we might be safe.
33. On the Fourth of July my father puts on his army suit and joins his friends on parade.
34. In fair weather and at high tide ships from many nations set sail for their own distant ports.
35. The baseball team from our high school played fifteen games; they lost six but they ended in second place.
36. Last night there was a large banquet at the hotel where many people dined and had a pleasant time.
37. Our reading books at school have many fine stories which are short but very full of life and action.
38. In the north country the days are very short in winter and the sun hangs low in the southern sky.
39. China closets filled with all kinds of dainty dishes and cut glass lined the large walls of the dining room.
40. On cold, clear nights hundreds of thousands of twinkling stars shine brightly from their cradles far up in the sky.
41. In the heart of the Congo there are many kinds of beasts which are a nightly terror to the black natives.
42. Down near the bank of the river is an estate from which sound the shouts of happy children hour after hour.
43. Each four years voting takes place which results in many men being placed in office for terms of two years or more.

16. Visual Attention Span for Letters

Score.....

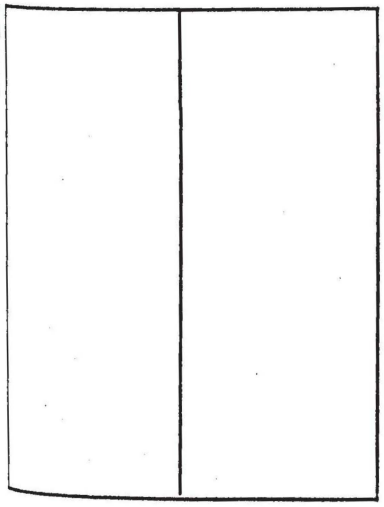
(See pages 84-85 of Handbook and pages 61-84 of Pictorial Material)

	I	II	III	IV
2.	c q	x p	t v	k x
3.	b m r	d n v	h b d	m c w
4.	g z f s	j p y c	q v l t	p m k t
5.	z t b r c	q l d n r	y f p q g	z q g f j
6.	b v n y g b	h x m j w d	w z s b x v	f p c l s n
7.	m z r f b s k	v q s j d c h	d b x c h q n	b d s v k p h

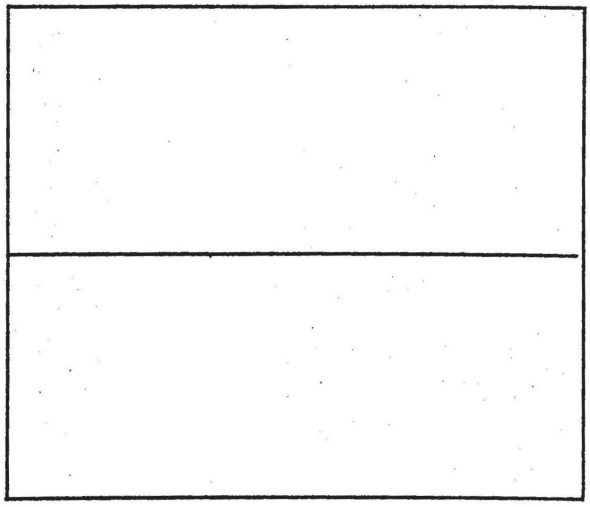
17. Disarranged Pictures

Score.....

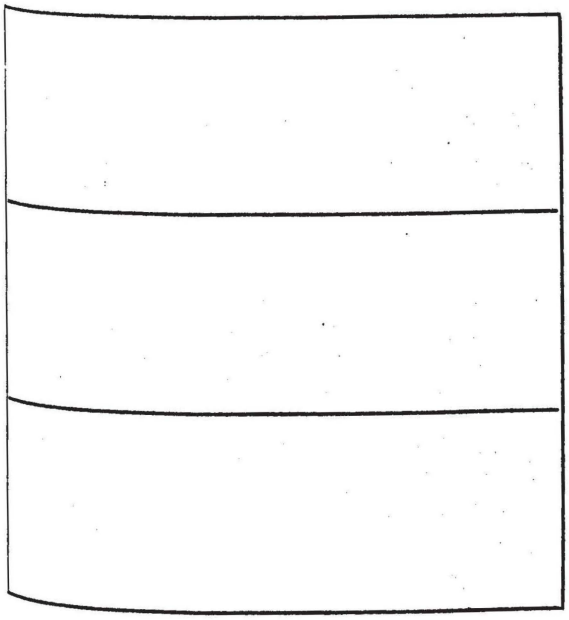
(See pages 85-87 of Handbook and pages 85-95 of Pictorial Material)



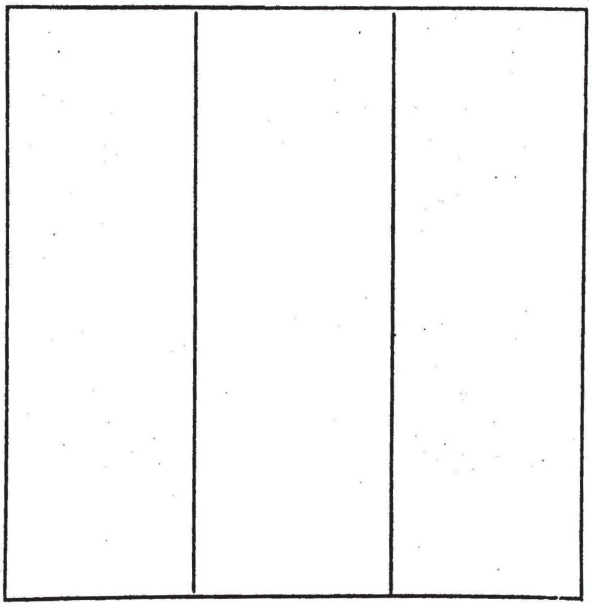
(A)



(1)



(2)



(3)

Name of Child:

Date Tested: Examiner's Name:

Age: Date of Birth:

Grade: Name of School:

Disabilities: Hearing:

Reading:

Speaking:

Other:

I.Q.: Test:

Error Score:

	X	Y
Form I	30	10
Form II	30	10

Additional Comments:

FORM II

		X	Y
1.	gear - beer		
2.	cad - cab		
3.	led - lad		
4.	thief - sheaf		
5.	sake - shake		
6.	jail - jail		
7.	ball - ball		
8.	lake - lake		
9.	bead - deed		
10.	rub - rug		
11.	wing - wing		
12.	gall - goal		
13.	pet - pit		
14.	lit - lick		
15.	bug - bud		
16.	lass - lath		
17.	cope - coke		
18.	pool - tool		
19.	zone - zone		
20.	fret - threat		

		X	Y
21.	bar - bar		
22.	bum - bun		
23.	lāve - lāthe		
24.	shot - shop		
25.	wedge - wedge		
26.	suck - sock		
27.	vie - thy		
28.	rich - rich		
29.	pit - kit		
30.	guile - dial		
31.	rash - wrath		
32.	chew - chew		
33.	fag - sag		
34.	phase - phase		
35.	sick - thick		
36.	wreath - reef		
37.	map - nap		
38.	muss - mush		
39.	cart - tart		
40.	cuff - cuss		

	X	Y
Error Score	/30	/10

SCORING FORM FOR THE WATKINS BENDER-GESTALT SCORING SYSTEM

Name: _____ Date Tested: _____

C.A.: _____ M.A.: _____ Total Error Score: _____

	(Circle One)			
No. of Errors Compared to C.A.:	Normal	Mild	Moderate	Severe
No. of Errors Compared to M.A.:	Normal	Mild	Moderate	Severe

Figures and Item Numbers	Descriptions of Items
_____ 1.	Total time ____ minutes ____ seconds (score if less than 4 or more than 9 minutes.) (Age 5)

Items Scored on Each Figure

Figure A

_____ 2. Rotation (Age 6).
_____ 3. Fail to touch or overlap by 1/8 inch or more (Age 6).
_____ 4. Missing and/or extra angle(s) in Diamond (Age 5).
_____ 5. Disproportion of parts, one approximately 1/3 larger or more, than other (Age 6).

Figure 1

_____ 6. Substitution of 5 or more circles for dots (Age 7).
_____ 7. Rotation (Age 5).
_____ 8. Dashes and commas for dots, 3 or more (Age 7).
_____ 9. Perseveration of two or more dots (Age 6).
_____ 10. Truncation of two or more dots (Age 5).

Figure 2

_____ 11. Dashes and commas for circles (Age 7).
_____ 12. Truncation of one or more columns of circles (Age 6).
_____ 13. Perseveration of one or more circles in the rows (Age 7).
_____ 14. One or two rows of circles omitted (Age 5).
_____ 15. Truncation of one or more circles in the rows (Age 7).
_____ 16. Perseveration of one or more columns of circles (Age 7).
_____ 17. Rotation (Age 9).

Figure 3

_____ 18. Substitution of 5 or more circles for dots (Age 6).
_____ 19. Substitution of lines for dots (Age 5).
_____ 20. Dashes and commas for dots, three or more (Age 7).
_____ 21. Shape of design lost (Age 7).
_____ 22. Rotation (Age 6).

Figure 4

_____ 23. Fail to touch, or overlap, by 1/8 inch or more (Age 5).
_____ 24. Rotation of entire Design or one element (Age 5).

Figures and Item Numbers	Descriptions of Items
Figure 5	
_____ 25.	Substitution of lines for dots (Age 5).
_____ 26.	Rotation (Age 5).
_____ 27.	Dashes or commas for dots, 3 or more (Age 5).
_____ 28.	Perseveration of two or more dots in circle or extension (Age 7).
_____ 29.	Substitution of 5 or more circles for dots (Age 7).
Figure 6	
_____ 30.	Two lines interwoven (Age 5).
_____ 31.	Substitution of two or more angles for curves (Age 6).
_____ 32.	Failure to cross the two lines, or crossing at extreme ends (Age 5).
_____ 33.	Substitution of straight lines for curves (Age 5).
_____ 34.	Perseveration of one or more curves (Age 7).
Figure 7	
_____ 35.	Missing and/or extra angle(s)(Age 7).
_____ 36.	Fail to touch or overlap excessively, by 1/8 inch or more (Age 6).
_____ 37.	Rotation (Age 6).
_____ 38.	Disproportion of the two hexagons, one approximately 1/3 larger than other (Age 9).
Figure 8	
_____ 39.	Rotation (Age 5).
_____ 40.	Missing and/or extra angle(s) (Age 6).
	Items Scored if Present on Any Figure
_____ 41.	Tremor. Score 1 for each figure with significant tremor, in case of doubt don't score (Age 5).
_____ 42.	Collision (the overlapping of two designs, including one design intruding into the open section of another design, or one design colliding with the edge of the page). Score 1 for each two collisions, and score 1 for each two collisions above the initial two. For example, if a child has five collisions, he would get a score of 2. (Age 5).

Directions for Completing Scoring Form:

1. Place a 1 in the blank to the left of each item where an error is made, except for Items 41 and 42 where a score of more than 1 may be recorded.

2. After all items have been scored, sum across all items to obtain the Total Error Score. This score is then used in the Norm Table to determine how the child compares to children of this mental age and chronological age.

3. Ages given in the parentheses after each item indicate chronological ages at which each item becomes significant by discriminating between normal and learning disability children.

4. The above scoring form should be used only if the test was given according to the directions used by Watkins.

NORMS FOR THE WATKINS BENDER-GESTALT SCORING SYSTEM

Number of Errors Necessary at each Age Level to Indicate the Presence of a Mild, Moderate or Severe Visual Perceptual Problem

C.A. or M.A.	Mild	Moderate	Severe
5-0 to 5-5	20	21	22
5-6 to 5-11	18	19	20
6-0 to 6-5	17	18	19
6-6 to 6-11	15	16	17
7-0 to 7-5	14	15	16
7-6 to 7-11	13	14	15
8-0 to 8-5	12	13	14
8-6 to 8-11	11	12	13
9-0 to 9-5	9	10	11
9-6 to 9-11	8	9	10
10-0 to 10-5	7	8	9
10-6 to 10-11	6	7	8
11-0 and up	5	6	7

Use of the Table:

1. In using the above table, use the child's C.A. if his M.A. is above his C.A.; use his M.A. if his M.A. is below his C.A. M.A. must be obtained from an adequate group or individually administered I.Q. test. Do not use short tests such as the PPVT. Compare each child's performance with his chronological age and with his mental age. This is important for developing educational plans.

2. If a child is 11½ months or more into a year, use the bottom of the next highest year. For example, if a child is 5 years 11 months, and 15 days old, use a C.A. of 6-0.

APPENDIX C

RAW SCORE DATA

RANDOM SAMPLE

Subject Number	Auditory Perception	Visual Perception	Phonics Ability
1101	113	103	138
1102	68	113	128
1103	134	140	125
1104	45	95	94
1105	128	141	129
1106	83	99	118
1107	127	147	133
1108	90	124	107
1109	60	99	106
1110	60	101	102
1111	110	131	179
1112	125	123	147
1113	135	105	143
1114	101	121	93
1115	63	122	106
1201	149	149	191
1202	86	114	187
1203	91	146	204
1204	114	130	109
1205	129	122	182
1206	138	137	175
1207	97	135	155
1208	78	128	147
1209	115	110	195
1210	98	128	161
1211	135	148	172
1212	122	122	150
1213	132	170	184
1214	125	179	194
1215	102	130	155
2101	121	156	195
2102	83	112	115
2103	74	108	98
2104	97	114	114
2105	120	153	131
2106	71	93	104

Subject Number	Auditory Perception	Visual Perception	Phonics Ability
2107	119	99	95
2108	84	147	175
2109	134	98	135
2110	78	105	97
2111	116	97	119
2112	130	128	113
2113	80	100	111
2114	48	122	86
2115	71	136	182
2201	87	114	151
2202	132	160	171
2203	91	144	191
2204	125	137	187
2205	89	101	143
2206	142	122	140
2207	105	165	194
2208	112	125	220
2209	91	149	126
2210	92	129	151
2211	141	171	220
2212	146	200	193
2213	169	152	104
2214	153	140	124
2215	141	122	119
$\bar{X}$	106.583	128.517	145.217
sd	28.403	23.2251	36.5824

SLOW READER SAMPLE

Subject Number	Auditory Perception	Visual Perception	Phonics Ability
01	126	115	93
02	83	99	107
03	93	138	99
04	67	110	100
05	114	110	106
06	67	102	101
07	129	101	99
08	45	95	94
09	101	121	93
10	63	122	106
11	60	101	102
12	90	124	107
13	60	99	106
14	110	135	192
15	105	132	107
16	75	138	124
17	80	123	101
18	98	128	136
19	125	179	136
20	102	130	136
21	135	148	136
22	94	93	96
23	74	117	121
24	111	123	136
25	114	130	109
26	90	126	104
27	122	122	136
28	149	125	114
29	93	102	113
30	87	111	97
31	116	97	107
32	77	114	96
33	106	110	98
34	54	98	97
35	99	107	101
36	80	100	107
37	97	114	107

Subject Number	Auditory Perception	Visual Perception	Phonics Ability
38	74	108	98
39	78	105	97
40	63	112	86
41	90	93	104
42	116	99	95
43	48	122	86
44	130	128	107
45	83	112	107
46	141	122	119
47	60	98	127
48	102	125	102
49	131	132	128
50	96	125	111
51	63	95	116
52	108	137	102
53	72	116	119
54	92	149	115
55	81	122	110
56	97	131	101
57	115	120	97
58	117	125	128
59	169	152	104
60	153	140	124
$\overline{X}$	96.167	118.450	110.050
sd	26.905	16.804	16.898

APPENDIX D

STATISTICAL PROCEDURES

Sex	Grade: Fourth	Grade: Sixth
Boys		
Girls		

APPENDIX E

POST-HOC CORRELATIONAL STUDY

POST-HOC CORRELATIONAL STUDY

A post-hoc correlational study was conducted to determine the relationships between the auditory subtests of the DTLA and the Wepman, and the visual subtests of the DTLA and the Bender-Gestalt. The scores on the auditory subtests of the DTLA were averaged to obtain a combined score for auditory perception. This combined score for each subject was utilized in the data analysis in the research study. The scores on the visual subtests of the DTLA were averaged to obtain a combined mental age score for visual perception. This combined score for each subject was utilized in the data analysis in the research study.

The correlational study included the combined scores, the original subtest scores, and the Wepman and Bender-Gestalt total error scores.

Table I

Correlation Matrix (Auditory Perception)

	1	2	3	4
1	1.0000	0.9218	0.9144	-0.6033
2	0.9218	1.0000	0.6899	-0.5754
3	0.9144	0.6899	1.0000	-0.5394
4	-0.6033	-0.5754	-0.5394	1.0000

1 - Combined mental age score for auditory perception

2 - Auditory Attention Span for Related Syllables

3 - Auditory Attention Span for Unrelated Words

4 - Wepman Test of Auditory Discrimination

The combined mental age score for auditory perception was highly correlated with both the subtests, Auditory Attention Span for Related Syllables, and Auditory Attention Span for Unrelated Words. The combined mental age score for auditory perception was relatively highly negatively correlated with the Wepman total error scores. This means that the lower the mental age score on the DTLA combined score, the greater the number of errors on the Wepman. It appears that the correlation of -0.6033 is high enough to utilize either the DTLA or the Wepman as measures of auditory perception. The critical value of the correlation coefficient

at the .05 level of significance is approximately .250.

Table II

Correlation Matrix (Visual Perception)

	1	2	3	4
1	1.0000	0.8678	0.8362	-0.3212
2	0.8678	1.0000	0.4538	-0.3181
3	0.8362	0.4538	1.0000	-0.2244
4	-0.3212	-0.3181	-0.2244	1.0000

1 - Combined mental age score for visual perception

2 - Visual Attention Span for Objects

3 - Visual Attention Span for Letters

4 - Bender-Gestalt (Watkin's Scoring System)

The combined mental age score for visual perception correlated highly with Visual Attention Span for Letters and Visual Attention Span for Objects. There was a low negative correlation between the combined mental age score for visual perception and the Bender-Gestalt. This negative correlation coefficient was significantly different from zero at the .05 level of significance when compared to the approximate critical value of .250.

This does not necessarily mean that the DTLA subtests

are invalid measures of visual perception. It appears that the DTLA subtests measure factors different from the Bender-Gestalt. The DTLA subtests may be a better measure of pure visual perception than the Bender-Gestalt because the Bender-Gestalt also includes measures of motor ability and integrative functioning.

It should be noted, however, that the combined score for visual perception yielded a higher correlation coefficient than either of the individual subtest scores. The combined mental age score for auditory perception also yielded a higher correlation coefficient than either of the individual auditory subtest scores. Therefore, the combined mental age scores would appear to be the best available measures for inclusion in the data analysis of this study.